3.1.2 Geologic Hazards

The 1981 Sycamore Springs and 1983 Hewlett Packard EIRs identified geological impacts to developed uses as significant but mitigable. Technical reports prepared for the 1981 and 1983 EIRs are incorporated by reference and available for review at the County PDS office.

A Geotechnical Reconnaissance was conducted for the Proposed Project by Geotechnics in 2004, and updated in 2008 to assess Project site, regulatory, industry and proposed design conditions at that time (Geotechnics 2004, 2008). A Geotechnical Investigation of the Proposed Project was also conducted by Leighton and Associates (Leighton) in 2012. This investigation includes more detailed analyses of site geotechnical conditions and currently proposed development, based on information such as site plans, subsurface exploration (e.g., borings) and laboratory testing, and is provided as Appendix I to this EIR. The results of the referenced geotechnical analyses are summarized below along with other pertinent data (including applicable information from the previous studies), with the complete reports included in Appendix I.

Portions of the previous geotechnical and related EIR analyses can be carried forward to the current evaluation as noted, including appropriate information related to stratigraphy, fault locations and activity status, and potential hazards associated with liquefaction, settlement, and expansive soils. These discussions are supplemented, however, with applicable information and conclusions from the 2012 Geotechnical Investigation prepared for the Proposed Project to reflect updated and more detailed technical analysis (e.g., field/laboratory evaluations), industry standards, regulatory requirements, and Project design revisions.

3.1.2.1 *Existing Conditions*

<u>Geological Setting</u>

Regional Geology/Topography

The Project site and vicinity are located within the coastal subprovince of the Peninsular Ranges Geomorphic Province, a region characterized by northwest-trending structural blocks with intervening fault zones and a relatively level coastal plain. Typical lithologies in the Peninsular Ranges include a variety of igneous intrusive (i.e., formed below the surface) rocks associated with the Cretaceous (between approximately 65 and 135 million years old) Southern California Batholith (a large igneous intrusive body), with such igneous bodies typically intruded into older metavolcanic and/or metasedimentary units in western San Diego County. Basement rocks in the coastal portion of San Diego County are locally overlain by a sequence of primarily Tertiary (between approximately 2 and 65 million years old) marine and non-marine sedimentary strata, with most of these deposits associated with several sea level advance/retreat cycles over approximately the last 55 million years. Tertiary sedimentary rocks are generally not present in the Project site vicinity, but occur in coastal areas to the west. The described geologic sequence is locally overlain with Quaternary (less than approximately two million years old) materials such as alluvial deposits, colluvium, and topsoil.

Topographically, the Peninsular Ranges are composed of generally parallel ranges of steep-sloped hills and mountains separated by alluvial valleys. More recent uplift and erosion has produced the characteristic canyon and mesa topography present today in western San Diego County, as well as the deposition of Quaternary deposits noted above.

Site Geology/Topography

Geologic and surficial units observed or expected to occur within the Project site and applicable off-site areas include Cretaceous-age granitic and/or gabbroic igneous intrusive rocks, Quaternary-age alluvial terrace deposits, alluvium, residual topsoil/colluvium, and undocumented fill. Basement igneous rocks within the site and vicinity are uncomformably overlain by Quaternary-age materials and historic fill. Additional description of geologic and surficial units within the Project site and vicinity is provided below under Stratigraphy.

On-site topography is characterized by generally level to moderately rolling terrain, with gentle to moderate slopes in most areas north of SR-76 and predominantly level conditions to the south near the San Luis Rey River and in larger drainages. On-site elevations range from approximately 266 feet amsl in low-lying alluvial areas near the San Luis Rey River, to 320 feet amsl along portions of the northern slopes. Surface drainage from the Project site flows primarily south to the San Luis Rey River, with internal drainage also moving generally to the south although somewhat variable with topography.

Stratigraphy

Surficial and geologic exposures within or underlying the Project site and vicinity are described below in order of increasing age, with principal geologic units shown on Figure 3.1.2-1, Geologic Map.

Historic Undocumented Fill (Map Symbol Afu). Undocumented fill deposits (i.e., undocumented for conformance with applicable geotechnical regulatory standards) are present in various portions of the site, primarily in association with Pankey Road (although other localized occurrences may also be present). In addition, off-site areas proposed for improvements such as roadway modifications and utility extensions consist predominantly of previously developed sites that encompass documented and/or undocumented fill. These materials were likely derived from local sources and encompass soil and/or alluvial deposits as described below.

Holocene (less than approximately 11,000 years old) Native Topsoil/Colluvium (not mapped). The U.S. Natural Resources Conservation Service (NRCS; formerly the U.S. Soil Conservation Service) has conducted topsoil mapping within the site and vicinity (1973). Four soil series (Grangeville, Ramona, Visalia, and Tujunga) represented by seven individual soil types are mapped within the Project site, with a summary description of soil series characteristics provided in Table 3.1.2-1, Summary Description of Soil Series Properties within the Project Site and Applicable Off-site Areas. Topsoil deposits within portions of the Project site and applicable off-site areas that have been previously graded or disturbed have likely been removed or altered, although intact soils are assumed to be present in undisturbed areas. Previous studies conducted for adjacent parcels have determined that local topsoils typically extend to depths of one to five feet, although deeper soils may be present locally.

