3.6 Geology and Soils

The purpose of this section is to analyze the potential impacts related to geology and soils. Several resources were consulted, including a Geotechnical Assessment (Terrestrial, 2014a), an Onsite Wastewater Treatment System Memorandum (PACE, 2014), a Response to County Comments on Onsite Wastewater Treatment Systems Memorandum (Terrestrial, 2014b) and a Draft Geotechnical Assessment prepared in 2008 (PSE, 2008). These four documents are provided in Appendices D1 through D4 of this EIR, respectively. Resources reviewed also include the Water Quality Management Plans (WQMPs) prepared for Phase 1 (north parcel) (Hunsaker, 2014a) and for Phase 2 (south parcel) (Hunsaker, 2014b) located in Appendices H1 and H2 of this EIR, respectively.

3.6.1 Environmental Setting

Existing Conditions

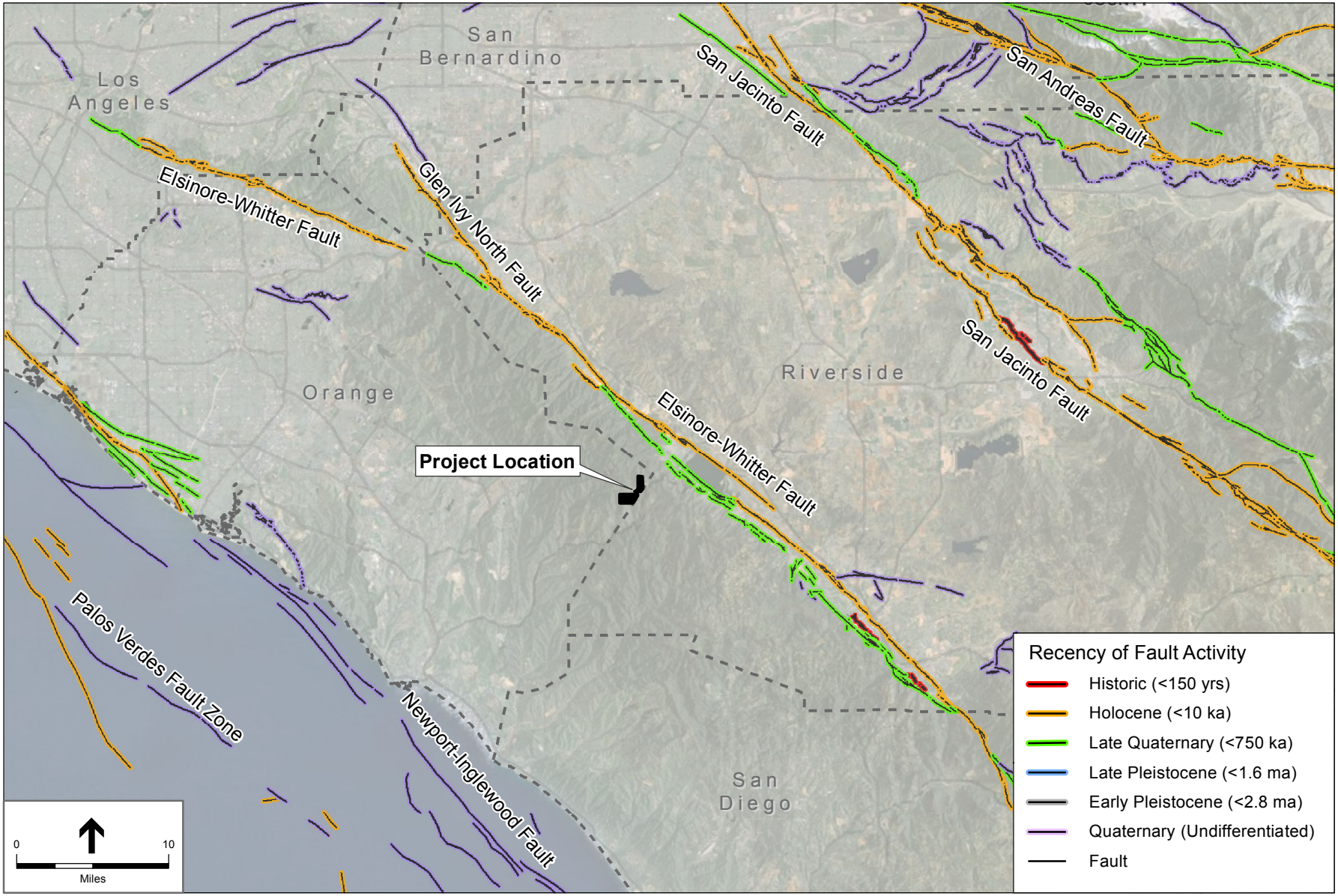
The project area is located within the Santa Ana Mountains that are part of the Peninsular Range geomorphic province in Southern California (Terrestrial, 2014a), which consists of a series of mountain ranges separated by northwest trending valleys sub-parallel to faults branching from the San Andreas Fault (CGS, 2002a).

