12.0 SOILS, GEOLOGY, AND SEISMICITY

12.1 ENVIRONMENTAL SETTING

This section presents an overview of the geologic, soils, and seismic setting of the Riolo Vineyard specific plan area (Plan Area) and offsite locations that would be affected by the installation of infrastructure (together called the study area). The following sections present a brief overview of the regional setting as well as a more detailed overview of the onsite characteristics listed above. The site conditions for the offsite infrastructure corridors are generally similar to the conditions found within the footprint of the Plan Area.

12.1.1 Topography

Regional Setting

The study area lies within the Great Valley geomorphic province characterized by low-lying ridges and valleys separated by streams. The Great Valley geomorphic province is made up of both the Sacramento and San Joaquin valleys (Hackel, 1966). Within the vicinity of the Plan Area, slopes are gentle and dip generally to the north and northwest towards Dry Creek, which is located to the north of the Plan Area. A smaller intermittent stream, called the Southern Tributary in this document, bisects the central to southwestern portion of the Plan Area and discharges onto the flood plain of Dry Creek or is carried in a series of onsite ditches during periods of low flow.

Existing Site Conditions

The Plan Area consists of generally level floodplain topography in the northern portion of the site, adjacent to Dry Creek, and a series of low rises and intervening valleys in the southern portion of the site. The Plan Area generally slopes and drains towards Dry Creek, with site elevations ranging from 112 feet above mean sea level (msl) in the southeastern portion, the highest elevation within the Plan Area, to approximately 79 feet, representing the lowest elevation at the northwestern boundary of the Plan Area.

12.1.2 Geology

Regional Setting

The study area is located in the eastern portion of the Sacramento Valley, which extends from Redding in the north to the Sacramento-San Joaquin Delta region in the south. At the latitude of the study area, the valley is approximately 40 miles wide. The Sacramento Valley is formed by the Great Valley geocline, which is a large, elongate, northwest-trending asymmetric structural trough. It is bordered by the Coast Ranges to the west, the Klamath mountains and Cascade mountains to the north, and the Sierra Nevada mountains to the east. The trough continues southward from the Sacramento-San Joaquin Delta region, where it is called the San Joaquin Valley. Both the Sacramento and San Joaquin valleys comprise the Great Valley geomorphic province of California (Hackel, 1966).

The structural trough has a long, stable eastern shelf which is supported by metamorphic and igneous rocks of the west-dipping Sierran slope. The basement rocks of the western edge of the structural trough are composed of Jurassic metamorphic, ultramafic, and igneous rocks of the Franciscan formation (Hackel, 1966). The northwest-trending axis of the geocline is closer to the west side of the valley; therefore, the regional dip of the formations on the east side is less than that of the formations on the west side. This structural trough began receiving sediments in the Late Jurassic epoch (208 to 144 million years ago [Ma]). It has been filled with sediments derived from both marine and continental sources. The thickness of the valley fill ranges from thin veneers along the valley edges to greater than 40,000 feet in the central portion of the valley. These sedimentary deposits range in age from Jurassic (190 to 135 Ma) to Holocene (0 to 0.01 Ma), with the older deposits (Jurassic to Eocene [57.8 to 36.6 Ma]) comprising the marine sequence and the younger deposits (Eocene to Holocene age) comprising the continental sequence. The marine deposits were formed in offshore shallow ocean shelf and basin environments. Continental sediments were derived from mountain ranges surrounding the valley and were deposited in lacustrine, fluvial, and alluvial environments (Norris and Webb, 1990).

The major geologic units surrounding and within the Plan Area are listed from youngest to oldest as follows:

- Quaternary Modesto Formation, lower member (Pleistocene, 0.01-1.5 Ma);
- Tertiary-Quaternary Turlock Lake Formation (Plio-Pleistocene, 0.01-5.5 Ma);