Colluvium (or slope wash) is locally associated with native topsoils, and consists of weathered material transported chiefly by gravity. Colluvial deposits generally tend to accumulate along slope faces or bottoms, and are typically composed of larger and more angular materials than topsoils.

Quaternary Alluvium (Map Symbol Qal). Alluvium within the Project site and vicinity is associated with deposition from larger active stream courses, including the San Luis Rey River and Horse Ranch Creek. Alluvial materials occur widely in the southern portion of the site (south of SR-76) and in larger drainage courses to the north. In the northern areas, alluvial deposits generally consist of poorly consolidated (loose) deposits of clay, silt and sand, while in the southern areas alluvium is comprised of loose to medium dense, fine- to coarse-grained sand, silty fine- to medium-grained sand, and sandy silt. On-site alluvium is expected to extend to average depths of approximately 5 to 10 feet north of SR-76, while the southern area may include alluvial deposits extending to depths of 70 feet.

Quaternary Terrace Deposits (Map Symbol Qt). Terrace deposits are associated with much of the rolling terrain present in the northern Project site. These materials are differentiated from alluvium by a greater degree of consolidation, and typically exhibit higher silt and clay content. The upper portions of these deposits are more highly weathered, with this weathered zone generally extending to depths of between 2 and 10 feet.

Cretaceous Granitic and/or Gabbroic Rocks. Granitic rocks are not exposed within the Project site, but occur in nearby surrounding areas and likely underlie the entire site at depth. These deposits are associated with the Southern California Batholith, and include rocks of variable granitic composition as well as the San Marcos Gabbro. Local igneous rocks weather to a distinctive bouldery appearance, and are typically light gray to light brown in color.

Groundwater

Groundwater was observed on site at depths of between 13 and 18 feet below the surface in all four exploratory borings conducted as part of the 2012 Geotechnical Investigation. Observed groundwater depths generally decrease to the north, with previous geotechnical investigations encountering groundwater as shallow as three feet below the surface of alluvial deposits in the northern portion of the Project site (Appendix I). The reader is also referred to Section 3.1.4, Hydrology and Water Quality, of this subchapter for additional detail on this topic.

Structure/Seismicity

The alluvial and terrace deposits observed during the 2012 Geotechnical Investigation are generally massive (i.e., not encompassing distinctive geologic structure, such as bedding), with localized cross-bedding and predominantly flat bedding where present (Appendix I).

The Project site, like all of southern California, is located within a broad, seismically active region characterized by a series of northwest-trending faults associated with the San Andreas Fault System. No active or potentially active faults are mapped or known to occur within or adjacent to the Project site. Active faults are defined as those that exhibit Holocene displacement or historic activity, while potentially active faults displace Pleistocene, but not Holocene, strata. The closest such structures are located within the Elsinore-Temecula Fault Zone, approximately 7.8 miles to the north. Several additional major active faults are also located in the Project region, with location and seismicity data for major faults within approximately 50 miles of the site summarized in Table 3.1.2-2 (and additional data provided in Appendix I). Estimated peak horizontal ground acceleration (or ground shaking) values associated with proximal active faults are also shown, with an estimated maximum peak acceleration value of 0.34 g (where g equals the acceleration due to gravity) identified for the Project site in association with a magnitude 7.1 event along the Elsinore-Julian Fault Zone. Based on 2010 California Building Code (CBC) procedures and the U.S Geological Survey Earthquake Hazard Program (GMT), the 2012 Geotechnical Investigation identifies a design earthquake with a magnitude of 7.6 and a corresponding peak ground acceleration of 0.4g for the Project site (Appendix I). This design ground acceleration value is used to evaluate related site-specific hazards such as liquefaction.

No fault-rupture hazard zones or other seismic hazard designations identified by the California Geologic Survey (CGS, formerly the California Division of Mines and Geology [CDMG]) are present within the Project site or the immediate vicinity (CGS 2007). The closest CGS Fault-Rupture Hazard Zone designations are located along the previously noted portion of the Elsinore-Temecula Fault Zone. The described CGS fault-rupture hazard designations are generally intended to “[r]egulate development near active faults so as to mitigate the hazard of surface fault rupture” (CGS 2007). The Project site is also not located within a County-designated Special Study Fault Zone or Near-Source Shaking Zone, as identified in the *Guidelines for Determining Significance, Geologic Hazards* (County 2007e). Similar to all of San Diego County, Campus Park West is within a Seismic Zone 4 designation. Seismic Zone 4 is the highest risk category of the four nationwide seismic zones, and generally exhibits a 10 percent chance of experiencing an earthquake-generated peak ground acceleration of 0.4g within the next 50 years. For comparison purposes, Seismic Zone 1 (the lowest risk category) exhibits a 10 percent chance of experiencing an earthquake-generated peak ground acceleration of 0.1g within the next 50 years.