The project site consists of varied terrain. The northernmost area has a steep high ridgeline and the southernmost area is a deep canyon. The bulk of the proposed developable area is gently rolling hills and small irregular valleys on a large plateau. Elevations range from approximately 3,300 feet above mean sea level (amsl) in the northeast portion of the property to approximately 2,025 amsl in the southern major canyon bottom. Most of the proposed development area is between the elevations of 2,400 amsl and 2,900 feet amsl. The project site drains by overland or sheet flow to the smaller canyons that flow into Long Canyon (Terrestrial, 2014a).

Regional Faults and Ground Shaking

The project area lies within a region of California that is seismically active. Alquist-Priolo Earthquake Fault Zones are regulatory zones that encompass surface traces of active faults that have a potential for future surface fault rupture (DOC, 2011). The project site does not contain any Alquist-Priolo Earthquake Fault Zones; however, the Elsinore Fault Zone is located approximately three miles north of the project site (DOC, 2006). The EFZ has been divided into segments, including the Whittier and Glen Ivy, which form the northern section of the fault and are closest to the project study area. The EFZ's most recent seismic event within the project vicinity occurred in 1910, with a magnitude of 6.0 (SCEDC, 2013). In addition, the SAF is capable of producing an earthquake with a magnitude of 8.1. While the potential damage from a magnitude of 8.1 earthquake on the SAF would likely produce the greatest damage nearest to the epicenter, some effects may be experienced within eastern Orange County (Lin, 2010).

The next closest active faults to the project site include the Newport-Inglewood Fault Zone located 24 miles west, the San Jacinto Fault Zone located 24 miles northeast, and the San Andreas Fault Zone located approximately 56 miles northwest (USGS, 2013). The location and approximate age of active regional faults within the project study area are shown in **Figure 3.6-1**.



SOURCE: ESRI, USGS 2011

The Preserve at San Juan

Figure 3.6-1

Regional Fault Locations and Activity

Seismic hazards may include ground shaking, liquefaction (failure of water-saturated soil), lateral spreading, and earthquake-induced landslides. To be located in a state seismic hazard zone means that there is likelihood that weak soil and/or rock are present beneath the property. If present, these weak materials can fail during an earthquake and, unless proper precautions are taken during grading and construction, can cause damage to structures (DOC, 2013a). The Southern California area is tectonically active, and known to be subject to seismic hazards (SCEC, 2013).

Ground Shaking

Southern California is a generally seismically active region and the proposed project is likely to be subjected to significant ground shaking motion during the design life of the project (Terrestrial, 2013a).

Richter magnitude (M) is a measure of the size of an earthquake as recorded by a seismograph, a standard instrument that records ground shaking at the location of the instrument. The reported Richter magnitude for an earthquake represents the highest amplitude measured by the seismograph at a distance of 100 kilometers from the epicenter. Richter magnitudes vary logarithmically with each whole number step representing a tenfold increase in the amplitude of the recorded seismic waves (CGS, 2002b).

Earthquakes with a Richter value of 5.0 or higher are potentially damaging (Schultz and Wallace, 2013). The likelihood of an earthquake with a magnitude over 5.0 occurring in the next 30 years at the project site is 80 percent (USGS, 2009). The Elsinore fault zone is the closest active fault zone to the project vicinity (Terrestrial, 2014a).

Another common measure of ground motion is the peak ground acceleration (PGA). The PGA for a given component of motion is the largest value of horizontal acceleration obtained from a seismograph. PGA is expressed as the percentage of the acceleration due to gravity (g), which is approximately 980 centimeters per second squared. In terms of automobile accelerations, one “g” of acceleration is a rate of increase in speed equivalent to a car traveling 328 feet from rest in 4.5 seconds. A maximum probable event could produce PGA values at the project site ranging from 0.63g for rock and 0.70 for soft rock (PSE, 2008).

Liquefaction

Soil liquefaction is a phenomenon in which saturated, cohesionless soils layers, located within approximately 50 feet of the ground surface, lose strength due to cyclic pore water pressure generation from seismic shaking or other large cyclic loading. Soils that are most susceptible to liquefaction are clean, loose, saturated, and uniformly graded fine-grained sands that lie below the groundwater table within approximately 50 feet below ground surface. The project site is not underlain by a high groundwater table or fine-grained sands (Terrestrial, 2014a). Hence, the project site is not located in a liquefaction zone.

