2.6 Geology, Soils, and Seismicity

This section discusses potential impacts to existing geology and soils conditions, and potential exposure to risks associated with those conditions that may result from implementation of the proposed project. This evaluation of geology and soils impacts incorporates the results of the following reports:

- Preliminary Geotechnical Investigation, prepared by Leighton and Associates for the Newland Sierra Project (Appendix J-1)
- Report Update Letter, prepared by Leighton and Associates for the Newland Sierra Project (Appendix J-2)
- Geotechnical Evaluation of Rockfall Potential, prepared by Leighton and Associates for the Newland Sierra Project (Appendix J-3)
- Groundwater Resources Letter, prepared by Leighton and Associated for the Newland Sierra Project (Appendix J-4)

Comments received in response to the Notice of Preparation (NOP) included concerns regarding rockfall hazards, landslides, and liquefaction. These concerns are addressed and summarized in this section. A copy of the NOP and comment letters received in response to the NOP is included in Appendix A of this EIR.

2.6.1 Existing Conditions

Regional Geology

The Site is located within the coastal subprovince of the Peninsular Ranges Geomorphic Province, near the western edge of the Southern California batholith. The topography at the edge of the batholith changes from the rugged landforms developed on the batholith to the more subdued landforms, which typify the softer sedimentary formations of the coastal plain. Primarily, the Site is underlain by the Cretaceous-aged Granite of the Southern California batholith with minor amounts of Jurassic-aged metavolcanic rock along the western margin (see Figure 2.6-1, Regional Geology Map). Erosion and regional tectonic uplift created the valleys and ridges of the area.

Site-Specific Geology

Based on a Site visit and review of geologic maps, the primary bedrock unit on Site is Cretaceous-aged Granite; however, Jurassic-aged Metavolcanic rock is present along the western margin. These units are in turn overlain by surficial units consisting of colluvium, alluvium, slopewash, and minor undocumented fill soils. Surficial soil deposits generally consist of

relatively fine-grained material useful during grading of a site where abundant oversize material is expected. A brief description of the geologic units encountered on the Site is presented below.

Undocumented Fill Soils (Afu)

Undocumented fill soils were observed in a number of places on the Site. As observed, the undocumented fill soils were generally associated with the grading of the on-site dirt roads and water tower pads. In general, these undocumented fill soils were found to be relatively limited in extent and are therefore unmappable at the scale of this investigation. Significant deposits of artificial fill were mapped at the western property margin, associated with the previous quarry operation located there. All existing undocumented fills located on the Site are considered potentially compressible and unsuitable in their present state for structural support.

Topsoil/Colluvium (Unmapped)

The topsoil/colluvium observed during the field study mantles the mid- to lower-portions of the hillsides across the majority of the Site. The topsoil/colluvium consists of light brown to brown, damp to moist, loose to medium dense, silty to clayey, fine to very coarse sand. These soils are typically massive, porous and contained scattered roots and organics. The potentially compressible topsoil is estimated to be approximately 0 to 2 feet thick. Localized areas of thicker accumulations of topsoil may be encountered. On hillsides of higher elevation, topsoil is minimal. Topsoil/colluvium soils on the lower hillsides of the on-site drainages can be expected to be somewhat deeper in extent and locally variable in composition. Topsoil and colluvium were not mapped due to the relatively thin exposures; however, locally thicker soil/colluvial profiles were encountered in the flatter areas in the southeast portion of the Site. The seismic profiles identify a "topsoil/colluvium" layer averaging 4.5 feet in thickness. Generally, this includes a thin weathered profile of granitic rock.

Alluvium (Qal)

Quaternary-aged alluvium is present in the bottom of the canyons and drainages on the Site. Similar to colluvial deposits, these soils are generally thin (less than 3 feet) and unmapped, except where identified by the subsurface investigation and field mapping. Significant thicknesses of alluvial deposits have been identified within the following areas: the northwestern canyon near the crude abandoned runway (3 to 10 feet), the northeast-southwest-trending canyon within the southwestern portion of the Site (6 to 10 feet), and the main canyon accessed by Sarver Lane to the south of the Site (more than 10 feet).

Alluvial soils likely underlie all of the on-site canyons, but in the upper elevations of the Site, the canyons were considered to be too narrow in lateral extent to be presented on the map at the scale provided. These soils typically consist of brown, damp to wet, loose to medium

dense/stiff, silty sands, sandy clays and silty clays. The alluvium is also considered to be moderately porous and usually contains localized zones of moderate to abundant roots and other organic matter. Dry, porous, and compressible alluvium is not suitable for support of additional fill and/or structural loads.

Older Quaternary Alluvium (Qalo)

Older alluvium was encountered in the deeper portion of the main canyon in the southwest corner of the Site. It consisted of red-brown to orange-brown silty sand with gravel older than the overlying Quaternary alluvium (Qal); the older alluvial deposits are generally medium dense to dense and moist. These materials are mapped in the lower portions (deeper than 10 to 15 feet below the ground surface) of the main canyon accessed by Sarver Lane..

Quaternary Slopewash (Qsw)

Quaternary slopewash includes residual materials shed from slopes and deposited on the lower portions of the slopes and within localized drainages. As encountered, the materials consist of light brown to gray-brown silty sand, and are dense and generally homogeneous. Resistant clasts of relatively unweathered granite are locally suspended within the deposits, which are anticipated to be on the order of 5 to 20 feet in thickness. These deposits are generally medium dense to dense, but are still locally porous and potentially compressible. This unit is not suitable for the support of additional fill or structural loads.

Possible Quaternary Landslide Deposits (Qls)

Review of available geologic literature indicates the presence of possible ancient landslide debris on the eastern edge of the Site. This possible large landslide was mapped by others along the central portion of the eastern Site property line and beneath Interstate 15 (SDAG 1988). The landslide has only been mapped based on its surficial expression and has never been confirmed by a subsurface investigation. Based on an understanding of the proposed project, the mapped landslide does not appear to be in the vicinity of any of the areas of proposed development..

Cretaceous Granitic Rock (Kgr)

Granitic rock outcrops were observed across the vast majority of the Site, and granitic rock underlies the Site at depths not exposed at the surface. The material generally consists of medium- to coarse-grained quartz-rich granite rock. Large granitic boulders characterize the outcrops in the upper regions of the Site, and in the mid- to lower-regions of the Site, weathered granitic material was observed in road cuts below the topsoil/colluvium. The weathered granitic materials generally consist of light gray to light red brown, damp, dense, fine to coarse sand with localized residual boulders throughout. As observed in the trenches and existing road cuts, the

depth of highly weathered rock varied from inches to less than 1 to 7 feet below the ground surface, or bedrock contact where these materials are buried. The seismic traverses performed at the Site and observation of existing cut slopes also substantiate the very dense nature of the on-Site bedrock. Due to the dense nature of the rock, heavy ripping and/or blasting is likely in cut areas deeper than 5 to 10 feet.

Localized areas containing abundant granitic boulders located on oversteepened, elevated promontories were identified across the Site, in particular in the steep areas in northern portions of the Site.

Jurassic-Cretaceous Metavolcanic Rock (KJm)

Metavolcanic rocks are mapped within a narrow band along the western margin of the project Site, including the quarry area. This relatively variable unit consists of schist, quartzite, argillite, gneiss, and meta-basalt. These metamorphosed rocks represent the older rocks, intruded and altered by the young Cretaceous-aged Granitics (Kgr), and tend to be more basic, and therefore less resistant to weathering. These rocks generally form more subdued erodible topography than the adjacent Cretaceous granitic rocks mapped to the east and west. Based on field observations, the upper portions of this material is expected to be relatively rippable in the near surface but would likely become difficult to excavate at depth or where previously mined. No subsurface exploration was conducted within this unit as part of the Leighton and Associates investigation (Appendix J).