Geologic Hazards

<u>Seismic Ground Rupture</u>. Seismic ground rupture is the physical surface (or near surface) displacement (typically along a fault structure) resulting from earthquake-induced movement. Based on the absence of known active and potentially active faults within the Project vicinity, the potential for associated seismic ground rupture is considered low (Appendix I).

<u>Seismic Ground Acceleration (Ground Shaking)</u>. Seismically generated ground shaking typically represents the most substantial hazard associated with earthquakes, and can affect the integrity of surface and subsurface facilities such as structures, foundations and utilities. Based on technical analysis conducted as part of the 2012 Geotechnical Investigation (and as previously described), a design peak ground acceleration value of 0.4g has been assumed for the Project site

and vicinity. Associated potential effects can occur directly from vibration-related damage to rigid structures, or indirectly through associated hazards including liquefaction (as described below).

Liquefaction/Dynamic Settlement and Related Hazards. Liquefaction and dynamic settlement of soils can be caused by seismic ground shaking. Loose, saturated and granular soils are the most susceptible to these effects, which result in a loss of shear strength and result in soils behaving as a viscous liquid. Surface manifestations from these events can include loss of support for structures/foundations, excessive (dynamic) settlement, the occurrence of sand boils (i.e., sand and water ejected at the surface), and other effects such as lateral spreading (horizontal displacement on sloped surfaces as a result of underlying liquefaction). The Project geotechnical investigations identify the potential for on-site liquefaction and related effects (including lateral spreading) in portions of the southern site. Specifically, this includes proposed improvements south of Pala Road and the Pankey Road realignment/bridge, as well as the area southwest of PAs 4 and 5. The referenced County significance guidelines for Geologic Hazards also identify the San Luis Rey River as one of several primary areas for potential liquefaction hazard, and map the River valley near the Project site as a potential liquefaction area (County 2007e). Based on these considerations, the potential for liquefaction/dynamic settlement and related effects in applicable portions of the Project site and vicinity in association with a design earthquake is generally high.

Landslides. The 2012 Geotechnical Investigation included evaluation of landslide potential based on efforts such as field investigation and review of aerial photographs, previous investigations and technical literature. From this analysis, it was concluded that no mapped landslide deposits or topographic features indicative of landslides were present within or adjacent to the site, and the potential for associated landslides or large-scale slope instabilities is considered low. Potential landslide and/or rock fall hazards were identified for off-site areas along Horse Ranch Creek Road that are associated with utilities (subsurface water and sewer lines) identified as part of the proposed Project.

Expansive Soils. Expansive (or shrink-swell) behavior is attributable to the water-holding capacity of clay minerals and can adversely affect the integrity of facilities such as pavement or structure foundations. Based on field investigation and laboratory analysis, the 2012 Geotechnical Investigation concludes that on-site soils generally have a low expansion potential, although it is noted that "Localized deposits of highly expansive soils may also be present." As shown in Table 3.1.2-1, the soil types mapped on the Project site typically have low to moderate expansion potential, and are not on the list of clay soils in the County guidelines for geologic hazards. The site also is not within any "Expansive Soil Areas" as mapped in the County guidelines (2007e). Accordingly, the potential for expansive soils to occur on the Project site and applicable off-site areas is considered low, although localized deposits may be present. Specifically, as noted above under the discussion of Landslides, this could potentially include portions of the off-site area along Horse Ranch Creek Road associated with utilities (subsurface water and sewer lines) identified as part of the proposed Project.

Non-seismic Compression/Settlement. A number of surficial materials present within the site and vicinity may be subject to compression and settlement under load (i.e., after site development) and/or if saturated, including undocumented fill, topsoil/colluvium, alluvium and weathered terrace deposits. Compression and settlement can result in damage to surface and subsurface facilities (e.g., pipelines) through effects such as displacement, cracking or differential settlement (i.e., variable degrees of settlement over short distances). Based on the described considerations, the potential for non-seismic compression and settlement at the Project site is considered high.

<u>Shallow Groundwater</u>. As previously described, shallow groundwater is expected to occur on site at depths as shallow as three feet below the surface. While the presence of shallow groundwater is not a geologic hazard per se, it can contribute to other potential hazards (e.g., liquefaction) as outlined in this section, and may necessitate temporary dewatering to accommodate Project-related grading and excavation. If dewatering is required, it would be subject to associated regulatory compliance requirements under the National Pollutant Discharge Elimination System (NPDES), with additional discussion provided in Section 3.1.4 of this subchapter.