Landslides and Lateral Spreading

Landslides are a type of seismic hazard. Landslides consist of two parts—the material that failed and the type of movement that the failed material exhibited. There are five common material and movement combinations: rock slides, earth flows, debris slides, debris flows and rock falls (DOC,

2013b). Lateral spreading refers to landslides that form on gentle slopes and have rapid fluid-like flow movement similar to water (USGS, 2012). The project site does not contain any landslide zones and no landslides are known to exist within the project site (DOC, 2006).

Natural slopes steeper than 1.5:1 horizontal to vertical and cut slopes that expose unfavorable geologic conditions such as low strength or poorly cemented soils, are potentially susceptible to the secondary seismic hazard of earthquake-induced rock falls or minor landsliding. Rock falls generally only occur on slopes steeper than 1.5:1. The area of the project site that is proposed for development does not contain any significant slopes that are steeper than 1.5:1 (Terrestrial, 2014a).

On-site Soils

Soil Morphology

Deposits of topsoil of relatively minor thickness (a few feet) are present over a majority of the project site. The relative lack of topsoil is due to the arid environment and the hardness of the bedrock. Seasonal runoff is the principal agent of erosion in addition to local, shallow, soil slumping (Terrestrial, 2014a). The dominant soil series on Phase 1 (south parcel) are Blasingame, Capistrano, and Cieneba. The dominant soil series on Phase 2 (north parcel) are Capistrano, Cieneba, and Friant (NRCS, 2013). **Table 3.6-1** shows each soil series' depth and drainage, permeability, concrete corrosion potential rating, and steel corrosion potential rating.

Expansive Soils

Expansive soils are fine-grained soils (generally high plasticity clays) that can undergo a significant increase in volume with an increase in water content and a significant decrease in volume with a decrease in water content. Changes in the water content of an expansive soil can result in severe distress to structures constructed upon the soil. The project site is underlain by rock and shallow soils that are generally low to non-expansive.

TABLE 3.6-1
SOIL DRAINGE, PERMEABILITY AND CORROSION POTENTIAL RATING FOR CONCRETE AND STEEL

Soil Series	Depth and Drainage	Permeability	Concrete Corrosion Potential	Steel Corrosion Potential
Blasingame	Moderately deep; well-drained	Moderately slow	Moderate	Moderate
Capistrano	Very deep; well-drained	Moderately rapid	Low	Low
Cieneba	Shallow; excessively drained	Moderately rapid	Low	Low
Friant	Shallow; well-drained	Moderately rapid	Low	Low

SOURCE: USDA, 2001a-c; USDA, 2012; NRCS, 2013.

Septic Suitability

Soil types affect the ability of soils to purify wastewater effluent and to allow the effluent to percolate (USEPA, 2006). Soils appropriate for supporting onsite wastewater treatment systems,

which include septic tanks, have particular percolation rates and sufficient depth to bedrock and groundwater. A soils analysis has mapped various locations on the project site that have the ability to adequately support onsite wastewater treatment systems.

A subsurface investigation was performed in 2013 to determine the percolation characteristics of the soil and bedrock at the site. In March 2013, 34 test pit trenches with a rubber tired backhoe were excavated. Percolation testing was conducted in seventeen of these trenches. In November 2013, an additional subsurface investigation was conducted consisting of eight backhoe trenches and 34 additional test pits for preliminary percolation testing. The percolation tests determined that the soils are suitable for percolation (Terrestrial, 2014a). The landscaping areas that would be irrigated by treated effluent have been designed to use all the effluent that would be generated by the project. In addition, as described below, the onsite wastewater treatment systems would be installed in compliance with the Orange County On-site Sewage Absorption System Guidelines and the State Water Resources Control Board (SWRCB) On-Site Wastewater Treatment System Policy, which requires soil percolation tests to be performed during construction activities at each proposed on-site wastewater treatment system location prior to receipt of operational permits, which would ensure the suitability of the landscaping areas at each septic location.

Drip Irrigation Suitability

The project would utilize treated effluent for irrigation in portions of Fuel Modification Zone B. A surficial stability analysis was prepared to determine if the amount of additional soil moisture produced by the drip system during the winter months would impact either surficial and/or gross stability of the fill slopes where they would be placed (Terrestrial, 2014b).

Regulatory Setting

Earthquake Hazards Reduction Act

The Earthquake Hazards Reduction Act was enacted in 1997 to "*reduce the risks to life and property from future earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards and reduction program*." To accomplish this, the Act established the National Earthquake Hazards Reduction Program (NEHRP). This program was significantly amended in November 1990 by NEHRP, which refined the description of agency responsibilities, program goals, and objectives.

