5.5 Geology and Soils

The analysis in this section of the EIR addresses the potential impacts associated with geology and soils that may occur due to implementation of the proposed Collier Park Renovations Project. The following discussion includes information based on the Preliminary Geotechnical Investigation prepared by Geocon Incorporated (2010), which is provided as Appendix F of this EIR.

5.5.1 Regulatory Framework

5.5.1.1 State

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act of 1972 (formerly the Special Studies Zoning Act) regulates development and construction of buildings intended for human occupancy to mitigate the hazards of surface fault rupture. This Act groups faults into categories of active, potentially active, and inactive. Historic and Holocene age faults are considered active, Late Quaternary and Quaternary age faults are considered potentially active, and pre-Quaternary age faults are considered inactive. These classifications are qualified by the conditions that a fault must be shown to be "sufficiently active" and "well defined" by detailed site-specific geologic explorations in order to determine whether building setbacks should be established. Alquist-Priolo zones define areas where ground rupture is likely to occur during future earthquakes. Where such zones are designated, a geologic study must be conducted to determine the locations of all active fault lines in the zone before any construction is allowed, and no building may be constructed on the fault lines.

California Building Code

The California Building Code (California Code of Regulations, Title 24, Part 2) provides minimum standards for building design which address the specific building conditions and structural requirements found in California (e.g., seismic hazards). Local building codes are permitted to be more restrictive, but are required to be no less restrictive than the California Building Code standards. Chapter 16 addresses structural design requirements, including (but not limited to) regulations governing seismically resistant construction and construction to protect people and property from hazards associated with excavation cave-ins and falling debris or construction materials. Chapter 18 deals with site demolition, excavations, foundations, retaining walls, and grading, including (but not limited to) requirements for seismically resistant design, foundation investigations, stable cut and fill slopes, and drainage erosion control.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 addresses earthquake hazards other than surface fault rupture, which is covered by the Alquist-Priolo Earthquake Fault Zoning Act (described above). This Act is intended to protect the public from the effects of strong ground shaking, ground failure, liquefaction, landslides, and other hazards caused by earthquakes. Under this Act, seismic hazard zones are to be identified and mapped to assist local governments in land use planning. Special Publication 117A, Guidelines for Evaluation and Mitigating Seismic Hazards in California (California Geological Survey 2008), contains guidance for the evaluation and mitigation of earthquake hazards for projects within designated zones of required investigations.

5.5.1.2 Local

City of La Mesa Building Code

La Mesa Municipal Code Title 14, Building Regulations, sets forth rules, regulations, and minimum standards for buildings, grading, and construction activities in the City of La Mesa. Section 14.04.010 adopts the California Building Code, 2010 Edition, as the building code of the City of La Mesa for regulating the erection, construction, enlargement, alteration, repair, movement, removal, demolition, conversion, occupancy, equipment, use, height, area, and maintenance of all buildings or structures. Section 14.05.010 adopts Appendix J of the California Building Code, 2010 Edition, for the purpose of prescribing regulations governing the excavation and grading on private property, including the issuance of permits and providing for the inspection thereof.

5.5.2 Existing Conditions

5.5.2.1 Geologic Setting

The City of La Mesa is situated at the western margin of the Peninsular Ranges Geomorphic Province of southern California. This geomorphic province encompasses an area that extends for approximately 790 miles, from the Transverse Ranges and the Los Angeles Basin to the tip of Baja California, and varies in width from 30 to 100 miles. In general, the Peninsular Ranges consist of rugged mountains underlain by Mesozoic era (67 to 245 million years old) metamorphic and crystalline rocks to the east and a dissected coastal plain underlain by Cenozoic era (up to 67 million years old) sediments. The mountain ranges of this geomorphic province are generally northwest-trending and separated by subparallel fault zones, and are largely composed of granitic and related rocks and smaller amounts of metamorphic rocks. The coastal portions of this geomorphic province in the San Diego region are typically comprised of marine and non-marine sedimentary rocks that have been deposited within a northwest-trending basin known as the San Diego Embayment. The Peninsular Ranges are bounded on the east by the Salton Trough and on the north by the Los Angeles Basin, and extends westward into the Pacific Ocean where its highest peaks are exposed at Catalina, Santa Barbara, San Clemente, and San Nicholas Islands.