<u>Tsunamis, Seiches and Earthquake-induced Flooding</u>. Due to the site location and distance relative to open water bodies and containment facilities (e.g., dams), as well as the distance from and barriers between the site and the coast (e.g., topography), the potential for on-site tsunamis, seiches, or earthquake-induced flooding is considered nil (Appendix I). Based on this assessment, potential hazards and related Project impacts associated with tsunamis, seiches and earthquake-induced flooding are not discussed further in this section.

<u>Oversize Materials</u>. Project-related grading and excavation can potentially result in the generation of oversize materials (i.e., greater than approximately eight inches in maximum dimension). Such materials could pose potential development hazards if improperly handled or placed on site. Specifically, the presence of oversize materials in engineered fills can result in effects such as differential settlement, with related issues including adverse effects to overlying structures, pavement, or drainage. Based on the described geologic conditions and the fact that igneous granitic/gabbroic rocks are unlikely to be encountered during construction, the potential to generate oversize materials during Project implementation is considered generally low.

<u>Corrosive Soils</u>. The 2012 Geotechnical Investigation included an assessment of potential corrosive soil hazards related to soluble sulfate concentrations, pH levels, resistivity values (i.e., the ability to restrict, or resist, electric current), and chloride content. Long-term exposure to corrosive soils can result in deterioration and eventual failure of underground concrete and metal structures, including foundations or utility lines. Based on field and laboratory analyses, the following conclusions were provided for corrosive soils in the Project site and vicinity: (1) the potential for corrosion hazards to concrete from soluble sulfate concentrations and pH levels is considered low; (2) the potential for corrosion hazards to buried and uncoated metals from chloride content is considered low; and (3) the potential for corrosion hazards to buried and uncoated metals from resistivity values is considered very high.

Regulatory Framework

Development of the Proposed Project is subject to a number of regulatory requirements and industry standards related to potential geologic/soil hazards. Geologic/soil requirements and standards typically involve measures to evaluate risk and minimize potential hazards through design and construction techniques. Specific guidelines with geologic/soil criteria that may be applicable to the design and construction of the Proposed Project include the following: (1) San Diego County General Plan Seismic Safety Element (1991); (2) County Guidelines for Determining the Significance – Geologic Hazards (2007e); (3) Title 8, Division 4 (Design Standards and Performance Requirements) and Division 7 (Excavation and Grading), and Title 5, Division 1 (Amendments to the State Building Standards Code) of the San Diego County Code of Regulatory Ordinances; (4) the International Code Council (ICC) International Building Code (IBC, most recent update) and related California Building Code (CBC); and (5) the Greenbook Committee of Standard Specifications for Public Works Projects (most recent update). Summary descriptions of these guidelines are provided below, with specific elements applicable to the Proposed Project discussed in Section 3.1.2.2.

County Standards

The San Diego County General Plan Seismic Safety Element is intended to identify and evaluate seismic hazards in San Diego County and to provide policies to reduce the loss of life and property damage related to seismic hazards. Associated policies in the Seismic Safety Element applicable to the Proposed Project include requirements for submittal and approval of appropriate geotechnical investigations, as well as conformance with applicable laws and standards such as County Hazard Maps, the Alquist-Priolo Act (for Fault-Rupture Hazard Zones), and the IBC/CBC.

The County Guidelines for Determining the Significance of Geologic Hazards provide direction for evaluating environmental effects related to geologic hazards. Specifically, these guidelines address potential adverse effects to life and property (pursuant to applicable CEQA standards) from hazards, including fault rupture, ground shaking, liquefaction, landslides, rockfalls, expansive soils, and tsunamis/seiches. The Geologic Hazard Guidelines identify significance guidelines for the noted issues, as well as related regulatory standards, methodologies, for identifying/evaluating impacts and related potential mitigation/design measures, and reporting requirements.

International Building Code and Greenbook Standards

The ICC publishes the IBC, which replaced the Uniform Building Code, or UBC, in 2000. Publication of the *Greenbook, the Standard Plans for Public Works Construction,* is under the oversight of Public Works Standards, Inc. (PWSI), a nonprofit mutual benefit corporation whose members include the American Public Works Association, Associated General Contractors of California, and Engineering Contractors Association. The Greenbook and IBC provide standard specifications for engineering and construction activities, including measures to address geologic and soil issues for roads and structures. Specifically, these measures encompass issues such as seismic parameters (e.g., classifying seismic zones and faults), engineered fill specifications (e.g., compaction and moisture content), expansive soil characteristics, and pavement design. The referenced guidelines, while not comprising formal regulatory requirements per se, are widely accepted by regulatory authorities and are routinely included in related standards, such as municipal grading codes. The IBC and Greenbook guidelines are regularly updated to reflect current industry standards and practices, including criteria from sources such as ASTM International (ASTM, formerly known as the American Society for Testing and Materials). The previously noted CBC guidelines are derived from the IBC and encompass criteria specific to California, such as geologic and seismic characteristics.