Geologic Structure

Based on the subsurface investigation and Site reconnaissance/geologic mapping, the materials on Site are generally massive with no distinctive structure. Some regional foliation and/or fracturing were observed during the aerial photographic analysis. Subsequent field mapping has identified jointing in localized areas within the weathered granitic rock at the surface. In general, no adverse structural conditions were noted during the Leighton and Associates investigation (Appendix J).

Surface and Groundwater

No surface or shallow groundwater conditions were encountered during the field investigations of the Site. However, surface flow is anticipated in the on-site drainages after heavy rainfall. In addition, an area of possible seepage has been reported in the northern section of the Site near the abandoned dirt airfield. Trenches in this area did not show any zones of seepage; however, seepage may be present in wetter years.

Near-surface groundwater seepage should be anticipated at the topsoil/bedrock contact after heavy rainfall. It is anticipated that groundwater levels will fluctuate during periods of high precipitation and/or irrigation, and that groundwater may become perched on the underlying bedrock or concentrated in fractures within the bedrock. Localized seeps may occur after periods of heavy rainfall or irrigation in cut areas along fractures and/or joint systems.

2.6.2 Regulatory Setting

Federal Regulations

Occupational Safety and Health Administration Regulations

Excavation and trenching are among the most hazardous construction operations. The Occupational Safety and Health Administration's (OSHA) Excavation and Trenching standard, Title 29 of the Code of Federal Regulations, Part 1926.650, covers requirements for excavation and trenching operations. OSHA requires that all excavations where employees could potentially be exposed to cave-ins be protected by sloping or benching the sides of the excavation, supporting the sides of the excavation, or placing a shield between the side of the excavation and the work area. In California, the California Occupational Safety and Health Administration (Cal/OSHA) has responsibility for implementing federal rules relevant to worker safety, including slope protection during construction excavations. Cal/OSHA's requirements are more restrictive and protective than federal OSHA standards.

U.S. Geological Survey Landslide Hazard Program

In fulfillment of the requirements of Public Law 106-113, the U.S. Geological Survey created the Landslide Hazard Program in the mid-1970s. According to the U.S. Geological Survey, the primary objective of the National Landslide Hazards Program is to reduce long-term losses from landslide hazards by improving understanding of the causes of ground failure and suggesting mitigation strategies (USGS 2016). The federal government takes the lead role in funding and conducting this research, whereas the reduction of losses due to geologic hazards is primarily a state and local responsibility. In San Diego County, the Unified Disaster Council is the governing body of the Unified San Diego County Emergency Services Organization. The primary purpose of the Unified Disaster Council and the Emergency Services Organization is to provide for the coordination of plans and programs designed for the protection of life and property in the County of San Diego.

State Regulations

The statewide minimum public safety standard for mitigation of earthquake hazards (as established through the California Building Code (CBC), Alquist–Priolo Earthquake Fault Zoning Act, and the Seismic Hazards Mapping Act) is that the minimum level of mitigation for a project should reduce

the risk of ground failure during an earthquake to a level that does not cause the collapse of buildings for human occupancy,[1] but in most cases, is not required to prevent or avoid the ground failure itself. It is not feasible to design all structures to completely avoid damage in worst-case earthquake scenarios. Accordingly, regulatory agencies have generally defined an "acceptable level" of risk as one that provides reasonable protection of the public safety, although it does not necessarily ensure continued structural integrity and functionality of a project (14 CCR 3721(a)). Nothing in these acts, however, precludes lead agencies from enacting more stringent requirements, requiring a higher level of performance, or applying these requirements to developments other than those that meet the acts' definitions of "project."

Alquist–Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. In accordance with this act, the State Geologist established regulatory zones, called "earthquake fault zones," around the surface traces of active faults and has published maps showing these zones. Earthquake fault zones are designated by the California Geological Survey (CGS) and are delineated along traces of faults where mapping demonstrates surface fault rupture has occurred within the past 11,000 years. Construction within these zones cannot be permitted until a geologic investigation has been conducted to prove that a building planned for human occupancy will not be constructed across an active fault. These types of site evaluations address the precise location and recency of rupture along traces of the faults and are typically based on observations made in trenches excavated across fault traces.

The proposed project is not within an Alquist-Priolo earthquake fault zone and, therefore, is not subject to the requirements of this act.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 (California Public Resources Code, Chapter 7.8, Section 2690 et seq.) directs the CGS to protect the public from earthquake-induced liquefaction and landslide hazards (these hazards are distinct from fault surface rupture hazard regulated by the Alquist-Priolo Act). This act requires the State Geologist to delineate various seismic hazard zones and requires cities, counties, and other local permitting agencies to regulate certain development projects within these zones (i.e., zones of required investigation). Before a development permit may be granted for a site within a Seismic Hazard Zone, a geotechnical investigation of the Site must be conducted and appropriate mitigation measures incorporated into the project design. Evaluation and mitigation of potential risks from seismic hazards within zones of required investigation must be conducted in accordance with the CGS

[1] A "structure for human occupancy" is any structure used or intended for supporting or sheltering any use or occupancy, which is expected to have a human occupancy rate of more than 2,000 person-hours per year.

Special Publication 117A, adopted March 13, 1997, by the State Mining and Geology Board as updated in 2008.

As of 2012, Seismic Hazard Zone Maps have been prepared for portions of populated areas of Southern California and the San Francisco Bay Area; however, no seismic hazard zones have yet been delineated for the project Site. As a result, the provisions of the Seismic Hazards Mapping Act would not apply to the project.

California Building Code

The CBC has been codified in the California Code of Regulations as Title 24, Part 2. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. The purpose of the CBC is to establish minimum standards to safeguard the public health, safety, and general welfare through structural strength, means of egress facilities, and general stability by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all building and structures within its jurisdiction. The CBC currently in effect is the 2016~~2013~~ version. The CBC is based on the Uniform Building Codes of the International Conference/Council of Building Officials. The Uniform Building Code was replaced by the International Building Code (IBC) published by the International Code Council. The 2016~~2013~~ CBC contains California amendments based on the American Society of Civil Engineers (ASCE) Minimum Design Standards 7-10~~7-05~~. ASCE 7-10~~7-05~~ provides requirements for general structural design and includes means for determining earthquake loads and other loads (such as wind loads) for inclusion into building codes, and adopts the Federal Emergence Management Agency's 2015 National Earthquake Hazards Reduction Program. The provisions of the CBC apply to the construction, alteration, movement, replacement, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

Local Regulations

County Special Studies Zones

The Alquist-Priolo Act provides that a city or county may establish more restrictive policies than those within the Alquist-Priolo Act, if desired. The County of San Diego (County) established Special Study Zones that include late-Quaternary faults mapped by the CGS in the County. Late-Quaternary faults (movement during the past 700,000 years) were mapped based on geomorphic evidence similar to that of Holocene faults except that tectonic features are less distinct. As indicated by the CGS, these faults may be younger, but the lack of younger overlying deposits precludes more accurate age classification. Traces of faults within "Special Study Zones" are treated by the County as active unless a fault investigation can prove otherwise. Before any construction is allowed, a geologic study must be conducted to determine if any active fault lines

are located on or within the vicinity of the project Site. For areas where active faulting is identified, the County's Fault Displacement Area regulations prohibit new development in areas subject to potential loss of life and property from earthquake fault displacement to mitigate such losses. The project Site is not within an area designated as a County Special Study Zone.

San Diego County General Plan

The 2011 County General Plan contains policies related to geological and soil conditions that may apply to the proposed project. The policies are listed below.

As to geology, soils, and seismic conditions, the County recognizes that soil characteristics, slope stability, erosion, and excavation and export of soils have the ability to potentially expose people or structures to substantial adverse impacts, including the risk of loss, injury, or death, from seismic related hazards. It also would have the potential to expose people or property to hazardous conditions associated with soil erosion, topsoil loss, exposed soils, or improper wastewater disposal. Key responses will include requirements that new development be located in areas where the risk to people or property is minimized, and all development must include engineering measures to reduce risk in accordance with the CBC, IBC, and other geologic hazard safety standards, including design and construction standards that regulate land use in areas known to have or potentially have significant geologic hazards.