NEHRP's mission includes improved understanding, characterization, and prediction of hazards and vulnerabilities; improvement of building codes and land use practices; risk reduction through post-earthquake investigations and education; development and improvement of design and construction techniques; improvement of mitigation capacity; and accelerated application of research results. The NEHRP designates the Federal Emergency Management Agency (FEMA) as the lead agency of the program and assigns it several planning, coordinating, and reporting responsibilities. Programs under NEHRP help inform and guide planning and building code requirements such as emergency evacuation responsibilities and seismic code standards such as those to which the proposed project would be required to adhere.

California Building Code

The California Building Code (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. Under state law, all building standards must be centralized in Title 24 or they are not enforceable. 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, 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 is based on the International Building Code (IBC; previously known as the Uniform Building Code) published by the International Code Conference. In addition, the CBC contains necessary California amendments, which are based on the American Society of Civil Engineers (ASCE) Minimum Design Standards 7-05. ASCE 7-05 provides requirements for general structural design and includes means for determining earthquake loads as well as other loads (flood, snow, wind, etc.) for inclusion into building codes. 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.

The earthquake design requirements of the CBC take into account the occupancy category of the structure, site class, soil classifications, and various seismic coefficients, which are used to determine a Seismic Design Category (SDC) for a project. The SDC is a classification system that combines the occupancy categories with the level of expected ground motions at the site and ranges from SDC A (very small seismic vulnerability) to SDC E/F (very high seismic vulnerability and near a major fault). Design specifications are then determined according to the SDC and CBC. Furthermore, the County of Orange has adopted the standards of the CBC in Section 7-1-12 of the County's Codified Ordinances; and compliance with applicable regulations are verified by the County prior to approval of building permits.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act requires that any person discharging waste or proposing to discharge waste within any region, other than to a community sewer system, which could affect the quality of the "waters of the state," file a report of waste discharge (ROWD). This report requires a complete characterization of the discharge including design and actual flows, a list of constituents and the discharge concentration of each constituent, a list of other appropriate waste discharge characteristics, a description and schematic drawing of all treatment processes, a description of any BMPs used, and a description of disposal methods, and a site map.

The project site is located within the jurisdiction of the San Diego Regional Water Quality Control Board (RWQCB). Upon review of the report of waste discharge, the San Diego RWQCB would provide feedback and determine the appropriate permits required for onsite wastewater treatment system and septic tank installation.

State Water Resources Control Board – Water Quality Control Policy for Siting, Design, Operation and Maintenance of On-site Wastewater Treatment Systems

On June 19, 2012, the SWRCB adopted Resolution No. 2012-0032—the Water Quality Control Policy for Siting, Design, Operation, and Maintenance of On-site Wastewater Treatment Systems which establishes a statewide, risk-based, tiered approach for the regulation and management of on-site wastewater treatment system installations and sets levels of performance and protection required from on-site wastewater treatment systems in order to avoid water quality degradation and protect public health. The Policy lists corrective action requirements for failing or potentially failing systems and includes minimum monitoring and reporting requirements; exemption criteria; and conditional waiver of waste discharge requirements (SWRCB, 2012a). The Policy also conditionally waives the requirement for owners of on-site wastewater treatment systems to apply for and receive Waste Discharge Requirements in order to operate their systems when they meet the conditions set forth in the Policy. The San Diego RWQCB was required to incorporate these standards into its Water Quality Control Plan (Basin Plan) by May 13, 2014 (SWRCB, 2012b).

Regional Water Quality Control Board – Guidelines for New Community and Individual Sewerage Facilities

The RWQCB adopted Guidelines for New Community and Individual Sewerage Facilities (Resolution No. 79-44) on June 25, 1979. An updated set of guidelines is included in the 2011 Basin Plan, which supersedes Resolution No. 79-44 and has the goal of improving the efficiency of the review process, eliminating unnecessary Regional Board regulation, and improving protection of ground water quality.

Authority deferral to a County health officer in regard to onsite wastewater treatment systems would occur if the project operator satisfies the following conditions: (1) the use of new individual subsurface disposal systems for any subdivision of land will be in the best public interest; (2) individual disposal systems will comply with all existing county design criteria; (3) the cumulative impact from proposed individual disposal system(s) or from new commercial and/or industrial development(s) will not cause adverse impacts to the beneficial uses of ground water; (4) individual disposal systems will meet the minimum unsaturated soil thickness between the bottom of leach lines or the bottom of seepage pits and the historic high ground water level. The minimum unsaturated soil thickness is nine feet for soils with good percolation rates, 12 feet for soils with moderate percolation rates, and 14 feet for soils with poor percolation rates. Exceptions to the unsaturated soil thickness criteria may be allowed by the appropriate County health officer, based upon knowledge of local site conditions.

Upon receipt of the report of waste discharge for the proposed onsite wastewater treatment systems, the San Diego RWQCB would determine whether the proposed project would meet the above listed criteria and authority would defer to the County Department of Health for regulation and protection of groundwater quality.