3.1.2.2 *Analysis of Project Effects and Determination as to Significance*

As previously described, a number of geotechnical investigations have been conducted for the Proposed Project. While all of these analyses identify potential geotechnical concerns, appropriate measures are identified to address related hazards identified in association with the proposed development. Specifically, all of the noted studies conclude that the Project is feasible form a geotechnical perspective, including the most current and detailed report (Appendix I), which states “[t]he site is suitable for the proposed development provided that the recommendations presented herein are incorporated into the design, grading and construction of the site.” The discussion of potential impacts provided below is applicable to both Project development scenarios (**Scenarios 1** and **2**). Similarly, because of the consistency of geologic issues relative to the Project area, the discussion of on-site impacts is also directly applicable to proposed off-site road and utility development unless specifically noted otherwise.

<u>Fault Rupture</u>

Guideline for the Determination of Significance

A significant geologic impact would occur if:

1. The Project proposes any building or structure to be used for human occupancy over or within 50 feet of the trace of an Alquist-Priolo fault or County Special Zone fault.

Guideline Source

This guideline is based on the County Guidelines for Determining the Significance – Geologic Hazards (July 30, 2007).

Analysis

No known active or potentially active faults are located within or adjacent to the Project site. While the potential for on-site ground rupture and related effects (e.g., lurching) associated with off-site seismicity cannot be totally discounted, the potential occurrence of these types of effects onsite is identified as “not likely” in the 2012 Geotechnical Investigation. Thus, implementation of the Proposed Project, as related to seismic ground rupture, would result in a **less than significant impact**.

Ground Shaking

Guideline for the Determination of Significance

A significant geologic impact would occur if:

2. The Project site is located within a County Near-Source Seismic Shaking Zone or within Seismic Zone 4, and the Project would not conform to the IBC.

Guideline Source

This guideline is based on the County Guidelines for Determining the Significance – Geologic Hazards (July 30, 2007).

Analysis

While the Project site and vicinity are not located within a County Near-Source Seismic Shaking Zone, they are (like all of San Diego County) within a Seismic Zone 4 designation. Accordingly, the site and vicinity may be subject to substantial ground shaking from larger earthquake events along one or more major regional faults. Based on these conditions, the 2012 Geotechnical Investigation has assumed a design peak ground acceleration value of 0.4g for the Project (Appendix I), with such ground shaking levels capable of producing substantial damage and related effects to Project structures and other facilities. The 2012 Geotechnical Investigation identifies a number of standard design measures to address these potential impacts, including the following: (1) use of the noted design ground acceleration level; (2) other related considerations such as appropriate subsurface profile types, acceleration and velocity coefficients, and seismic source (including type and distance); and (3) applicable seismic elements of the IBC/CBC and County Building Code. Specifically, these measures would involve incorporating the noted factors into the design of facilities such as structures, foundations/slabs, pavement and utilities, as well as related activities including remedial grading (e.g., removal and/or reconditioning liquefiable soils), manufactured slope/retaining wall design, site drainage, and fill composition/placement. Implementation of the noted design measures and related efforts would be verified through standard plan review and on-the-ground geotechnical observations and testing during Project excavation, grading, and construction activities, as outlined in the 2012 Geotechnical Investigation. Based on these efforts, site-specific modifications to the described recommendations would be implemented as necessary to ensure conformance with all applicable regulatory requirements and industry standards. Implementation of and conformance with such recommendations and standards would effectively avoid or reduce potential seismic ground acceleration hazards to a **less than significant** level.

Liquefaction/Dynamic Settlement and Related Hazards

Guideline for the Determination of Significance

A significant geologic impact would occur if:

3. The Project site has the potential to expose people or structures to substantial adverse effects because: (1) the Project site has potentially liquefiable soils; (2) the potentially liquefiable soils are saturated or have the potential to become saturated; and (3) in-situ soil densities are not sufficiently high to preclude liquefaction.

Guideline Source

This guideline is based on the County Guidelines for Determining the Significance – Geologic Hazards (July 30, 2007).

Analysis

The southern portion of the Project site and applicable off-site areas located near SR-76 contain soils susceptible to liquefaction and related effects such as dynamic settlement and lateral spreading. These potential hazards would be addressed through standard measures to reduce the potential for liquefaction and related effects, including removal/replacement of unsaturated soils, vibro-compaction of saturated materials, deep soil mixing (i.e., introducing cement to consolidate loose soils), and the use of stone or sand columns and/or vibro-replacement/densification techniques. As noted above under the discussion of Ground Shaking, site-specific conditions and remedial efforts associated with liquefaction hazards would be verified through standard plan review and on-the-ground geotechnical observations and testing during Project excavation, grading, and construction activities. As a result, site-specific modifications would be implemented as necessary to ensure conformance with all applicable regulatory requirements and industry standards. Implementation of and conformance with geotechnical investigation recommendations and standards would effectively avoid or reduce associated potential liquefaction and related hazards to a **less than significant** level.