Existing Site Conditions

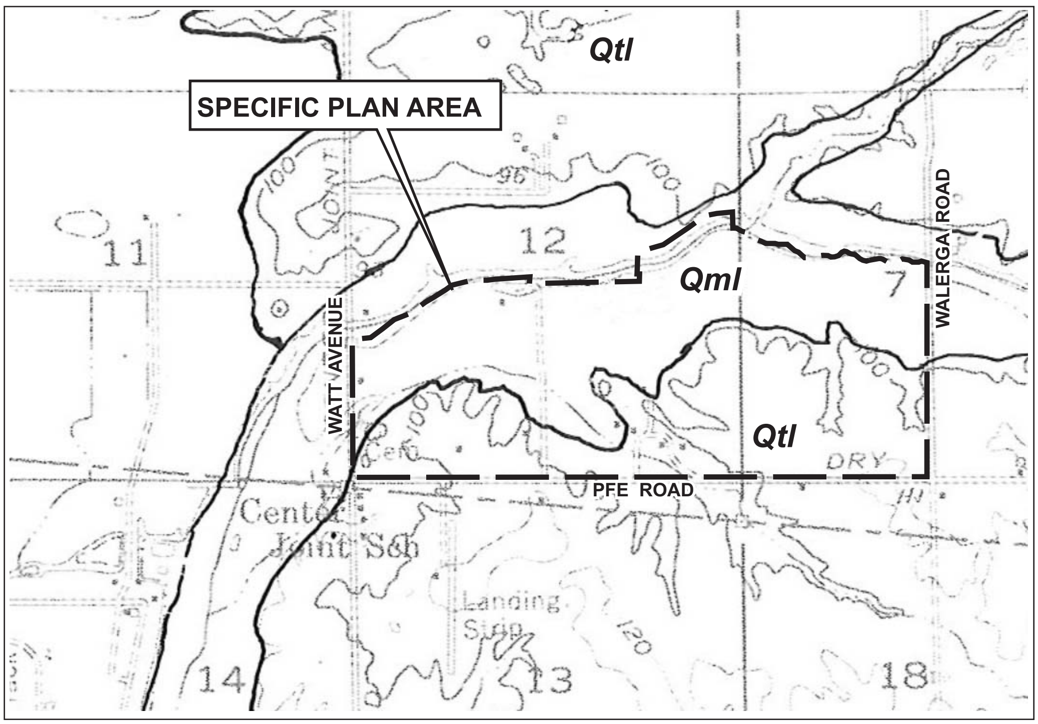
Both the onsite and offsite components of the proposed project as planned are likely to be influenced by the geologic deposits occurring at or near the surface. For this reason, only those deposits that occur at or near the surface within the Plan Area are described in this section. One site-specific study has been completed to evaluate the vicinity of the study area (Wallace-Kuhl & Associates Inc., 2003). This study addresses geologically important aspects of the study area and was reviewed during the preparation of this Draft EIR.

Two distinct geologic units exist at the site. The unconsolidated, slightly weathered gravel, sand, silt and clay of the Modesto Formation (lower member) is the younger of these two units. The partially consolidated sand, silt, and gravel of the Turlock Lake Formation is the older of these units. The lower member of the Modesto Formation and the Turlock Lake Formation occupy approximately the northern and southern half of the Plan Area, respectively. Approximate boundaries of these units are shown on Figure 12-1.

The Turlock Lake Formation represents eroded alluvial fans that were derived primarily from granitic and metamorphic rocks of the Sierra Nevada located to the east of the Plan Area. Alluvial fans typically form as a result of the accumulation of river-derived sediment and display, in areal view, elongated lobate fan features extending outwards from the mouths of canyons. The Turlock Lake Formation represents materials deposited approximately 600,000 to 700,000 years ago that were carried within stream channels emanating from elevated terrains and deposited on more level surfaces downgradient of steeper terrain. The majority of the deposits, which make up the alluvial fans, were likely carried downstream and deposited during seasonal high precipitation events. The Turlock Lake Formation stands topographically above younger fans and terraces and can commonly display up to 98 feet of erosional relief (Helley and Harwood, 1985).

The Turlock Lake Formation consists of deeply weathered and highly dissected arkosic (feldspar-rich) gravel, sand, and silts, with minor resistant metamorphic rock fragments as well as quartz pebbles (Helley and Harwood, 1985).

The lower member of the Modesto Formation consists of alluvial terraces, alluvial fans, and abandoned channel ridges and forms the lowest-lying deposits above Holocene deposits in streams, and in valleys (Helley and Harwood, 1985). Soils that form on top of the lower member have a distinct B-horizon, which is red in color. This unit is composed of tan and light gray gravely sand, silt, and clay (Helley and Harwood, 1985). These sands, silts, and clays that comprise the Modesto Formation are currently being deposited by Dry Creek, which is located along the northern boundary of the Plan Area.



LEGEND

Qml Modesto Formation; Lower member - unconsolidated, slightly weathered gravel, sand, silt, and clay

Qtl Turlock Lake Formation (Pleistocene)

N

0 8 16

Scale in Miles

Source:
Helley and Harwood, 1985;
Geologic Map of the Late Cenozoic Deposits of the Sacramento Valley and Northern Sierran Foothills, California;
U.S.G.S. Map 1790

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FIGURE 12-1

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These two formations also exist within the offsite components of the Plan Area. PFE Road, the southern boundary of the Plan Area, is situated entirely in the Turlock Lake Formation, including the offsite extension of the proposed water pipeline. Walerga Road, which is located along the eastern boundary of the site, is situated in both the Modesto and Turlock Lake Formations, whereas Watt Avenue, the western site boundary, is underlain predominantly by the Modesto Formation (Figure 12-1).