Orange County General Plan Safety Element

The following goal and policies are contained within the Orange County General Plan that would apply to the proposed project.

Goal 1: Provide for a safe living and working environment consistent with available resources.

Objective 1.1: To identify public safety hazards and determine the relative threat to people and property in Orange County.

Goal 2: Minimize the effects of public safety hazards through implementation of appropriate regulations and standards which maximize protection of life and property.

Objective 2.1: To create and maintain plans and programs which mitigate the effects of public safety hazards.

Objective 2.2: To encourage the development and utilization of technologies that minimizes the effects of public safety hazards.

Orange County Regulations for Wastewater Treatment and Disposal Systems

Effective April 1, 2015, County Regulations for Wastewater Treatment and Disposal Systems include minimum horizontal setback requirements from various and features for onsite wastewater treatment systems. The purpose of these setbacks is to avoid damage to existing utilities, ground instability and water quality degradation. These setbacks are shown in **Table 3.6-2** (Orange County, 2013).

TABLE 3.6-2
MINIMUM HORIZONTAL SETBACKS FOR GROUND ABSORPTION SYSTEMS WHERE TS-I PRETREATMENT SYSTEMS ARE USED FOR < 1000 GALLONS PER DAY

Land Feature or Component	TS-I (feet)
Any public water supply	100
Streams classified as WS-I, except for saprolite	70
Waters classified as S-A, from mean high water mark	70
Other coastal waters, from mean high water mark	35
Any other stream, canal, marsh or other surface waters, from normal pool elevation	35
Any Class I or Class II reservoir, from normal pool elevation	70
Any permanent storm water retention pond, from flood pool elevation	35
Any other lake or pond, from normal pool or mean high water elevation	35
Any building foundation	5
Any basement	15
Any property line	10
Top of slope of embankments or cuts of 2 feet or more vertical height	15
Any water line	10
Upslope interceptor/foundation drains/diversions	7
Sideslope interceptor/foundation drains/diversions	10
Downslope interceptor/foundation drains/diversions	20
Groundwater lowering ditches or devices	20
Any swimming pool	15
Any other nitrification field (except the system repair area)	10

Orange County On-Site Sewage Absorption System Guidelines

Required as part the Orange County Building Plan Check, the Orange County On-Site Sewage Absorption System Guidelines are intended to provide a uniform approach to percolation testing requirements and design criteria of an on-site sewage absorption system. The Orange County Public Works Department's approval of proposed on-site sewage systems may be either a requirement for recordation of a parcel/tract map or a requirement before building/structural permits are issued. There are two main conditions for approval of an on-site sewage system: 1) percolation tests must be performed in accordance with County procedures onsite wastewater treatment systems; and 2) the system must be designed in accordance with County standards.

Four copies of the engineer's soil percolation reports must be submitted to the Plumbing Plan Check Section at the Orange County Public Works Department. All reports must include a log of all soil borings and percolation tests as well as plans showing a designated system. Reports and plans submitted to obtain Building Permits must include (Orange County, 2014):

- Depth to groundwater
- Depth to any impervious layers
- Acceptable result of six percolation tests distributed throughout an area set aside for trench leach fields and/or at least one passing percolation for seepage pits for the proposed dwelling
- Distance between trenches or seepage pits
- Location of property lines
- Drainage courses
- Soils characteristics
- Trench width or pit diameter
- Pit depth or depth of gravel below pipe
- Topographic lines, if steep slopes exist
- Footprint of house
- Outline of septic tank and distribution box
- The plan must reflect all conditions after precise grading (Orange County, 2010).

In order to test the feasibility of percolation at the project site, a preliminary subsurface investigation was performed to determine the percolation characteristics of the soil and bedrock at the site. In March 2013, 34 test pit trenches with a rubber tired backhoe were excavated. Percolation testing was conducted in seventeen of these trenches. In November 2013, an additional subsurface investigation was conducted consisting of eight backhoe trenches and 34 additional test pits for percolation testing (Terrestrial, 2014a). Additional detailed information is provided in the Geotechnical Assessment, included as Appendix D1 of this EIR. In addition, the Orange County On-Site Sewage Absorption System Guidelines require the project operator to perform soil percolation tests at each specific proposed onsite wastewater treatment system location prior to permit approval, to ensure appropriate soil suitability.

Orange County Grading and Excavation Code and Grading Manual

The Orange County Grading and Excavation Code and County Grading Manual provide information pertaining to grading permit requirements (application, clearances, soils and engineering report content, issuance and expiration); fees; cuts; fills; setbacks; drainage and terracing; erosion control and inspection.