Landslides

Guidelines for the Determination of Significance

A significant geologic impact would occur if:

4. The Project site would expose people or structures to substantial adverse effects, including the loss, injury, or death involving landslides;

5. The Project is located on a geologic unit or soil that is unstable or would become unstable as a result of the Project, potentially resulting in an in- or off-site landslide; and

6. The Project site lies directly below or on a known area subject to rockfall that could result in collapse of structures.

Guideline Source

These guidelines are based on the County Guidelines for Determining the Significance – Geologic Hazards (July 30, 2007).

Analysis

The Project geotechnical investigations did not identify any evidence of historic landslide deposits or other on-site conditions, such as topographic features, indicative of landslide hazards. In addition, while some potential for landslides and/or rock falls was identified for off-site areas along Horse Ranch Creek Road associated with Project utilities (i.e., water and sewer lines), no associated adverse effects are anticipated due to the subsurface location of these facilities. Accordingly, potential landslide-related impacts and associated risks to life and structures from implementation of the Proposed Project would be **less than significant**.

<u>Expansive Soils</u>

Guideline for the Determination of Significance

A significant geologic impact would occur if:

7. The Project is located on expansive soil, as defined in Section 1802.32 of the IBC (2006) and does not conform to the IBC.

Guideline Source

This guideline is based on the County Guidelines for Determining the Significance – Geologic Hazards (July 30, 2007).

Analysis

While the potential for expansive soils to occur within the Project site and vicinity is low, localized deposits of expansive materials potentially could be encountered during Project development, including off-site areas along Horse Ranch Creek Road associated with Project utilities (i.e., water and sewer lines). As previously described, site-specific conditions and remedial efforts associated with geologic hazards (including expansive soils) would be verified through standard plan review and on-the-ground geotechnical observations and testing during Project excavation, grading, and construction activities. As a result, site-specific measures would be implemented as necessary to ensure conformance with all applicable regulatory requirements and industry standards. For expansive soils, this may include standard measures such as mixing with non-expansive material, burial in deeper fills, use of stiffer slab/foundation design, presaturation, overexcavation, or other IBC/CBC-recommended measures. Implementation of such design and construction recommendations, as well as conformance with applicable County, IBC/CBC or other pertinent guidelines, would avoid or reduce impacts from expansive soils to a **less than significant** level.

Other Potential Geotechnical Impacts

Guideline for the Determination of Significance

A significant geologic impact would occur if:

8. The Project would be located on a geologic unit or soil that is unstable or that would become unstable as a result of the Project, and potentially would result in on- or off-site structure loss, injury, or death.

Guideline Source

This guideline is derived from CEQA Guidelines Appendix G.

Analysis

Potential geologic hazards addressed under this threshold include compression/settlement, oversize materials, and corrosive soils. As previously described, the potential occurrence of shallow groundwater is not a geologic or geotechnical hazard per se, and is therefore not specifically addressed here (although it is addressed in the context of related hazards, such as liquefaction, as well as in Section 3.1.4 of this subchapter). The Project site and vicinity site also contain a number of surficial materials with moderate or high erosion potential (e.g., topsoils and alluvium). Due to the relationship with water quality concerns, however, potential erosion and sedimentation issues associated with the Proposed Project are discussed in Section 3.1.4 of this subchapter.

Compression/Settlement. The Project geotechnical investigations identify a number of surficial and underlying materials that may be susceptible to compression and settlement, including fill, topsoil/colluvium, alluvium and weathered terrace deposits. A number of standard measures are identified to address these concerns, including removal and recompaction or replacement of compressible deposits with engineered fill. The 2012 Geotechnical Investigation also notes that "Saturated alluvium that is left in-place may consolidate/settle under proposed fill loads…there will be some ongoing settlement after grading is complete." Accordingly, it is recommended that standard settlement monuments and monitoring be used in applicable areas after completion of Project grading, and prior to construction of proposed improvements, to verify when settlement of saturated alluvium ceases or is no longer a hazard to Project facilities. Thirteen preliminary settlement monument locations have been identified in areas of substantial alluvial deposits (Figure 3.1.2-1, Geologic Map), with associated monitoring anticipated to extend over a period of approximately three to six months (and potentially extending up to one year locally). Once it is determined that significant settlement is no longer occurring in the monitored areas, proposed construction of Project improvements would commence. Based on the implementation of standard remedial measures, as well as site-specific settlement monitoring and related schedule restrictions as described for areas of saturated alluvium, associated potential compression/settlement impacts effects would be **less than significant.**

An additional area of potential compression/settlement identified in the 2012 Geotechnical Investigation involves the proposed Pankey Road bridge. Specifically, the proposed bridge design would encompass a deep foundation consisting of driven plies or cast-in-drilled-hole (CIDH) piles. Based on the occurrence of deep alluvium in this area, the noted foundation design and related construction efforts would be verified through standard plan review and on-the-ground geotechnical observations and testing to be conducted during Project excavation, grading, and construction activities (as previously described under the discussion of Ground Shaking and outlined in the 2012 Geotechnical Investigation). As a result, site-specific modifications to the noted foundation design are expected to be minor and limited to the length of the foundation piles, with any such modifications to be implemented as necessary to ensure conformance with all applicable regulatory requirements and industry standards. Implementation of and conformance with the described recommendations and standards would effectively avoid or reduce potential compression/settlement hazards related to the Pankey Road bridge foundation to a **less than significant** level.