Safety Element

The following goals and policies of the Safety Element are applicable to the proposed project:

- **Goal S-7: Reduced Seismic Hazards.** Minimized personal injury and property damage resulting from seismic hazards.
- **Policy S-7.1: Development Location**. Locate development in areas where the risk to people or resources is minimized. In accordance with the California Department of Conservation Special Publication 42, require development be located a minimum of 50 feet from active or potentially active faults, unless an alternative setback distance is approved based on geologic analysis and feasible engineering design measures adequate to demonstrate that the fault rupture hazard would be avoided.
- **Policy S-7.2: Engineering Measures to Reduce Risk.** Require all development to include engineering measures to reduce risk in accordance with the CBC, Uniform Building Code, and other seismic and geologic hazard safety standards, including design and construction standards, that regulate land use in areas known to have or potentially have significant seismic and/or other geologic hazards.
    - **Policy S-7.3: Land Use Location**. Prohibit high occupancy uses, essential public facilities, and uses that permit significant amounts of hazardous materials within Alquist–Priolo and County special studies zones.

- **Goal S-8: Reduced Landslide, Mudslide, and Rock Fall Hazards.** Minimized personal injury and property damage caused by mudslides, landslides, or rock falls.
- **Policy S-8.1: Landslide Risks.** Direct development away from areas with high landslide, mudslide, or rock fall potential when engineering solutions have been determined by the County to be infeasible.
    - **Policy S-8.2: Risk of Slope Instability.** Prohibit development from causing or contributing to slope instability.

San Diego County Code

Grading Ordinance

Division 7 of Title 8 of the San Diego County Code (County of San Diego 2012), Grading Ordinance, establishes the requirement to obtain a grading permit prior to grading operations. The grading ordinance requires the submittal of grading plans or improvement plans for review by the County Official (Director of Public Works or his or her authorized representative) prior to issuance of a grading permit. The ordinance contains design standards and performance requirements that must be met to avoid or reduce to an acceptable level the potential for slope instabilities, expansive soils, excessive erosion, and sedimentation to adversely affect the proposed development (Chapter 4). The ordinance sets forth the maximum slope allowed for cut and fill slopes, the requirement for drainage terraces on cut or fill slopes exceeding 40 feet in height, expansive soil requirements for cuts and fills, minimum setback requirements for buildings from cut or fill slopes, and reporting requirements including a soil engineer's report and a final engineering geology report by an engineering geologist, which includes specific approval of the grading as affected by geological factors. The ordinance also contains requirements to reduce effects on air quality (Section 87.428, Dust Control), native habitat (Section 87.503), cultural and paleontological resources (Sections 87.429 and 87.430), and watercourses (Chapter 6). Upon review of grading plans, the County Official has the authority to approve, attach conditions of approval, or deny the permit application.

The applicant for the proposed project would be required to submit a soil investigation report, which would include data regarding the nature, distribution, and strength of existing soils and rock on the Site; the soil engineer's conclusions and recommendations for grading requirements, including the correction of weak or unstable soil conditions and treatment of any expansive soils that may be present; and their opinions as to the adequacy of building sites to be developed by the proposed grading operations (Section 87.209). The soil engineer shall provide an engineering geology report by an engineering geologist when required by the County Official. Recommendations included in such reports and approved by the County Official shall be incorporated in the grading plan or specifications.

On-Site Wastewater Treatment System Ordinance

Chapter 3, Division 8, of Title 6 of the San Diego County Code (County of San Diego 2011b) establishes the requirements for on-site wastewater treatment systems in the County. The purpose of this chapter is to implement state laws and regulations associated with waste discharge requirements (State Water Resources Control Board and the California Regional Water Quality Control Board for the San Diego Region) and implement additional standards for septic systems and graywater systems that are necessary to protect the health and safety of the San Diego County community. It also makes it unlawful for any person to cause, suffer, or permit the disposal of sewage, human excrement, or other liquid wastes, in any place or manner except through and by means of an approved plumbing and drainage system and an approved sewage disposal system.

If no public sanitary sewer system is available, the ordinance allows for installation of on-site wastewater treatment systems provided that the requirements and standards of the ordinance are complied with and a permit issued by the Department of Environmental Health is obtained. Standards and requirements include, but are not limited to soil percolation tests to determine soil suitability, the selection of a treatment system appropriate for Site conditions, and specific setback requirements from lakes, streams, ponds, slopes, and other utilities and structures. Chapter 6, Division 8, of Title 6 of the County Code pertains to Septic Tank and Cesspool Cleaners, which establishes processes, fees, and requirements for the examination, cleaning, and collection of sewage from septic tanks and cesspools.

2.6.3 Analysis of Project Effects and Determination as to Significance

2.6.3.1 Fault Rupture

For the purposes of this EIR, the County's Geologic Hazards Guidelines (County of San Diego 2007a) apply to both the direct impact analysis and the cumulative impact analysis. These significance guidelines were developed by the County to address question VI (a)(i) in the California Environmental Quality Act (CEQA) Guidelines, Appendix G (14 CCR 15000 et seq.), and to ensure compliance with Fault Displacement Area regulations within the County Zoning Ordinance.

A significant impact would result if:

- The project would propose 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 Study Zone fault.
- The project proposes the following uses within an Alquist-Priolo Zone which are prohibited by the County: i) uses containing structures with a capacity of 300 people or more; ii) uses with the potential to severely damage the environment or cause major loss of life; iii) specific civic uses including police and fire stations, schools, hospitals, rest homes, nursing homes, and emergency communication facilities.

Analysis

- The State Geologist has defined a potentially active fault as any fault considered to have been active during Quaternary time (last 1,600,000 years). This definition is used in delineating Earthquake Fault Zones as mandated by the Alquist-Priolo Earthquake Fault Zoning Act of 1972 and as most recently revised in 1997. The intent of this act is to assure that unwise urban development does not occur across the traces of active faults. Based on the review performed by Leighton and Associates, the Site is not located within an "Earthquake Fault Zone" (Appendix J).
- Review of available geologic literature indicated that there are no known active, potentially active, or inactive faults that transect the project Site. The nearest known active regional fault is the Elsinore-Julian Fault. The closest projected trace for this fault zone is located approximately 12 miles east of the Site. The maximum peak horizontal ground acceleration as a result of the maximum credible earthquake is expected to be produced by the Elsinore-Julian Fault located 13 miles east of the Site. Compliance with the County's Grading Ordinance, current seismic design specifications, current CBC standards, and other regulatory requirements, in addition to implementation of project design features and best management practices, would ensure that the proposed project would have **less than significant** impacts associated with fault rupture geologic hazards.

The I-15 interchange improvements, which constitute an off-site mitigation measure for the project, are not within the Alquist-Priolo Zone, nor is there any known active, potentially active, or inactive faults that transect the anticipated location of the intersection improvements.

2.6.3.2 Ground Shaking

For the purposes of this EIR, the County's Geologic Hazards Guidelines (County of San Diego 2007a) apply to both the direct impact analysis and the cumulative impact analysis. These significance guidelines have been developed by the County to address question VI (a)(ii) in the CEQA Guidelines, Appendix G. A significant impact would result if:

- The project would be located within a County Near-Source Shaking Zone or within Seismic Zone 4 and the project does not conform to the Uniform Building Code.

Analysis

- The Site is considered to lie within a seismically active region, as is all of Southern California. As previously mentioned above, the Elsinore-Julian Fault zone located east of the Site is considered the 'active' fault having the most significant effect at the Site from a design standpoint. The Seismic Parameters for Active Faults in the vicinity of the Site are presented in Table 2.6-1.