The Peninsular Ranges are traversed by several major active faults. Right-lateral, strike-slip movement is the major tectonic activity associated with faults in the regional tectonic framework. Earthquakes along these faults have the potential for generating strong seismic ground motions in the region. The seismic event most likely to affect the City of La Mesa would be a major earthquake on the Rose Canyon Fault. The Rose Canyon Fault is a complex zone of strike-slip, oblique, reverse, and normal faults that extend onshore from La Jolla Cove south to San Diego Bay, and is capable of generating a magnitude-7.2 earthquake. Probabilistic seismic hazard analysis indicates that La Mesa lies within an area where the peak horizontal acceleration with a 10 percent probability of exceedance in 50 years ranges from zero to 0.2 g (g corresponds to the vertical acceleration force due to gravity) (City of La Mesa 2012).

According to the Preliminary Geotechnical Investigation (Geocon Incorporated 2010), Collier Park is not underlain by known active, potentially active, or inactive faults, and is not located within an Alquist-Priolo Earthquake Fault Zone. Seven known active faults are located within a 50-mile search radius of Collier Park: Rose Canyon, Coronado Bank, Elsinore (Julian), Newport-Inglewood (offshore), Earthquake Valley, Elsinore (Coyote Mountain), and Elsinore (Temecula). The nearest known active fault to the project site is the Rose Canyon Fault, which is located approximately 15 miles west of Collier Park.

5.5.2.2 Topography

The topography of Collier Park ranges from relatively flat, primarily in the developed southern and western portions of the park (Panhandle area), to steep hillsides sloping up to the primarily undeveloped northern and western portions of the park. Elevations range from approximately 500 feet above mean sea level to approximately 545 feet above mean sea level, generally from south to north.

5.5.2.3 Soils and Geologic Formations

According to the National Resources Conservation Service Web Soil Survey (U.S. Department of Agriculture 2007), four soil types have been mapped within Collier Park that correspond to the following four different soil series: Friant rocky fine sandy loam, 9 to 30 percent slopes (FxE); Huerhuero loam, 9 to 15 percent slopes, eroded (HrD2); Redding-Urban land complex, 2 to 9 percent slopes (RhC); and Cieneba coarse sandy loam, 15 to 30 percent slopes, eroded (CIE2). Table 5.5-1 summarizes the characteristics of these soil types.

Table 5.5-1 Soil Characteristics

Soil Series	Base Material	Expansiveness	Erosion Potential	Runoff Potential
Friant	Metamorphic	Low	Severe	Very High
Huerhuero	Sedimentary	High	Moderate	Very High
Redding	Sedimentary	High	Severe	Very High
Cieneba	Igneous	Low	Severe	Medium

Source: City of La Mesa 1996

Since portions of the project site have been previously graded and/or excavated during development of the park and installation of the storm drain, the majority of the surface soils are highly disturbed. Two surficial deposits, topsoil and undocumented fill, were identified during the Preliminary Geotechnical Investigation (Geocon Incorporated 2010). The topsoil, which consists of loose, dry to moist, reddish brown, silty sand with some gravel and organic debris, forms a relatively thin layer covering the entire project site. The undocumented fill, which consists of loose to medium dense, moist, brown to reddish brown and olive brown, clayey, fine to medium sand with some gravel, was encountered in the developed southern and western portions of the park (Panhandle area) and in the northeastern corner of the park. The surficial deposits at Collier Park are underlain by Cretaceous/Jurassic-age metasedimentary and metavolcanic rock associated with the Santiago Peak Volcanics formation, which is exposed at the surface and on cut slopes in the park. This formational rock material is generally moderately strong to strong, intensely to slightly weathered, and moderately to slightly jointed.

5.5.2.4 Groundwater

According to the Preliminary Geotechnical Investigation (Geocon Incorporated 2010), neither a static groundwater table nor subsurface seepage was encountered during exploratory excavations at Collier Park. However, due to the permeability characteristics of the geologic formation underlying the project site, it would not be uncommon for groundwater seepage conditions to develop where none previously existed. During periods of heavy or prolonged rainfall, perched groundwater conditions are likely to develop within drainage areas. Groundwater elevations tend to vary because they are dependent upon a number of factors such as seasonal precipitation, irrigation, and land use.