Oversize Material. While the generation of oversize materials from Project construction is generally not anticipated as previously described, specific measures that could be used to address associated potential impacts, if necessary, include selective disposal (e.g., burial in deeper fills), use in landscaping/decorative efforts or off-site disposal. Implementation of these types of measures, as well as conformance with other pertinent geotechnical recommendations and applicable standards (e.g., the IBC), would avoid or reduce potential effects related to disposal of oversize materials to a **less than significant** level.

Corrosive Soils. The 2012 Geotechnical Investigation identifies potential corrosion hazards to buried, uncoated metallic facilities in association with observed resistivity values. These potential effects would be addressed through standard industry remedial measures, including efforts such as: (1) removal of unsuitable deposits and replacement with non-corrosive fill; (2) use of corrosion-resistant construction materials (e.g., coated or non-metallic facilities); and (3) installation of cathodic protection devices (e.g., use of a more easily corroded "sacrificial metal" to serve as an anode and draw current away from the structure to be protected). Implementation of such measures, or other applicable techniques in conformance with related industry standards and regulatory guidelines, would avoid or reduce associated potential corrosion impacts to a **less than significant** level.

3.1.2.3 *Cumulative Impact Analysis*

As noted above, all potential Project-specific geotechnical impacts would be avoided or reduced below identified significance guidelines through conformance with geotechnical recommendations and established regulatory requirements as part of the Project design. Potential geology and soils effects are inherently restricted to the areas proposed for development and would not contribute to cumulative impacts associated with other planned or proposed development. That is, issues including seismic ground acceleration and liquefaction/dynamic settlement, as well as expansive soils, compression/settlement, oversize materials, and corrosive soils, would involve effects to (and not from) the proposed development and/or are specific to on-site conditions. Accordingly, addressing these potential hazards for the proposed development would involve using standard geotechnical measures to comply with existing requirements, and/or site-specific design and construction efforts that have no relationship to, or impact on, off-site areas. Avoiding liquefaction impacts through efforts such as removing/replacing unsuitable materials or vibro-compaction, for example, would not affect or be affected by similar deposits/hazards in off-site areas. Because of the site-specific nature of these potential hazards and the measures to address them, there would be no connection to similar potential issues or cumulative effects to or from other properties. Accordingly, a **less than significant** cumulative geologic hazard impact would occur from implementation of the Proposed Project.

3.1.2.4 *Significance of Impacts*

Based on the analysis provided above, the Proposed Project would have **less than significant** impacts related to geologic hazards.

3.1.2.5 *Conclusion*

Based on the analysis provided above, no significant Project-specific or cumulative impacts related to geologic hazards would result from implementation of the Project.

Table 3.1.2-1
SUMMARY DESCRIPTION OF SOIL SERIES PROPERTIES WITHIN THE PROJECT SITE AND APPLICABLE OFF-SITE AREAS

Soil Series	Physical Characteristics/Location	Expansion Potential	Reactivity	Erosion Potential
Grangeville	Poorly drained fine sandy loam derived from granitic alluvium. Occurs on level terrain in the southern, north-central and easternmost site areas.	Low	Moderately alkaline (pH 7.9 to 8.4)	Low
Ramona	Well-drained sandy loam with a sandy clay loam subsoil, derived from granitic alluvium. Occurs on shallow to moderate slopes in the central and northern site areas.	Moderate	Moderately acidic to neutral (pH 5.6 to 7.3)	Low to moderate
Visalia	Moderately well-drained sandy loam derived from granitic alluvium. Occurs on shallow to moderate slopes in the south-central and southwestern portions of the site.	Low	Slightly acidic (pH 6.1 to 6.5)	Low to moderate
Tujunga	Excessively drained sands derived from granitic alluvium. Occurs on level areas in the southern portion of the site near the San Luis Rey River.	Low	Neutral (pH 6.6 to 7.3)	Low