- Severe ground shaking is most likely to occur during an earthquake on one of the regional active faults in Southern California. To ensure the structural integrity of all structures, the proposed project would conform to the seismic design requirements as outlined within the CBC, which contains universal standards for proper Site preparation and grading practices, adequate design of foundation, and guidelines for the appropriate selection and use of construction materials. The local agency that enforces the CBC is the County Department of Planning & Development Services, which reviews applications for building permits for compliance with the CBC, local amendments to the CBC, and County Zoning Ordinance Section 87.209. Grading plans would also be reviewed for compliance with state and local standards.
- As part of the development review process, the County requires a soil investigation report that includes data regarding the nature, distribution, and strength of existing soils and rock on a site; the soil engineer's conclusions and recommendations for grading requirements, including the correction of weak or unstable soil conditions and treatment of any expansive soils that may be present; and the soil engineer's opinion as to the adequacy of building sites to be developed by the proposed grading operations. A preliminary version of such a report was prepared by Leighton and Associates (Appendix J); the recommendations contained therein will be refined as necessary based on final designs, and incorporated into the project's plans and specifications as a condition of final project approval. Further detail regarding soils will be included in the final soils report that will be prepared as Site and facility design advances, and that must be approved by a County Official as part of the grading permit process (County Ordinance No. 9634 (N.S.)).

Because the Site would be required to comply with state and local building and grading standards, substantial adverse effects from strong seismic ground shaking would be avoided or reduced to acceptable levels. Potential adverse effects from strong seismic ground shaking would, therefore, be **less than significant**.

2.6.3.3 Liquefaction

For the purposes of this EIR, the County's Geologic Hazards Guidelines (County of San Diego 2007a) apply to both the direct impact analysis and the cumulative impact analysis. The following significance guidelines have been developed by the County to address question VI (a) (iii), and the portion of question (c) that addresses on-site and off-site lateral spreading or liquefaction, in the CEQA Guidelines, Appendix G. A significant impact would result if:

- The project site has potential to expose people or structures to substantial adverse effects because i) the project site has potentially liquefiable soils, ii) the potentially liquefiable soils are saturated or have the potential to become saturated, and iii) in-situ soil densities are not sufficiently high to preclude liquefaction.

Analysis

- Liquefaction and dynamic settlement of soils can be caused by strong vibratory motion due to earthquakes. Both research and historical data indicate that loose, saturated, granular soils are susceptible to liquefaction and dynamic settlement. Liquefaction is typified by a loss of shear strength in the affected soil layer, thereby causing the soil to act as a viscous liquid. This effect may be manifested by excessive settlements and sand boils at the ground surface.
- Because of lack of a groundwater table and the low potential groundwater recharge rates due to the very hard, moderately weathered, slightly fractured and steep topographic relief of the Cretaceous-aged Granite Rock unit that underlies the majority of the site (Appendix J-3), the potential for liquefaction in bedrock areas is considered low. While the potential for liquefaction in alluvial areas is also considered low, saturated alluvial soils at the site may have a potential for liquefaction; therefore, impacts related to liquefaction would be **potentially significant (Impact GE-1)**.

2.6.3.4 Landslides

For the purposes of this EIR, the County's Geologic Hazards Guidelines (County of San Diego 2007a) apply to both the direct impact analysis and the cumulative impact analysis. The following significance guidelines have been developed by the County to address question VI (a)(iv), and the portion of question (c) that relates to on-site or off-site landslide or collapse, in the CEQA Guidelines, Appendix G. A significant impact would result if:

- The project would expose people or structures to substantial adverse effects, including the risk of loss, injury, or death involving landslides.
- 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 on-site or off-site landslide.
- The project Site lies directly below or on a known area subject to rockfall, which could result in collapse of structures.

Analysis

Landslides

The project Site and off-site improvement areas are not within or adjacent to a "Landslide Susceptibility Area," as designated by the County's Multi-Jurisdictional Hazard Mitigation Plan (County of San Diego 2010). However, as stated above under existing conditions, review of available geologic literature indicates the presence of possible ancient landslide debris on the eastern edge of the Site. This possible large landslide was mapped by others along the central portion of the eastern Site property line and beneath Interstate 15. The landslide has only been mapped based on its surficial expression and has never been confirmed by a subsurface investigation. Based on an understanding of the proposed project, the mapped landslide is not in

the vicinity of any of the areas of proposed development. If the Site development plans are changed to include development of these areas of the Site, or if landslide materials are encountered in subsequent subsurface investigations of the Site or during Site grading, remedial measures may be necessary; if so, such remedial measures will be implemented.

It is anticipated that the surficial soils and upper highly weathered portion of the granitic rock may be excavated with conventional heavy-duty construction equipment. Localized areas within the upper portion of the Site may require heavy ripping and/or localized blasting. Cut areas are expected to be only marginally rippable and would likely require generalized blasting. Blasting is anticipated below 10 to 20 feet of the surface and in outcrop areas. Care should be taken to avoid overblasting/overbreaking of cut slopes. Any loose material remaining on the cut slope faces should be scaled, by hand if necessary, to clean slope faces of loose, easily erodible material.

Natural slopes at the Site contain local areas of potential surficial instability, as indicated by the presence of slopewash deposits, source area scars, and perched granitic boulder outcrops. Such areas are of particular significance when located above and immediately adjacent to proposed development and are considered **potentially significant** (**Impact GE-2**). Mitigation measures will be implemented on a case-by-case basis, and include buffer areas without structural development, construction of debris walls, catchment basins, or slope reconstruction and buttressing. The need for such mitigation shall be based on review of final grading plans and field observations during grading.

In general, it is anticipated that cut slopes over 10 feet would require blasting to excavate the slope. If rock debris remain on the 1:1 (horizontal to vertical) cut slopes, the cut rock slopes may need to be raked/scaled, with proper runoff control measures in-place. Cut slopes located within dense rock areas and free of adverse geologic conditions (jointing/fracturing/weathering) are anticipated to have an adequate factor of safety for both deep seated and surficial stability. The upper portions of proposed cut slopes below open space areas would likely be weathered and may need to be replaced or laid back to a flatter gradient.

All cut slopes will be geologically mapped during construction. If areas of adverse conditions are identified they would be **potentially significant** (**Impact GE-3)** and specific mitigation may be required. Specific mitigation methods may include removal of loose boulders or displaced blocks, possible stabilization fills, buttresses, or possibly the use of localized rock bolts and/or catchment netting. Some localized irregularities in the finish slope face of rock cut slopes should be anticipated.

Rockfall Hazards

Site development has been planned to avoid development below natural steeply sloping areas with granitic boulder outcrops, where there is a potential for isolated rockfalls to occur. Over-steepened areas of granitic boulders with potential for mobilization have been identified and are depicted in Figure 2.6-2, Rockfall Hazard Locations.

Using the proposed grading plan and large scale aerial photographs, Leighton and Associates conducted a Site visit to observe the hillsides located above future building pads and mapped the limits of potential rockfall hazard zones (Appendix J). As observed in the field, a majority of the boulder outcrops appear to be large intact rock masses or boulders that are located on flatter slope areas where rock movement would not be an issue. In other cases, there are places where loose boulders are located in areas of nested rock that limit the potential for rock falls. Most of the areas that contain abundant boulders with a potential to pose a rockfall hazard are located within the limits of the proposed grading and the boulders will be removed by planned grading operations.

There are, however, 14 localized areas that would not be graded and are located above proposed building pads where rocks appear to have a potential to become dislodged (**Impact GE-4**). These areas have been mapped and are shown on the attached Rockfall Hazard Map (Figure 2.6-2, Rockfall Hazard Locations) and summarized in Table 2.6-2, below. As shown on the Rockfall Hazard Map, rockfall hazards located outside the proposed limits of grading that may potentially affect building areas include 14 areas designated as rockfall hazard areas, RF-1 through RF-13. No potential rockfall hazard areas were identified north of RF-13 at the project Site.

All of the areas that were observed to have potential rockfall hazards are located either within the proposed residential development areas, neighborhood commercial uses and associated facilities and infrastructure. The boulders in these potential rockfall hazard areas will be removed in conjunction with grading for the pad sites and roadways. However, if removal of the rock is not possible, the hazard will be mitigated by breaking up the rock in place to reduce the potential for the rock to be dislodged. Alternatively, the hazard will be mitigated with deflection berms or rock catchments. This work shall be completed prior to construction of structures in downslope areas.