12.1.3 Mineral Resources

Information regarding the potential for mineral resources to occur within the study area was obtained from the California Department of Conservation, Division of Mines and Geology (CDMG), Mineral Land Classification of Placer County (OFR 95-10) (CDMG, 1995). In accordance with California's Surface Mining and Reclamation Act of 1975, this document classifies the land in Placer County according to "the presence, absence, or likely occurrence of significant mineral deposits in areas of the county subject to either urban expansion or other irreversible land uses incompatible with mining."

Regional Setting

OFR 95-10 classifies the land in Placer County as (Mineral Resource Zone) 1 (MRZ-1), Mineral Resource Zone 2a (MRZ-2a), Mineral Resource Zone 2b (MRZ-2b), Mineral Resource Zone 3a (MRZ-3a), Mineral Resource Zone 3b (MRZ-3b), and Mineral Resource Zone 4 (MRZ-4). Mineral Resource Zones are defined as follows:

- MRZ-1 – Areas where available geologic information indicates there is little likelihood for the presence of significant mineral resources.
- MRZ-2a – Areas underlain by mineral deposits where geologic data indicate that significant measured or indicated resources are present.
- MRZ-2b – Areas underlain by mineral deposits where geologic information indicated that significant inferred resources are present.
- MRZ-3a – Areas containing known mineral occurrences of undetermined mineral resource significance.
- MRZ-3b – Areas containing inferred mineral resources of undetermined mineral resource significance.
- MRZ-4 – Areas of no known mineral occurrences where geologic information does not rule out either the presence or absence of significant mineral resources.

Existing Site Conditions

The study area is classified as MRZ-4, or mineral areas with no known mineral occurrences. OFR 95-10 identifies one sand and gravel pit (Collet Pit) as MRZ-2A, indicating that significant resources are expected to be present based on geologic data. The Collet Pit was located approximately 6 miles to the northeast of the Plan Area but has ceased operation and is no longer used for aggregate production. No other valuable deposits of mineral commodities are known to exist within 3 miles of the site.

12.1.4 Soils

Soil type is one criterion used to evaluate potential impacts of development. Soils are typically considered for their resource value in agricultural production or for their potential development characteristics or constraints. For proposed development, some soils are susceptible to erosion and/or expansive behavior, while others are more suitable for compaction for construction.

Regional Setting

The Soil Survey of Placer County, Western Part (USDA, 1980) shows the following general soil types occurring in the region of the study area.

- Soils on terraces and alluvial bottoms, in the low lying areas west of Roseville, consisting of:
  - Fiddyment-Cometa-Kaseberg and Cometa-Ramona: – undulating to rolling, very deep to shallow, well-drained soils; on terraces.
  - Xerofluvents-Kilaga-Ramona: – nearly level, very deep, well drained to somewhat poorly drained; on alluvial bottoms.
- Soils on foothills, typically east of Roseville, consisting of.
  - Exchequer-Inks: – undulating to steep, well drained shallow soils over volcanic rock;
  - Andregg-Caperton-Sierra: – undulating to steep, well-drained shallow to deep soils over granite rock.