5.5.3 Thresholds of Significance

According to Appendix G of the CEQA Guidelines, a significant impact associated with geology and soils would occur if implementation of the proposed project would:

- **Threshold 1:** Expose people or structures to potential adverse effects, including the risk of loss, injury, or death involving: i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault; ii) Strong seismic ground shaking; iii) Seismic-related ground failure, including liquefaction; or iv) Landslides.
- **Threshold 2:** Result in substantial soil erosion or the loss of topsoil.
- **Threshold 3:** 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, liquefaction, or collapse.
- **Threshold 4:** Be located on an expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.

In accordance with Section 15128 of the CEQA Guidelines, impacts related to soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems were determined not to be significant and are discussed briefly in Section 7.1, Effects Found Not to be Significant, of this EIR.

5.5.4 Impacts

5.5.4.1 Seismic Hazards

Threshold 1: Would the project expose people or structures to potential adverse effects, including the risk of loss, injury, or death involving: i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault; ii) Strong seismic ground shaking; iii) Seismic-related ground failure, including liquefaction; or iv) Landslides?

Fault Rupture

Ground surface rupture occurs when movement along a fault is sufficient to cause a gap or rupture where the upper edge of the fault zone intersects that earth surface. As stated in Section 5.5.2.1 above, the project site is not underlain by a known active, potentially active, or inactive fault, and is not located within an Alquist-Priolo Earthquake Fault Zone. Due to the absence of known fault zones underlying the project site, the potential for ground surface rupture is considered to be very low (Geocon Incorporated 2010). Therefore, it is unlikely that implementation of the proposed project would expose people or structures to substantial adverse effects involving rupture of a known fault. Impacts would be less than significant.

Seismic Ground Shaking

Seismic ground shaking is a potential hazard throughout the southern California region. The intensity of ground shaking at any particular site and relative potential for damage from this hazard depends on the earthquake magnitude, distance from the source (epicenter), and the site response characteristics (ground acceleration, predominant period, and duration of shaking). Table 5.5-2 presents the peak ground accelerations at the project site associated with an earthquake on the seven known active faults located within a 50-mile search radius. In the event of a major earthquake on any of the faults listed in Table 5.5-2, or other significant faults in the southern California region, the project site could be subjected to moderate to strong ground shaking, which has the potential to damage or destroy buildings and other structures, thereby exposing people to hazardous conditions. Poorly constructed buildings and structures on unstable soil are particularly susceptible to the effects of seismic ground shaking.

Table 5.5-2 Peak Ground Acceleration at Project Site from Regional Active Faults

Fault Name	Distance from Project Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration (g)[1]		
			Boore-Atkinson 2008 Model	Campbell-Bozorgnia 2008 Model	Chiou-Youngs 2008 Model
Rose Canyon	15	7.2	0.23	0.25	0.26
Coronado Bank	22	7.7	0.16	0.12	0.15
Elsinore (Julian)	34	7.5	0.09	0.07	0.07
Newport-Inglewood (Offshore)	37	7.2	0.08	0.06	0.06
Earthquake Valley	39	6.9	0.06	0.05	0.04
Elsinore (Coyote Mountain)	41	7.2	0.07	0.05	0.04
Elsinore (Temecula	43	7.2	0.06	0.05	0.04

(1) Peak ground acceleration was calculated using three models based on different acceleration-attenuation relationships. Ground acceleration is expressed in units of acceleration due to gravity (g), where 1 g corresponds to the vertical acceleration force due to gravity.
Source: Geocon Incorporated 2010

Proposed park improvements would include the redevelopment of the Spring House and construction of Collier Club House building and other ancillary structures, such as restrooms, that would be subject to the effects of seismic ground shaking. However, pursuant to La Mesa Municipal Code Title 14, the proposed project would be designed and constructed in compliance with the California Building Code, which contains specific structural requirements for seismic safety. Proper engineering and adherence to the California Building Code guidelines would minimize the risk to life and property from potential ground motion at the project site. Furthermore, the existing Spring House, which is structurally unstable due to damage and deterioration over time, could present a significant hazard during strong seismic ground shaking. Under the proposed project, this structure would be demolished and replaced with an interpretive center. Implementation of the proposed project would reduce the potential hazard from ground shaking by replacing the dilapidated Spring House with the structurally sound interpretive center. Therefore, impacts associated with strong seismic ground shaking would be less than significant.