- In 9 of the 14 locations, removal of the boulders appears to be the most feasible option. These areas can be easily accessed by a large dozer or excavator tracking through the brush. It is anticipated that the areas can be accessed with the dozer blade in the air to minimize disturbance; and, construction of an access road would not be required. Some localized disturbance is anticipated as the boulders are pushed/rolled into the proposed grading areas where they can be broken down and removed from the Site. Large boulders that cannot be easily dislodged by the strong forces applied by the grading equipment may be determined not to be a rockfall hazard and may be left in place. In some instances boulders with a large flat side may be flipped onto the flat surface where they are, so they no longer have a rolling potential. These boulders could then be left in place per the recommendations of a California Certified Engineering Geologist.
- In less accessible areas, which are typically located well above the limits of planned grading, there are localized boulders on the steeper slopes that also have a potential for rolling. In these areas, boulders should be broken up in place. In 4 of the 14 locations, breaking the boulders in place appears to be the most feasible option. This may be

accomplished by hand drilling and breaking of the rock until it is reduced in size such that it is no longer a hazard or splitting the boulder into large flat surfaces that eliminate the potential for rolling.

- In 1 of the 14 locations (rockfall hazard location RF-7), it is recommended that catchment techniques be implemented at the toe of the rockfall slope located directly below rockfall hazard location RF-7 and Sarver Lane. The catchment area should use sections of flat or negatively sloped ground to dissipate rockfall energy and to collect rocks, boulders and other debris that have detached from rockfall hazard location RF-7. In addition, a ditch in combination with a barrier (typically a wall or berm) should be constructed in this catchment mitigation area.
- Alternative methods could include the use of cables to drag isolated boulders up or down existing slopes, embedding the boulder in excavation areas, constructing deflection berms or catchment basins, or anchoring the boulder in place. These alternative methods are not proposed at this time, but are potential options that may be used in the future per the recommendations of a California Certified Engineering Geologist upon review and approval by the County of San Diego. Potential impacts associated with proposed and/or alternative methods of mitigating rockfall hazards have been evaluated in this EIR. Any temporary impact areas located within the preserve and/or outside of the fire management zone shall be restored and revegetated to pre-project conditions (i.e., a 1:1 ratio), thus restoring the functions and values of those resources (see mitigation measure M-BIO-6).

Overall, prior to mitigation, impacts would be **potentially significant**.

2.6.3.5 Expansive Soils

For the purposes of this EIR, the County's Geologic Hazards Guidelines (County of San Diego 2007a) apply to both the direct impact analysis and the cumulative impact analysis. The following significance guidelines have been developed by the County to address question VI (d) in the CEQA Guidelines, Appendix G. A significant impact would result if:

- The project would be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), and does not conform with the Uniform Building Code.

Analysis

The majority of the on-site soils are expected to have a very low to low expansion potential per CBC criteria. However, the following soil formations include expansive properties: (1) topsoil/colluvium consists of damp to moist, loose to medium dense soils, which are typically massive, porous, and organic; (2) existing undocumented fills located on the Site are considered potentially compressible and unsuitable in their present state for structural support; (3) alluvium

is also considered potentially compressible and would need to be removed to competent bedrock material in areas of proposed development; and (4) quaternary slopewash deposits are medium dense to dense but are still locally porous and potentially compressible, thus, this unit is not suitable for the support of additional fill or structural loads (**Impact GE-5**). Therefore, the undocumented fill, topsoil/colluvium, alluvium, and Quaternary slopewash formational materials are porous and/or potentially compressible in their present state. Geotechnical observation and/or laboratory testing during grading will be required to identify areas of highly expansive soils and determine the actual expansion potential of finish grade soils. Impacts would be **potentially significant** prior to mitigation.

2.6.3.6 Soil Erosion

For the purposes of this EIR, the County's Geologic Hazards Guidelines (County of San Diego 2007a) apply to both the direct impact analysis and the cumulative impact analysis. The following significance guidelines have been developed by the County to address question VI (b) in the CEQA Guidelines, Appendix G. A significant impact would result if:

- The project would result in substantial soil erosion or the loss of topsoil.

Analysis

Most of the property is proposed as biological open space (approximately 1,209 acres of the 1,985-acre property) or fuel modification zone (272.2 acres). Within the development footprint, the potential for erosion would increase during grading and construction as a result of vehicles and heavy equipment accelerating the erosion process as exposed soil is subject to wind and water erosion due to rainfall.

Prior to project-related construction, a Stormwater Pollution Prevention Plan (SWPPP) would be prepared in accordance with the State Water Resources Control Board (SWRCB) Order No. 99-08-DWQ NPDES General Permit No. CAS00002 (Construction General Permit) and the modifications to the Construction General Permit Order No. 2001-046, adopted by the SWRCB. For coverage by the Construction General Permit, the Project Applicant is required to submit to the SWRCB a Notice of Intent (NOI) and develop a SWPPP describing best management practices (BMPs) to be used during and after construction. The BMPs would provide erosion and sedimentation control through measures such as silt fences, fiber rolls, gravel bags, temporary desilting basins, velocity check dams, temporary ditches or swales, storm water inlet protection, and soil stabilization measures such as erosion control mats, tackifier, hydroseeding and/or vegetation. The SWPPP would be approved prior to the issuance of a grading permit.

The project is also required to comply with the County of San Diego Code of Regulations Title 8, Zoning and Land Use Regulations, Division 7, Sections 87.414 (DRAINAGE - EROSION

PREVENTION) and 87.417 (PLANTING). Compliance with these regulations minimizes the potential for water and wind erosion.

The project design currently includes a Community-wide network of vegetated swales and bio-retention basins. These measures would also ensure maintenance of water quality in stormwater runoff, and are discussed in greater detail in Section 3.2, Hydrology and Water Quality, of this EIR, and in the Stormwater Management Plan (Appendix Y) and Preliminary Drainage Study (Appendix Z). Earth-disturbing activities associated with construction would be temporary and compliance with the General Construction Permit and BMPs outlined in the SWPPP, impacts related to soil erosion and the loss of topsoil would be **less than significant**.

The I-15 interchange improvements, which constitute an off-site mitigation measure for the project, are not expected to cause significant impacts to geology, soils and seismicity. The I-15/Deer Springs Road interchange improvements do not include any habitable structures, and are expected to comply with any and all recommendations from a qualified geologist for the specified improvements once a final design has been prepared. Caltrans can and should prepare, or cause to be prepared, a project geotechnical investigation report describing the geologic conditions present and making recommendations for how to address these conditions during construction. Nonetheless, the interchange improvements could be exposed to earthquake shaking and compaction settlement, landslides, rockfall hazards, and/or expansive soils, and soil erosion. The Caltrans' design and construction guidelines incorporate engineering standards that address seismic risks. Caltrans can and should ensure the design and construction of project improvements meet seismic design requirements for ground shaking and ground motion, as determined for the project's vicinity and site conditions. Caltrans also can and should ensure a field investigation program and construction monitoring program is implemented.

2.6.3.7 Adequate Soils for Septic Systems or Other On-Site Wastewater Systems

The County's Geologic Hazards Guidelines or its Guidelines for Determining Significance – Hydrology (County of San Diego 2007a, 2007b) do not contain a significance criterion that addresses adequate soils for septic systems or other on-site wastewater systems. However, the following analysis is provided to address question VI (e) in the CEQA Guidelines, Appendix G, which states that a significant impact would result if:

- The project would have soils incapable of supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

Analysis

The proposed project does not include any septic or on-site wastewater systems. As such, the proposed project would result in **no impact**.