3.6.2 Thresholds of Significance

The *CEQA Guidelines* Appendix G provides guidance for assessing the significance of potential environmental impacts. Relative to geology and soils, a project could have a significant effect on the environment if it would:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the state Geologist for the area or based on other substantial evidence of a known fault;
  - Strong seismic ground shaking,
  - Seismic-related ground failure, including liquefaction, or
  - Landslides;
- Result in substantial soil erosion or the loss of topsoil;
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse;
- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property; or
- Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal system where sewers are not available for the disposal of waste water.

It was determined in the Notice of Preparations/Initial Studies (Appendices A1 and A2) that implementation of the proposed project would have no impact related to the exposure of people or structures to the rupture of a known earthquake fault; expansive soils; and liquefaction. No public comments were received during the public scoping periods for the Notice of Preparations/Initial Studies related to these thresholds. Therefore, no further analysis of those significance criterion is included in the EIR.

However, a comment related to the potential for soil erosion to occur during road related work was received. Potential impacts related to soil erosion during construction is described below.

3.6.3 Methodology

The significance determination for the geology and soils analysis is based on a review of existing literature as well as the Geotechnical Assessments prepared for the proposed project (Terrestrial, 2014a), an Onsite Wastewater Treatment System Memorandum (PACE, 2014), Draft Geotechnical Assessment prepared in 2008 (PSE, 2008), and WQMPs prepared for Phase 1 (south parcel) (Hunsaker, 2014a) and for Phase 2 (north parcel) (Hunsaker, 2014b). These assessments presented findings, conclusions, and recommendations concerning development of the project based on the engineering analysis of geotechnical properties of the subsurface conditions, evaluation of geotechnical properties of soils, and a summary of findings, conclusions, and recommendations. The sections that follows discusses the identified impacts and the measures that would be incorporated to mitigate potentially significant impacts.

3.6.4 Project Impacts

Impact 3.6-1: Would the project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking?

Less than Significant Impact with Mitigation Incorporated. The project site is located in the highly seismically-active region of Southern California, and is likely to be subjected to significant ground shaking during the design life of the project. Because ground shaking could result in significant damage to buildings and associated infrastructure, the County requires that all construction meet the latest standards of the CBC code requirements, as included in the Orange County Codified Ordinances Article 2, Buildings and Structures. In addition, the project specific geotechnical assessment that are completed and are required by the County's Codified Ordinances would determine final design standards for the walls, foundations, foundation slabs, and surrounding related improvements (utilities, roadways, parking lots and sidewalks). Compliance with the existing construction and building safety design standards that are verified by the County's Building and Safety Department during the permitting process, would reduce potential impacts associated with ground shaking at the project site to less than significant levels.

Prior to the issuance of a grading and/or building permits, the project operator would be required to submit final building plans and final grading plans to the County Building and Safety Department to ensure compliance with the County and state building regulations. The project operator would also be required to provide a Final Geotechnical Assessment with its submittal for a grading permit. Compliance with all geotechnical and soil requirements and recommendations provided in the Final Geotechnical Assessment, as required by Mitigation Measure MM 3.6-1, would reduce potential impacts related to seismic ground shaking to a less than significant level.

Mitigation Measure

MM 3.6-1 Prior to the issuance of a grading permit, the applicant shall have a qualified civil engineer prepare final grading plans and a Final Geotechnical Assessment in conformance with the California Building Code, County Grading and Excavation Code, that shall be approved by the County's Building and Safety Department.

Impact 3.6-2: Would the project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving landslides?

Less than Significant Impact with Mitigation Incorporated. Although the project is not mapped as being within a landslide zone, and no landslides are known to exist within the project site (DOC, 2006), landslides could occur on the project site because it contains ridges, ravines, and gullies that have moderate to high topographic relief, rocky terrain, and steep slopes. However, these highly topographic areas are proposed for undeveloped open space, and the proposed development areas do not contain any significant slopes. The most inclined slopes in the development area are 1.5:1 (Terrestrial, 2014a). In addition, the geotechnical reports prepared for the project (Terrestrial, 2014a; PSE, 2008) state that the bedrock underlying the development areas are capable of supporting 2:1 or flatter cut slopes, which are compliant with the requirements of the County's Codified Ordinances.

The residential sites in both phases have been clustered in areas where the existing topography is suitable for development and that limited grading would be required. Additionally, Project Design Feature PDF-10 would reduce the potential for landslides by developing flat residential building pads while maintaining a similar topography on-site, geologic stability would be maintained. Furthermore, as required by Mitigation Measure 3.6-1, grading plans and a Final Geotechnical Assessment are required prior to approval of a grading permit; thus, overall, impacts related to landslides would be less than significant.

Mitigation Measure

MM 3.6-1 *(Provided previously under Impact 3.6-1)*

Impact 3.6-3: Would the project result in substantial soil erosion or the loss of topsoil?