Source: NCRS; formerly U.S. Soil Conservation Service (SCS) 1973

Table 3.1.2-2
SUMMARY OF REGIONAL FAULT LOCATIONS AND SEISMICITY DATA

Fault Zone	Distance From Site (miles)	Direction From Site	Maximum Earthquake Magnitude[1]	Estimated Peak Site Acceleration (g)[2]
Elsinore-Temecula	7.8	N	6.8	0.31
Elsinore-Julian	8.7	ESE	7.1	0.34
Newport-Inglewood	20.4	WNW	7.1	0.16
Rose Canyon	21.6	SSW	7.2	0.16
Elsinore-Glen Ivy	23.6	NNW	6.8	0.10
San Jacinto-Anza	30.4	ENE	7.2	0.10
San Jacinto-San Jacinto Valley	31.1	NNE	6.9	0.08
Earthquake Valley	34.8	ESE	6.5	0.05
Coronado Bank	37.3	WSW	7.6	0.10
Elsinore - Chino	41.0	NNW	6.7	0.06
Palos Verdes	45.4	WNW	7.1	0.06
San Diego Trough	46.0	WSW	7.7	0.09
Newport-Inglewood	47.8	W	7.1	0.05
San Andreas - Southern	49.1	ENE	7.4	0.7

Source: Leighton 2012; Geotechnics 2004; CGS 2010
[1] Moment magnitude, derived from various sources.
[2] Median peak horizontal ground acceleration, where g equals the acceleration due to gravity.

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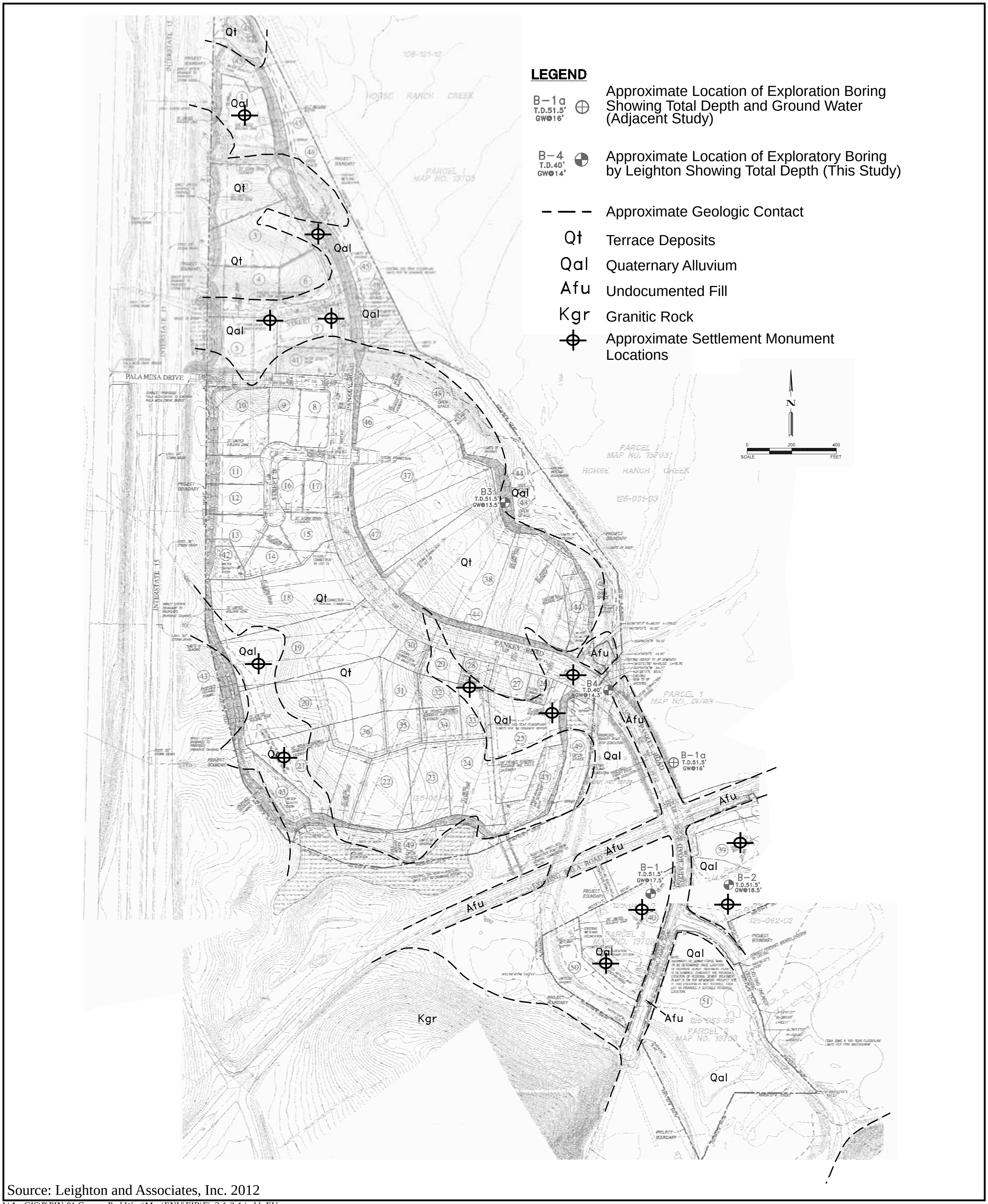

Source: Leighton and Associates, Inc. 2012

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Geologic Map

CAMPUS PARK WEST

Figure 3.1.2-1

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