2.6.3.8 Consistency with Applicable Plans, Policies, and Ordinances

The proposed project is consistent with County General Plan Goals and Policies, including Goal S-7; Policies S-7.1, S-7.2, and S-7.3; Goal S-8; and Policies S-8.1 and S-8.2 of the Safety Element, which are set forth in Subsection 2.6.2, above. The proposed project would minimize personal injury and property damage resulting from seismic hazards, as indicated by Goal S-7, by requiring the preparation of the proper geotechnical studies and adhering to the required CBC seismic design requirements. The proposed project would be consistent with Policy S-7.1 because the project would not be located within 50 feet from an active or potentially active fault. As identified by Policy S-7.2, the proposed project would include engineering measures to reduce risk in accordance with the CBC, Uniform Building Code, and other seismic and geologic hazard safety standards, including design and construction standards. In addition, the proposed project would be consistent with Policy S-7.3 because the project would not permit high-occupancy uses, essential public facilities, or uses that permit significant amounts of hazardous materials within an Alquist-Priolo or County special study zone.

The proposed project would be consistent with Goal S-8 because the Geotechnical Report prepared for the project includes recommendations and design considerations to minimize geologic, seismic, soils, slopes, and other hazards. The proposed project would be designed in accordance with the most recent building code standards for geologic and seismic safety. In accordance with Policy S-8.1, development would be directed away from areas with high landslide, mudslide, or rock fall potential when engineering solutions have been determined to be infeasible. The proposed project would also not permit development that could cause or contribute to slope instability, in accordance with Policy S-8.2.

For additional details on the proposed project's consistency with applicable plans, policies, and ordinances, see Section 3.3, Land Use and Planning.

2.6.4 Cumulative Impact Analysis

Geotechnical conditions are localized and generally unique to each site. Approved projects and those under review are subject to soils and stability analyses and cannot be constructed unless each project is determined to be geotechnically feasible. The project is not located adjacent to other cumulatively considerable projects related to geotechnical conditions; therefore, cumulative impacts related to localized site stability would not occur. With regard to seismicity, the project and any future development would expose additional property and people to

earthquake hazards. However, this impact can be mitigated by compliance with CBC seismic requirements on a project-by-project basis. Development throughout northeastern San Diego County would not impact the plate tectonic conditions of the area. Therefore, the project would **not result in a cumulatively considerable impact** to geology, soils, or seismicity.

2.6.5 Significance of Impacts Prior to Mitigation

Impact GE-1: The potential for liquefaction in alluvial areas is considered low; however, saturated alluvial soils may have a potential for liquefaction.

Impact GE-2: Natural slopes at the site contain local areas of potential surficial instability, as indicated by the presence of slopewash deposits, source area scars, and perched granitic boulder outcrops. Such areas are of particular significance when located above and immediately adjacent to proposed development.

Impact GE-3: If areas of adverse conditions are identified during geotechnical observation and/or laboratory testing during grading, cut slopes may be subjected to surficial instability.

Impact GE-4: Approximately 14 localized areas that will not be graded and are located above proposed building pads where rocks appear to have a potential to become dislodged.

Impact GE-5: Undocumented fill, topsoil/colluvium, alluvium, and Quaternary slopewash are porous and/or potentially compressible in their present state.

2.6.6 Mitigation Measures

The following mitigation measures are developed from recommendations provided in the geotechnical report and rockfall hazard report (Appendix J), which will minimize or avoid potential impacts related to geologic hazards. These mitigation measures shall be used in conjunction with the geotechnical reports for the proposed project prepared by Leighton and Associates (EIR, Appendix J) to ensure that the measures are implemented in the proper context of the earthwork and grading specifications provided in the report.

M-GE-1 A geotechnical consultant in the field shall perform geotechnical observation and/or laboratory testing during grading to identify areas of potential liquefaction due to saturated alluvial soils and develop conclusions and recommendations. All alluvial soils in areas of proposed development or future fill shall be removed and recompacted during grading. Prior to approval of final inspection of site grading for each phase of the affected areas of the proposed project, the removal and

recompaction measures shall be reviewed and approved by the Director of the County Department of Planning & Development Services or its designee.

M-GE-2 A California Certified Engineering Geologist shall complete a final soils report specific to the preliminary design of the proposed development. The final soils report shall include, but not be limited to, a surficial stability analysis. The report shall include conclusions and design recommendations including, but not limited to, buffering areas without structural development, construction of debris walls, catchment basins, or slope buttressing. The final soils report and final grading plans shall be submitted to, and approved by, the County Department of Planning & Development Services or its designee prior to the issuance of grading or construction permits for any phase of the project. The final soils report and final grading plans shall conform to all applicable laws, regulations, and requirements. All geotechnical recommendations provided in the final soils report and final grading plans shall be followed during grading and construction at the project site.

M-GE-3 A geotechnical consultant in the field shall perform mapping of all cut slopes during grading. If adverse geologic conditions (e.g., highly fractured and jointed rock, clay-lined fractures, seepage zones) are encountered during installation of cut slopes, stabilization measures shall be required and implemented during grading. Specific stabilization measures shall include, but not be limited to, removal of loose boulders or displaced rocks, stability fill, buttresses, rock-bolting, and/or catchment netting. Prior to approval of final inspection of site grading for each phase of the affected areas of the proposed project, the stabilization measures shall be reviewed and approved by the County Department of Planning & Development Services or its designee.

M-GE-4 All boulders located within the proposed development footprint shall be removed during grading. Boulders affecting the 14 locations identified in Table 2.6-2, below, as potentially hazardous zones shall either be removed, broken in place, or mitigated with catchments, as set forth in Table 2.6-2. The removal or breaking of the boulders, as well as the catchment construction, shall be completed prior to approval of final inspection of site grading for each phase of the affected areas of the proposed project. Prior to such approval of final inspection of site grading, evidence shall be provided to the satisfaction of the County Department of Planning & Development Services or its designee, demonstrating that hazardous boulders have been removed, broken in place, or mitigated with catchments, as required.

In addition, prior to approval of final inspection of site grading for each phase of the affected areas of the proposed project, a written professional opinion from a California Certified Engineering Geologist shall be provided that indicates that

the potential risk for rock fall hazards to impact the proposed development has been mitigated to a less than significant level. The written opinion shall also indicate that, with mitigation measures incorporated, the proposed development shall be safe for human occupancy.

M-GE-5 A geotechnical consultant in the field shall perform geotechnical observation and/or laboratory testing during grading to identify areas of highly expansive soils and determine the actual expansion/compression potential of finish-grade soils. All compressible soils in areas of proposed development or future fill shall be removed and recompacted during grading. Prior to approval of final inspection of site grading for each phase of the affected areas of the proposed project, the removal and recompaction measures shall be reviewed and approved by the Director of the County Department of Planning & Development Services or its designee.

As described above, impacts from the I-15/Deer Springs Road interchange improvement are expected to be less than significant; however, because the final design has not been determined, to ensure impacts to geology, soils and seismicity remain less than significant, this EIR recommends the following measure:

M-GE-6 Pursuant to California Public Resources Code Section 21081(a)(2), in coordination with the I-15 interchange improvement project, which is to be fully funded and constructed by the project applicant, though is within the ~~responsibility and~~ jurisdiction of Caltrans to approve, Caltrans can and should prepare, or cause to be prepared, a project geotechnical investigation report describing the geologic conditions present and making recommendations for how to address these conditions during construction of the interchange improvements as part of the NEPA/CEQA process. Caltrans can and should ensure the design and construction of the interchange improvements meet any and all design recommendations to address potential geologic and soils-related considerations including, but not limited to, seismic ground shaking, liquefaction, landslides, rockfall hazards, expansive soils, and soil erosion. Further, Caltrans can and should ensure a field investigation and construction monitoring program is implemented.

2.6.7 Conclusion

The potential for liquefaction in saturated alluvial soils (**Impact GE-1**) would be mitigated to less than significant with implementation of mitigation measure M-GE-1. Mitigation is achieved through the removal and replacement of alluvium with compacted fills in areas of proposed grading in accordance with geotechnical recommendations.