Liquefaction

Liquefaction is a soil phenomenon in which saturated, unstable soil loses its shear strength when subjected to the forces of intense, prolonged ground shaking. Liquefaction causes two types of ground failure: lateral spread and loss of bearing strength. Lateral spreads develop on gentle slopes and entail the sidelong movement of large masses of soil as an underlying layer liquefies. Loss of bearing strength results when the soil supporting structures liquefies and causes structures to collapse. Loosely structured soils, such as alluvium or improperly compacted fill, are more susceptible to liquefaction, while clay-rich, well-compacted soils are less susceptible to liquefaction. A high groundwater table increases the risk of liquefaction hazard.

As stated in Section 5.5.2.3 above, the surficial deposits at the project site are underlain by Cretaceous/Jurassic-age metasedimentary and metavolcanic rock associated with the Santiago Peak Volcanics formation, which is exposed at the surface and on cut slopes in the park. Where this geologic formation is present, the bedrock is close to the surface and the soils are shallow and fairly fast draining, and thus relatively free from hazards related to liquefaction (City of La Mesa 1996). Furthermore, as stated in Section 5.5.2.4 above, neither a static groundwater table nor subsurface seepage was encountered during exploratory excavations at the project site. Due to the characteristics of the underlying geologic formation and the lack of permanent near-surface groundwater at the project site, the potential for liquefaction and lateral spreading is considered to be very low. Therefore, it is unlikely that implementation of the proposed project would expose people or structures to substantial adverse effects involving liquefaction. Impacts would be less than significant.

Landslides

Landslides occur when masses of rock, earth, or debris move down a slope, including rock falls, deep failure of slopes, and shallow debris flows. Landslides are influenced by human activity (mining and construction of buildings, railroads, and highways) and natural factors (geology, precipitation, and topography), and frequently accompany other natural hazards such as floods, earthquakes, and volcanic eruptions. Although landslides sometimes occur during seismic activity, earthquakes are rarely their primary cause. Areas prone to rain-induced landslides overlap areas where earthquake-induced landslides are likely to occur. According to the San Diego County Multi-Jurisdictional Hazard Mitigation Plan (County of San Diego 2010), the project site is not located within a rain-induced landslide hazard area. Therefore, it is unlikely that implementation of the proposed project would expose people or structures to substantial adverse effects from seismic-induced landslides. Impacts would be less than significant.

5.5.4.2 Soil Erosion or Topsoil Loss

Threshold 2: Would the project result in substantial soil erosion or the loss of topsoil?

The proposed project may result in or indirectly accelerate erosion on the project site during construction. Ground-disturbing activities, such as grading and excavation, and stockpiling of excavated materials would expose bare soils that could be eroded by wind or water. Furthermore, vegetation removal in landscaped areas could reduce soil cohesion and temporarily diminish the buffer provided by vegetation from wind, water, and surface disturbance, rendering the exposed soils more susceptible to erosive forces.

Construction activities would comply with the California Building Code, which regulates excavation, construction of foundations and retaining walls, and grading, including drainage and erosion control. As discussed in Section 5.2, Air Quality, San Diego Air Pollution Control District (SDAPCD) Rule 55 requires that construction activities implement fugitive dust control measures, which would minimize the effects of wind erosion. Dust control measures would include, but not be limited to, the following:

- Multiple applications of water during grading between dozer/scraper passes;
- Use of sweepers or water trucks to remove any track-out/carry-out material on roadways;
- Track-out grates or gravel beds at each egress point;
- Wheel-washing at each egress point during muddy conditions;
- Termination of grading if winds exceed 25 miles per hour;
- Stabilization of dirt stockpiles and inactive disturbed areas by soil binders, chemical soil stabilizers, geotextiles, tarps, fencing, or other erosion control; and
- Hydroseeding of graded lots.