Construction

Less than Significant Impact with Mitigation Incorporated. As described in Section 2.0, *Project Description*, Phase 1 (south parcel) would require 313,800 cubic yards of cut and fill and Phase 2 (north parcel) would require 221,700 cubic yards of cut and fill. Total excavation over both phases is estimated at 535,500 cubic yards, with 10,000 cubic yards to be excavated on a maximum day. These grading and excavation activities have the potential to result in top soil loss and soil erosion by exposing bare soil to wind and rain. In addition, construction of the project would require clearing of existing vegetation, which would loosen soil structure and expose bare soil making it more easily eroded by wind and rain, especially on slopes. All excavated soils would be balanced on-site; thus, no import or export of soils would be necessary.

To eliminate the potential of construction related erosion, the project is required to comply with the National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges of Storm Water Runoff Associated with Construction Activity (Construction General Permit) as included as Mitigation Measure MM 3.9-1 in Section 3.9, *Hydrology and Water Quality*. In compliance with the Construction General Permit, a Storm Water Pollution Prevention Plan (SWPPP) would be prepared and implemented, which would include BMPs that would minimize

loss of top soil and soil erosion during construction, preventing soil from washing into storm drains and adjacent natural habitats. Refer to Section 3.9, *Hydrology and Water Quality* and Mitigation Measure MM 3.9-1.

Operation

Operation of the proposed project also has the potential to result in soil erosion through hydromodification, which is defined as any activity that increases the velocity and volume (flow rate), and often the timing, of runoff (SWRCB, 2009). The project would develop impermeable areas and structures on the project that that would alter existing drainage patterns. However, the project includes several Project Design Features that are provided to minimize runoff and erosion potential:

- Landscape plan that has been designed, in part, to minimize surface water runoff (Project Design Feature PDF-4);
- Adhering to hydromodification requirements established by the Municipal Separate Storm Sewer System permit (Project Design Features PDF-13 and PDF-14);
- Providing Low Impact Development techniques and BMPs to minimize the impervious footprint of the project, promote infiltration, and slow down surface flows (Project Design Feature PDF-15);
- Hydrology technical analysis and implementation of a WQMP to ensure that existing runoff velocities and peak discharges would not be exceeded with implementation of the project (Project Design Features PDF-16 and PDF-17); and
- Minimization of disturbances to natural drainages (Project Design Feature PDF-14).

To address runoff from the developed portions of the project site the WQMPs includes vegetated swales, vegetated culverts and gutters installed within both phases to convey storm water to infiltration basins, catch basins or detention/drywell systems that would capture and retain the difference in runoff flow rates between the site's existing and proposed conditions (Hunsaker, 2014a; 2014b). See Section 3.9, *Hydrology and Water Quality* for a more detailed explanation of water quality, stormwater control, and the WQMP. Overall, with implementation of the required SWPPP, WQMP, and their associated BMPs would reduce the potential for substantial soil erosion or the loss of topsoil to a less than significant level.

Mitigation Measure

MM 3.9-1 *(Provided in Section 3.9, Hydrology and Water Quality, under Impact 3.9-1)*

Impact 3.6-4: Would the project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site lateral spreading or collapse?

Less than Significant Impact with Mitigation Incorporated. Lateral spreading is a type of landslide that occurs on gentle slopes. The project site is underlain by highly weathered granite and alluvial deposits that are likely to result in lateral spreading or collapse (Terrestrial, 2014a).

However, the same regulations that apply to seismic ground shaking and landslides that are described above, also apply to lateral spreading and collapsible soils. Compliance with the CBC and the County's requirements in the Codified Ordinances would ensure that structure foundations are designed and located appropriately to reduce the potential for lateral spreading. Furthermore, building and grading plans would be developed in accordance with all County building and grading requirements and submitted for County approval prior to issuance of a building permit and/or a grading permit as required by Mitigation Measure MM 3.6-1. With implementation of CBC and the requirements of the County's Codified Ordinances that would be verified by the County Building and Safety Department, and implementation of Mitigation Measure MM 3.6-1, impacts related to unstable soils would be less than significant.

Mitigation Measure

MM 3.6-1 *(Provided previously under Impact 3.6-1)*

Impact 3.6-5: Would the project site have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal system where sewers are not available for the disposal of wastewater?

Less than Significant Impact with Mitigation Incorporated. The project proposes the installation of onsite wastewater treatment systems on each residential lot that would utilize landscaping areas to dispose of treated wastewater. The onsite wastewater treatment systems installed on each lot would consist of three components: (1) a 1,500-gallon septic tank; (2) three modular peat fiber biofilters; and (3) a 300-gallon water reuse pump station. After receiving primary treatment from the septic tank and secondary treatment from the biofiltration system, effluent would be pumped by the reuse water pump station to subsurface dispersal irrigation areas to irrigate portions of Fuel Modification Zone B area. The irrigation landscaping areas have been designed to provide the irrigation needs of the plants, while using all the effluent that would be generated by the project. Irrigation would be supplemented when necessary by an irrigation system that is linked to weather-monitoring controllers.