Natural slopes at the site containing local areas of potential surficial instability, as indicated by the presence of slopewash deposits, source area scars, and perched granitic boulder outcrops (**Impact GE-2**), would be mitigated to less than significant with implementation of mitigation measure M-GE-2. Mitigation is achieved through buffering areas without structural development, construction debris walls, catchment basins, or slope buttressing.

Cut slopes that have the potential to be subject to surficial instability (**Impact GE-3**) would be mitigated to less than significant with implementation of mitigation measure M-GE-3. Mitigation for this impact requires mapping of all cut slopes and stabilization ~~if necessary~~.

Locations on site where rocks appear to have a potential to become dislodged (**Impact GE-4**) would be mitigated to less than significant with implementation of mitigation measure M-GE-4. Mitigation is achieved through boulder removal or breaking the boulder in place.

Impacts associated with potentially compressible soils (**Impact GE-5**) is mitigated to less than significant with implementation of mitigation measure M-GE-5, which requires geotechnical observation and/or laboratory testing during grading to determine areas of highly expansive soils.

With implementation of mitigation measures, all identified impacts would be reduced to below a level of significance.

Table 2.6-1
Seismic Parameters for Active Faults

Potential Causative Fault	Distance from Fault to Site (miles)	Slip Rate (millimeters per year)	Maximum Magnitude Event (M_w)
Elsinore-Julian	13	5.0	7.1
Elsinore-Temecula	13	5.0	6.8
Rose Canyon	15	1.5	7.2
Newport-Inglewood	16	1.5	7.1
Coronado Banks	31	3.0	7.6

Source: Leighton and Associates 2015a

Table 2.6-2
Rockfall Mitigation

Rockfall Hazard Area	Acreage (approximate) with Potentially Hazardous Boulders	Proposed Lots or Affected Roadways	Recommended Mitigation Measure	Feasibility of Mitigation	Impacts Due to Implementation of Mitigation
RF-1	0.3 acre	Mesa Rock Road	Removal of Boulders	Boulders can be moved into grading area by heavy equipment, then broken down and disposed of. Site can be readily accessed from the adjacent graded slope.	A dozer will be used to access the location of boulders to be removed. Site is immediately adjacent to a proposed graded cut slope. It is anticipated that no more than 0.15 acres would be disturbed for boulder removal. Based on the location of boulders to be removed, no access road would be required.
RF-2	1.0 acre	Street T-2, and Lots 23 and 29	Removal of Boulders	(see RF-1)	A dozer will be used to access the location of boulders to be removed. Site is immediately adjacent to a proposed graded cut slope. It is anticipated that no more than 0.5 acres would be disturbed for boulder removal. Based on the location of boulders to be removed, no access road would be required.
RF-3	0.2 acre	Mesa Rock Road	Break Boulders in Place	Areas located on steep slope, boulders can be reduced utilizing hand drills and rock breaking methods.	Areas can be accessed on foot and boulders to be reduced in size by use of hand held power tools. Disturbance limited to the hazardous boulders location and the immediately surrounding area. It is anticipated that less than 0.10 acres would be disturbed.

Table 2.6-2
Rockfall Mitigation

Rockfall Hazard Area	Acreage (approximate) with Potentially Hazardous Boulders	Proposed Lots or Affected Roadways	Recommended Mitigation Measure	Feasibility of Mitigation	Impacts Due to Implementation of Mitigation
RF-4	1.2 acres	Mesa Rock Road and Lots 117–124	Removal of Boulders	Site can be reached with heavy equipment from an existing access road that is located approximately 150 feet away.	A dozer will be used to access the location of boulders to be removed. A dozer will need to track across about 600 feet of distance during boulder removal. It is anticipated that 0.3 acres would be disturbed from boulder removal.
RF-5	0.4 acre	Lots 1126–1129	Removal of Boulders	(see RF-1)	A dozer will be used to access the location of boulders to be removed. Site is immediately adjacent to a proposed graded cut slope. It is anticipated that no more than 0.2 acres would be disturbed for boulder removal. Based on the location of boulders to be removed, no access road would be required.
RF-6	0.1 acre	Sarver Lane and Lots 1098–1103	Break Boulders in Place	(see RF-3)	Areas can be accessed on foot and boulders to be reduced in size by use of hand held power tools. Disturbance limited to the hazardous boulders location and the immediately surrounding area. It is anticipated that less than 0.10 acre would be disturbed.
RF-6a	0.3 acre	Lots 1098–1103	Removal of Boulders	(see RF-1)	A dozer will be used to access the location of boulders to be removed. Site is immediately adjacent to a proposed graded cut slope. It is anticipated that no more than 0.15 acres would be disturbed for boulder removal. Based on the location of boulders to be removed, no access road would be required.
RF-7	0.2 acre	Sarver Lane	Catchment Area	Sections of flat or negatively sloped ground located directly adjacent to the toe of the	A trench with a barrier (typically a wall or berm) may need to be installed in the area located directly adjacent to the toe of the potential rockfall slope and

Table 2.6-2
Rockfall Mitigation

Rockfall Hazard Area	Acreage (approximate) with Potentially Hazardous Boulders	Proposed Lots or Affected Roadways	Recommended Mitigation Measure	Feasibility of Mitigation	Impacts Due to Implementation of Mitigation
				potential rockfall slope and proposed Sarver Lane can be used.	proposed Sarver Lane. An excavator or backhoe will be used to dig the rockfall ditch to be located directly adjacent to the toe of the potential rockfall slope. It is anticipated that no more than 0.15 acres would be disturbed for the installation of the catchment area.
RF-8	0.9 acre	Sarver Lane and Lots 1022–1026	Break Boulders in Place	(see RF-3)	Areas can be accessed on foot and boulders to be reduced in size by use of hand held power tools. Disturbance limited to the hazardous boulders location and the immediately surrounding area. It is anticipated that less than 0.3 acres would be disturbed.
RF-9	1.1 acres	Lots 847–856	Break Boulders in Place	(see RF-3)	Areas can be accessed on foot and boulders to be reduced in size by use of hand held power tools. Disturbance limited to the hazardous boulders location and the immediately surrounding area. It is anticipated that less than 0.3 acres would be disturbed.
RF-10	0.4 acre	Mesa Rock Road and Lots 566–568	Removal of Boulders	Site can be reached with heavy equipment from an existing access road that is located approximately 100 feet away.	A dozer will be used to access the location of boulders to be removed. A dozer will need to track across about 100 feet during boulder removal. It is anticipated that 0.2 acres would be disturbed from boulder removal.
RF-11	0.3 acre	Lots 610–612	Removal of Boulders	(see RF-1)	A dozer will be used to access the location of boulders to be removed. Site is immediately adjacent to a proposed graded cut slope. It is anticipated that no more than 0.3 acres would be disturbed for boulder removal. Based on the location of boulders to be removed, no access road would be required.

Table 2.6-2
Rockfall Mitigation

Rockfall Hazard Area	Acreage (approximate) with Potentially Hazardous Boulders	Proposed Lots or Affected Roadways	Recommended Mitigation Measure	Feasibility of Mitigation	Impacts Due to Implementation of Mitigation
RF-12	0.3 acre	Lots 571–577	Removal of Boulders	Boulders to be removed are located along an existing access road within 40 feet of a graded slope.	A dozer will be used to access the location of boulders to be removed. Site is immediately adjacent to a proposed cut slope. It is anticipated that fifty percent of the 0.3 acre area could be disturbed for boulder removal. Based on the location of boulders to be removed, no access road would be required.
RF-13	0.3 acre	Street S-1 and Lots 578-580	Removal of Boulders	Boulders to be removed are located along the existing access road within 30 feet of a graded slope	A dozer will be used to access the location of boulders to be removed. Site is immediately adjacent to a proposed cut slope. It is anticipated that no more than 0.15 acres would be disturbed for boulder removal. Based on the location of boulders to be removed, no access road would be required.