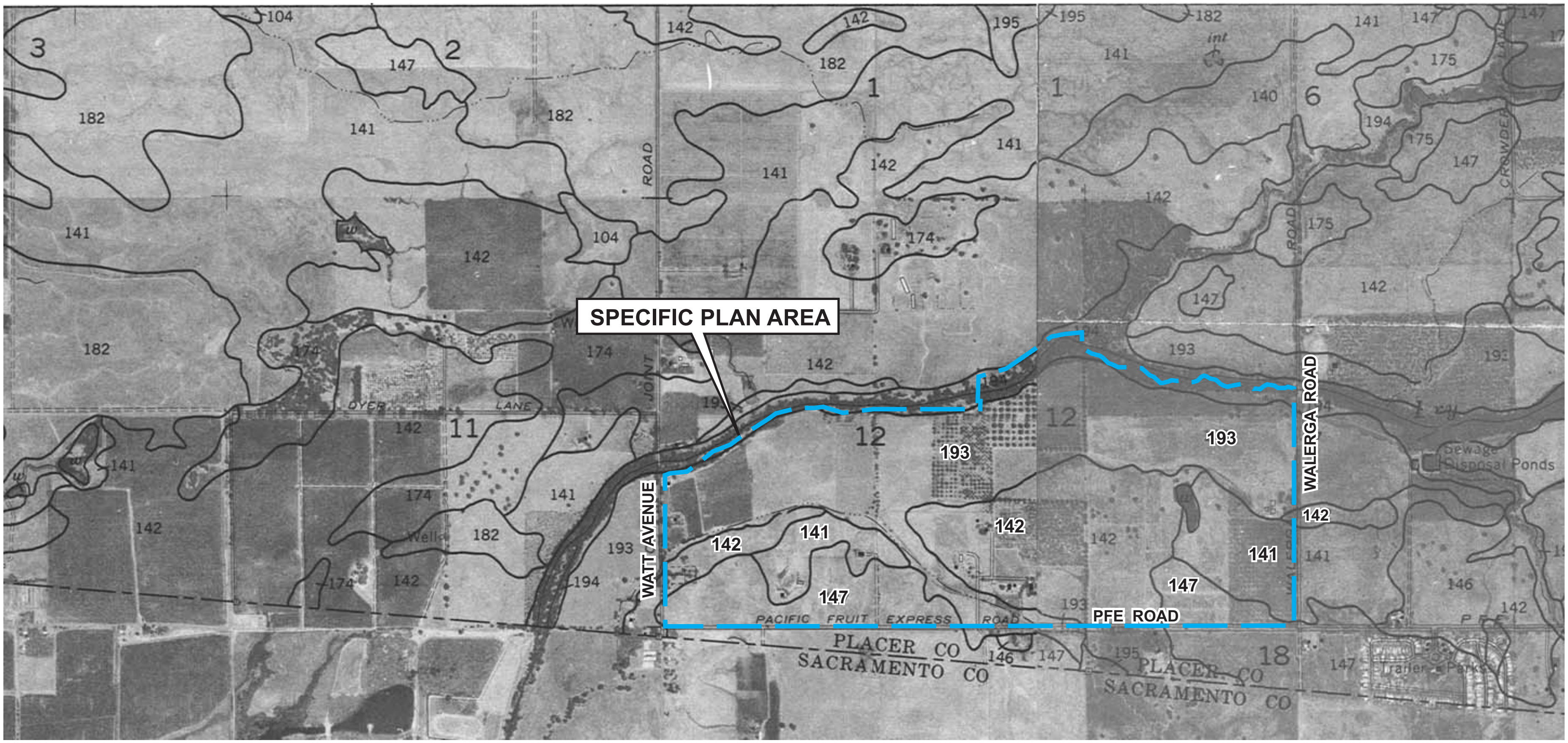
Existing Site Conditions

The Soil Survey of Placer County California, Western Part (USDA, 1980) shows five soil types occurring within the boundaries of the study area. The primary soils associated with the site are described below. The numeral preceding the soil name refers to the soil series indicated on 1-inch: 2,000-foot scale air-photo base maps (Figure 12-2).

It should be noted that the basic soil reference (USDA, 1980) is written from an agricultural, not engineering, standpoint. This reference refers to "slow" permeability, whereas permeability is normally referred to as low, moderate, or high from an engineering perspective. Likewise, surface runoff is defined as slow, moderate, or high but not necessarily consistent with the permeability characteristics, expressed in terms of the Unified Soil Classification System (USCS), and engineering nomenclature. Accordingly, this document refers to the permeability and surface runoff characteristics of soil units based on engineering experience as well as on the USCS description.

141 – Cometa-Fiddyment complex, 1 to 5 percent slopes: These undulating soils are on low terraces and occur at elevations of 75 to 200 feet. The unit is approximately 35 percent Cometa soil and 35 percent Fiddyment soil, with the remaining percentage including soils of the San Joaquin sandy loam, the Kaseberg loam, and the Ramona sandy loam. The Cometa soil can be found on younger land surfaces and the Fiddyment on older surface features. This soil complex underlies approximately ⅛ of the Plan Area in a portion of the southwestern area and a portion of the southeastern area, including approximately the southern half of Walerga Road.