As discussed in Section 5.8, Hydrology and Water Quality, erosion and sedimentation control best management practices (BMPs) would be implemented as part of the site-specific Storm Water Pollution Prevention Plan (SWPPP) developed pursuant to the National Pollutant Discharge Elimination System (NPDES) Construction General Permit and the City's Storm Water BMP Manual, which would minimize the effects of water erosion. Construction BMPs would include, but are not limited to, the following:

- Minimization of disturbed areas to the portion of the project site necessary for construction;
- Stabilization of exposed or stockpiled soils and cleared or graded slopes;
- Establishment of permanent re-vegetation or landscaping as early as feasible.
- Removal of sediment from surface runoff before it leaves the project site by silt fences or other similar devices around the site perimeter;
- Diversion of upstream runoff around disturbed areas of the project site;
- Protection of all storm drain inlets on site or downstream of the project site to eliminate entry of sediment; and
- Prevention of tracking soil off site through use of a gravel strip or wash facilities at exits from the project site.

Although the proposed project would be completed in phases, grading of the entire project site may occur during the initial Panhandle phase with the actual development of the Spring House, History Hill and Collier Club House phases occurring much later, thereby leaving graded areas exposed during the interim period. All graded areas that would not be developed immediately would remain subject to the SDACPD Rule 55, NPDES Construction General Permit, and City's Storm Water BMP Manual until permanently stabilized in accordance with the standards contained within these regulations. As indicated above, compliance with these regulations requires the implementation of dust control measures and construction BMPs, which include provisions for the stabilization of inactive disturbed areas and graded slopes. Stabilization methods include hydroseeding, soil binders, chemical soil stabilizers, geotextiles, tarps, fencing, or other erosion control measures. Following construction of each phase, any remaining disturbed areas within that phase would be stabilized with landscaping to prevent erosion and topsoil loss. With implementation of the dust control measures and construction BMPs described above, the proposed project would not result in substantial erosion or loss of topsoil. Impacts would be less than significant.

5.5.4.3 Unstable Soils

Threshold 3: Would the project 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, liquefaction, or collapse?

As stated in Section 5.5.4.1 above, the project site is not located within a rain-induced landslide hazard area identified in the San Diego County Multi-Jurisdictional Hazard Mitigation Plan (County of San Diego 2010). In addition, due to the characteristics of the underlying geologic formation and the lack of permanent near-surface groundwater at the project site, the potential for liquefaction and lateral spreading is considered to be very low. However, according to the Preliminary Geotechnical Investigation (Geocon Incorporated 2010), the surface soils at the project site, which consist of topsoil and undocumented fill, are considered unsuitable to receive additional fill or settlement-sensitive structures in their present condition as soils may not be properly compacted and may be subject to collapse. Therefore, implementation of the proposed project would result in a potentially significant impact associated with unstable soils.

5.5.4.4 Expansive Soils

Threshold 4: Would the project be located on an expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?

According to the Preliminary Geotechnical Investigation (Geocon Incorporated 2010), soils at the project site are expected to be both “non-expansive” (defined as Expansion Index less than 20) and “expansive” (defined as Expansion Index greater than 20). Laboratory testing of soils was not performed as part of the Preliminary Geotechnical Investigation. Therefore, due to the potential for expansive soils to occur onsite, implementation of the proposed project would result in a potentially significant impact associated with expansive soils.

5.5.5 Mitigation Measures

5.5.5.1 Seismic Hazards

No significant impacts related to seismic hazards would result from the implementation of the proposed project. Therefore, no mitigation measures are required.

5.5.5.2 Soil Erosion and Topsoil Loss

No significant impacts related to soil erosion and topsoil loss would result from the implementation of the proposed project. Therefore, no mitigation measures are required.

5.5.5.3 Unstable Soils

A potentially significant impact related to unstable soils would result from implementation of the proposed project. Implementation of the following mitigation measures would reduce this impact to below a level of significance.

GEO-1 Preliminary Grading Recommendations. Remedial grading of the project site shall be conducted in accordance with the following preliminary grading recommendations, as provided in the Preliminary Geotechnical Investigation (Geocon Incorporated 2010):

1) A pre-construction conference with the owner, contractor, civil engineer, and soil engineer in attendance shall be held at the site prior to the beginning of grading operations. Special soil handling requirements shall be discussed at that time.

2) Earthwork shall be observed and compacted fill shall be tested by a geotechnical engineering consultant.

3) Grading of the site shall commence with the removal of existing improvements from the areas to be graded. Deleterious debris and unacceptable contaminated soil (if encountered) shall be exported from the site and shall not be mixed with the fill soil. Existing underground improvements within the proposed building areas shall be removed and the resulting depressions properly backfilled in accordance with the procedures described in the recommended grading specifications (refer to Appendix C of the Preliminary Geotechnical Investigation [Geocon Incorporated 2010]).