Source: Leighton and Associates 2015b

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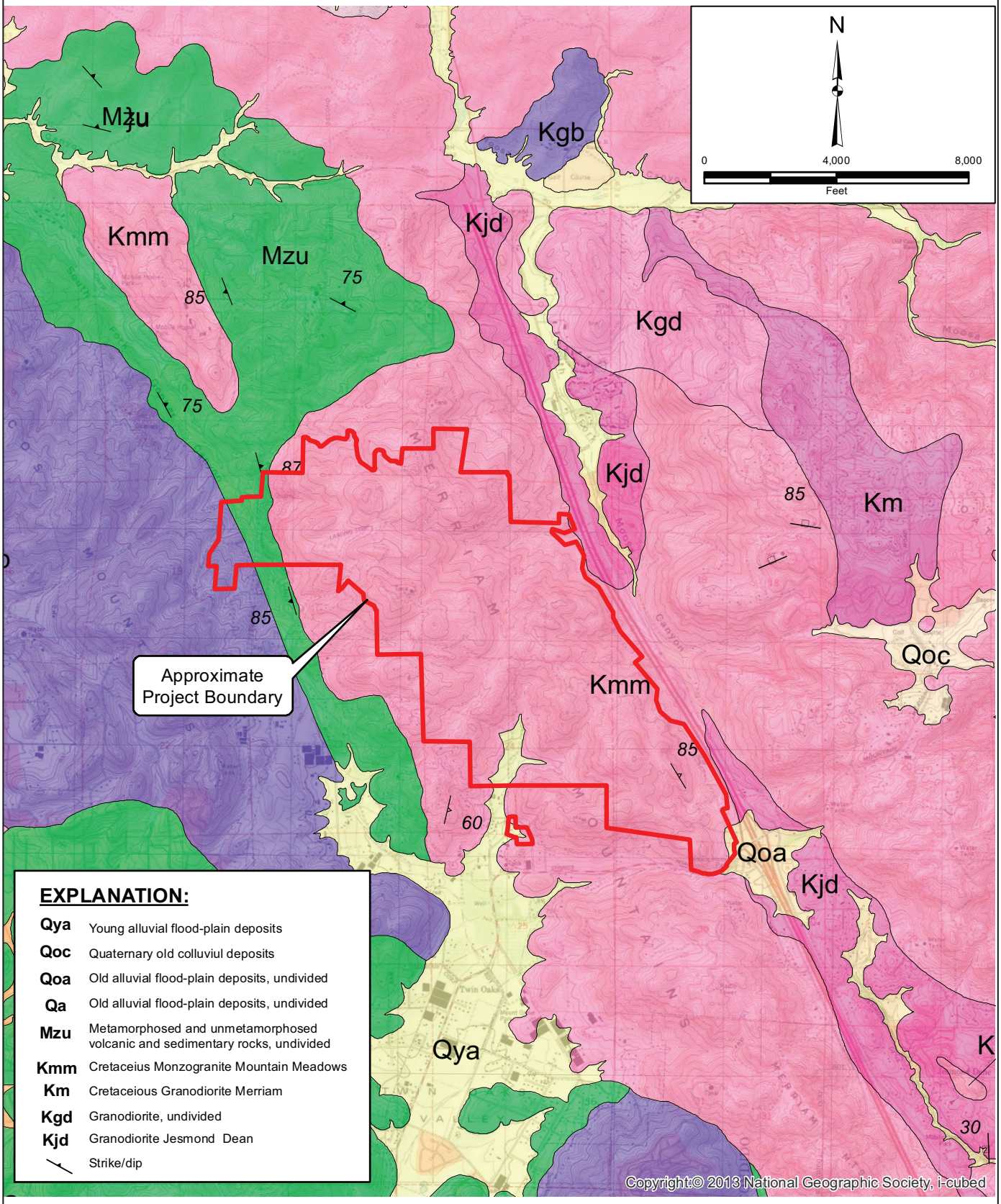

FIGURE 2.6-1

Regional Geology Map

Newland Sierra Environmental Impact Report

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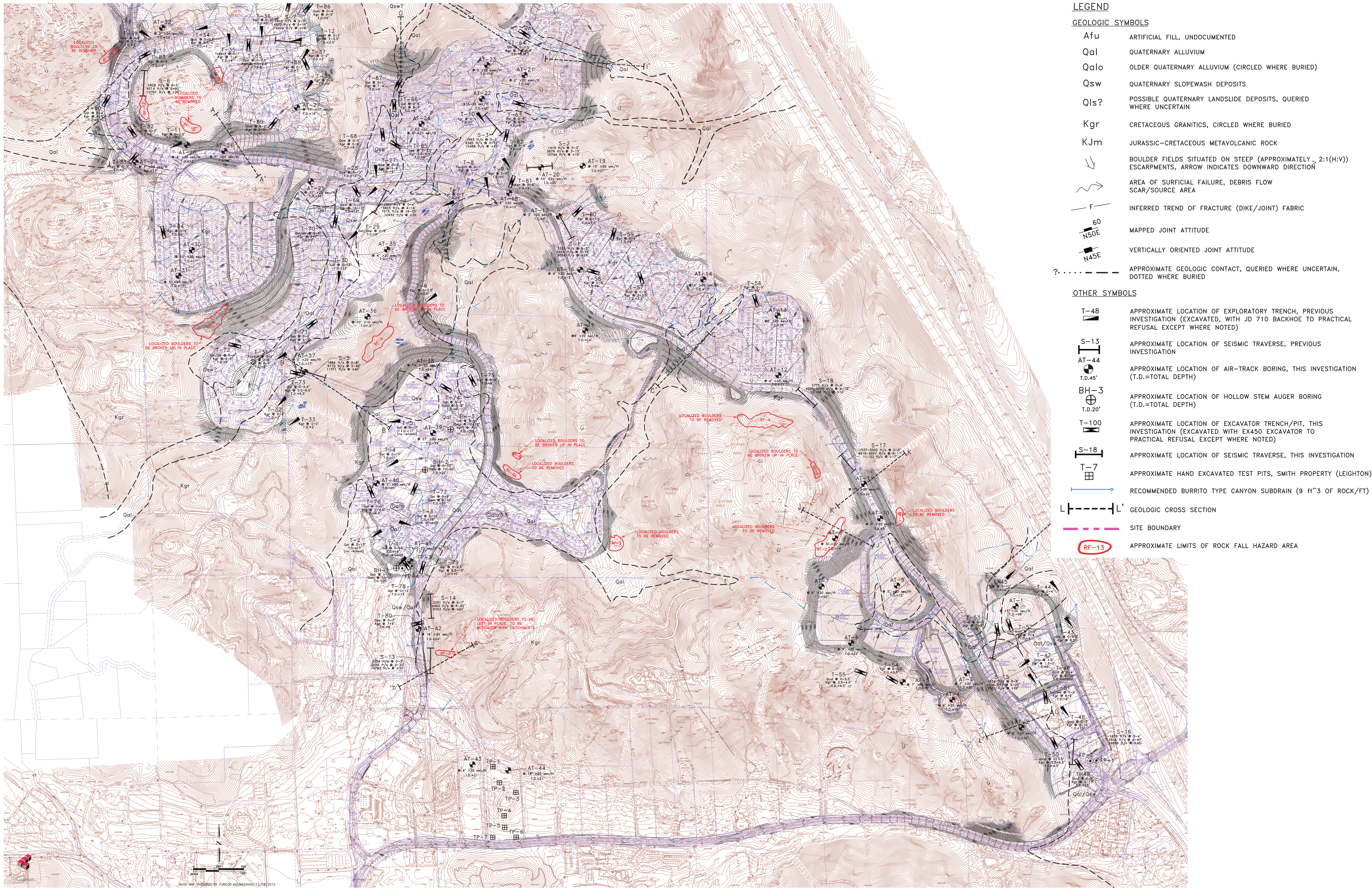

SOURCE: Leighton 2015

FIGURE 2.6-2

Rock Fall Hazards

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