The septic tank, biofiltration system, and subsurface drip irrigation fields would be located in soil with suitable characteristics, and percolation testing at each septic tank location is required during project construction pursuant to the Orange County On-Site Sewage Absorption System Guidelines to ensure the suitability for the proposed onsite wastewater treatment systems. Mitigation Measure MM 3.6-2, requires the project to be designed in accordance with the Orange County On-site Sewage Absorption System Guidelines and SWRCB On-Site Wastewater Treatment System Policy (Policy), which details siting, design and construction standards for system installation, expected performance, and maintenance requirements. The wastewater systems would be designed in accordance with Tier 2 requirements of the Policy, which means that siting and approval of the systems would be overseen by the Orange County Department of Public Works. In addition, the Orange County On-Site Sewage Absorption System Guidelines require the project operator to perform soil percolation tests at each specific proposed onsite wastewater treatment system location prior to permit approval to ensure appropriate soil suitability.

Through compliance with the SWRCB Water Quality Control Policy for Siting, Design, Operation, and Maintenance of On-site Wastewater Treatment Systems, RWQCB adopted Guidelines for New Community and Individual Sewerage Facilities, and Orange County Sewage Absorption System Guidelines and Wastewater Treatment and Disposal System Regulations (Mitigation Measure MM 3.6-2), which would be required to be implemented prior to receipt of operating permits, onsite wastewater treatment systems would be properly installed and maintained. This requires components of the onsite wastewater treatment system to be setback a minimum of five feet from structures, property lines, and the top of descending slopes to ensure appropriate function; and appropriate setbacks from streams and other features per the County Regulations for Wastewater Treatment and Disposal Systems. In addition, per Mitigation Measure MM 3.6-3, the HOA would be required to educate residents about the proper use and maintenance of septic systems, and would provide a list of septic service companies approved by the HOA to prevent damage and failure. The septic tanks would also be emptied of sludge regularly and transported to disposal by a County-registered and HOA approved waste hauler. Overall, compliance with existing regulations as implemented in Mitigation Measure MM 3.6-2 would reduce potential impacts related to soils and the use of septic tanks to a less than significant level.

Mitigation Measures

MM 3.6-2 The project operator shall design and operate the onsite wastewater treatment systems in accordance with the SWRCB adopted Resolution No. 2012-0032—the Water Quality Control Policy for Siting, Design, Operation, and Maintenance of On-site Wastewater Treatment Systems (specifically Tier 2 of this Policy requiring Orange County Department of Public Works to oversee the design and approval of the systems); the Orange County On-site Sewage Absorption System Guidelines; and the County Regulations for Wastewater Treatment and Disposal Systems, which include minimum horizontal setback requirements from geologic and water features. All septic tanks, biofilters and reuse water pump station/emergency storage tanks shall be setback a minimum of five feet from structures, property lines and the top of descending slopes. The project operator shall obtain approval from the County for issuance of building permits for and operation of onsite wastewater treatment systems.

MM 3.6-3 The Home Owners Association (HOA) shall provide detailed information via flyers and meetings to project residents regarding the proper use and maintenance necessary to keep onsite wastewater treatment systems functioning properly. In addition, information regarding County-registered HOA approved liquid waste haulers shall be provided to project site residents.

3.6.5 Cumulative Impacts

The geographic scope for cumulative impact analysis related to geology and soils are generally contained to the project site. The closest cumulative project is located approximately 2.4 miles from the project site in the City of Lake Elsinore. Thus, cumulative projects are too distant for

soils related activities on the project site to be effected. In addition, and as described above, the project site is in a seismically active area, which is bordered by major fault systems including the Elsinore Fault and San Andreas Fault. All areas of Orange County are considered seismically active; therefore, all other projects within the County are subject to similar seismic hazards. This project and other planned projects in the vicinity would be subject to state building codes to increase stability during seismic events. Further, the project and other planned projects are development projects, would not involve any subsurface activities that could increase the seismicity of surrounding areas. As a result, cumulative impacts related to seismicity would be less than significant.

In addition, most projects are required to implement site-specific SWPPPs and WQMPs, which would reduce soil erosion potential on each project site during construction and operation, which would reduce the potential for projects, such as the proposed project, to combine and result in cumulatively considerable impacts.

Furthermore, the onsite wastewater treatment systems proposed by the project are subject to state and County septic requirements and would be completely contained within the project site; thus, would not cumulatively affect other projects. Overall, project impacts related to geology and soils would be less than cumulatively considerable, and less than significant.