4) Topsoil and highly weathered or decomposed formational rock material (if encountered) shall be removed to expose firm formational rock materials. The actual depth of removal shall be evaluated by a geotechnical engineering consultant during the grading operations. In addition, the existing formational rock material shall be undercut at least three feet and replaced with compacted fill. The undercuts shall facilitate trenching/landscaping at the planned finish grade.

5) Roadways and utility areas underlain by hard rock units at grade shall be undercut a minimum of eight feet for the areas inside of the public right-of-way (including joint utility structures and sidewalk areas). The undercut zone shall include the areas within one foot of the lowest utility or drain line.

6) The existing upper four feet of undocumented fill within the area of planned structures or flatwork improvements shall be removed and replaced with compacted fill. The actual depth of removal shall be evaluated by a geotechnical engineering consultant during grading operations. A deeper removal may be determined subsequent to performing the supplemental geotechnical investigation. Prior to the placement of compacted fill, the exposed ground surface shall be scarified where possible, moisture conditioned as necessary, and properly compacted.

7) The bottom of the excavations shall be scarified to a depth of at least eight inches where possible, moisture conditioned as necessary, and properly compacted. To the extent practical, excavated soils with an Expansion Index greater than 50 shall be kept at least three to four feet below finish grades in areas of structural fill. Sheet-graded pads shall be capped with at least six feet of low expansive soil to accommodate minor regarding.

8) If the remedial grading is limited due to the presence of utility lines or boundary conditions, partial removal and recompaction along with other corrective measures shall be implemented to accommodate the potential settlement. A geotechnical engineering consultant shall be contacted if this issue exists.

9) The site shall be brought to final grade elevations with structural fill. Excavated soil generally free of deleterious debris shall be placed as fill and compacted in layers to the

design finish grade elevations. Fill and backfill soil shall be placed in horizontal loose layers approximately six to eight inches thick, moisture conditioned as necessary, and compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content as determined by ASTM D 1557. Rock greater than one foot in maximum dimension shall not be placed within three feet of finish grades or one foot of the deepest utilities.

10) Import fill shall consist of granular material with a "very low" to "low" expansion potential (Expansion Index of 50 or less) free of deleterious material or stones larger than three inches and shall be properly compacted as described in the recommended grading specifications (refer to Appendix C of the Preliminary Geotechnical Investigation [Geocon Incorporated 2010]). A geotechnical engineering consultant shall be notified of the import soil source and authorized to perform laboratory testing of import soil prior to its arrival at the site to evaluate its suitability as fill material.

GEO-2 Design Level Geotechnical Investigation. Prior to the approval of the grading permit for each phase of the project, a design-level geotechnical investigation pursuant to Section J104 of the California Building Code shall be conducted by a qualified geotechnical consultant based on project grading plans. The geotechnical investigation shall include laboratory testing of onsite soils. If necessary, the geotechnical consultant shall identify and recommend more detailed grading recommendations to be implemented during grading of the project site. Any recommendations made by the geotechnical consultant shall be incorporated into the final grading plans.

5.5.5.4 Expansive Soils

A potentially significant impact related to expansive soils would result from implementation of the proposed project. Implementation of mitigation measures GEO-1 and GEO-2 (described above) would reduce this impact to below a level of significance.

5.5.6 Significance Determination

The significance of geology and soils impacts before and after mitigation is summarized in Table 5.5-3. Implementation of the proposed project would not result in any significant impacts related to seismic hazards or soil erosion and topsoil loss; however, potentially significant impacts related to unstable soils and expansive soils would occur prior to mitigation. With implementation of mitigation measures GEO-1 and GEO-2, these impacts would be reduced to below a level of significance. Therefore, impacts associated with geology and soils would be less than significant after mitigation.

Table 5.5-3 Summary of Significance of Geology and Soils Impacts

Issue	Significance before Mitigation	Mitigation	Significance after Mitigation
Seismic Hazards	Less than Significant	None	Less than Significant
Soil Erosion and Topsoil Loss	Less than Significant	None	Less than Significant
Unstable Soils	Significant	GEO-1 & GEO-2	Less than Significant
Expansive Soils	Significant	GEO-1 & GEO-2	Less than Significant