The Cometa soil is composed of a deep, well-drained clay-pan soil that formed on alluvium, primarily from granitic sources. Surface soils are typically brown sandy loam and are approximately 18 inches in



LEGEND

141 Cometa-Fiddyment complex, 1 to 5% slopes

142 Cometa-Ramona sandy loam, 1 to 5% slopes

146 Fiddyment loam, 1 to 8% slopes

147 Fiddyment-Kaseberg loam, 2 to 9% slopes

193 Xerofluvents, occasionally flooded

Source:
Soil Survey of Placer County, California, Western Part (Sheet No. 16);
U.S Department of Agriculture, Soil Conservation Service, 1980

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FIGURE 12-2

1/11/08 ..vsa/hk \Riolo Vineyard\Graphics\EIR Jan 2008\F12-2_soils_jan08.cdr thickness. The subsoil is brown clay and extends to a depth of about 29 inches, where it grades into a compacted, very pale, brown sandy loam. Permeability of the Cometa soil is very low; surface runoff is moderately high; and the erosion potential is considered slight.

The Fiddyment soil is well-drained and moderately deep, overlying a hardpan. The surface layer consists of a light yellowish-brown loam and silt loam, which is about 12 inches thick. The subsoil is yellowish-brown and brown, dense clay loam. Permeability is very low; surface runoff is moderately high; and the hazard of erosion is slight.

The major construction limitations of the Cometa soil are the very low permeability of the subsoil, high shrink-swell potential, and limited ability of the soil to support a load. The Fiddyment soil has similar engineering characteristics as the Cometa soil, with the addition of a moderate depth to hardpan.

142 – Cometa-Ramona sandy loams, 1 to 5 percent slopes: This unit occurs at elevations between 75 to 200 feet and consists of approximately 50 percent Cometa soil and 30 percent Ramona soil. The Cometa-Ramona soil complex underlies about one-fourth of the Plan Area in a small portion of the southwest corner and the majority of the south-central portion within the Plan Area footprint east of the Southern Tributary. The soil complex can also be found in the central portion of Walerga Road on its eastern side and within PFE Road to the east of the Plan Area.

The Cometa series soil is typically located on the short side of slopes and bottoms and consists of surface soils made up of brown sandy loam and subsoils of brown clay.

The Cometa soil is characterized by very low permeability with slow surface runoff and a slight potential for erosion. Limitations of the Cometa soil for urban uses include a subsoil with high shrink-swell potential, very low permeability, and limited ability to support loads.

The Ramona soil is composed primarily of a sandy loam and loam surface layer, with a subsoil of reddish-yellow and yellowish-red sandy clay loam. Permeability is considered to be moderately low, with moderate surface runoff and a slight potential for erosion. Limitations of the Ramona soil include moderately low permeability of the subsoil, shrink-swell, and low bearing strength. These characteristics may be offset with engineering considerations.

146 – Fiddyment loam, 1 to 8 percent slopes: This is a moderately deep, well-drained soil found on low terraces at elevations of 75 to 135 feet. The Fiddyment loam is composed of a combination of Kaseberg loam, Cometa sand, San Joaquin sandy loam, and Alamo clay, which occurs in some drainageways and basins. Fiddyment loam is limited to areas within the PFE Road, east of the Plan Area.

The surface layers of the Fiddyment soil are light yellowish-brown loam and silt loam and are about 12 inches thick. The subsoil is brown and yellowish-brown, dense clay loam.

Permeability of the Fiddyment soil is very low; surface runoff is slow to medium; and the potential for erosion is considered to be slight to moderate. Following intense storm events, the soil is saturated for short periods of time.

The major limitations of the Fiddyment loam include low permeability of the subsoil, the moderate depth to the hardpan, and the limited ability of the soil to support a loads, which can be offset by engineering considerations.

147 – Fiddyment-Kaseberg loams, 2 to 9 percent slopes: This unit is undulating to gently rolling and overlies terraces with elevations of 75 to 135 feet. The unit consists of 50 percent Fiddyment soil and

30 percent Kaseberg soil, with the remaining percentage including Alamo clay, which can be found in areas with swales and drainageways. Fiddyment-Kaseberg soils underlie a part of the southwestern and southeastern portions of the Plan Area and constitute about one-eighth of the site acreage. These soils can also be found within PFE Road to the east of the site.

The Fiddyment soil is a well-drained soil that is moderately deep overlying a hardpan. The surface layer is composed of a light yellowish-brown loam and silt loam, which is about 12 inches thick. The subsoil is yellowish-brown and brown, dense clay loam.

The Kaseberg soil is well-drained, shallow, and overlying a hardpan. These soils typically formed in old valley fill overlying hardpan. The surface layer is light brownish-gray loam with yellowish-brown mottles and is about 8 inches thick. The subsoil consists of light gray silt loam.

The permeability of the Fiddyment-Kaseberg loam is moderate, and the potential for erosion is considered slight to moderate. These soils are saturated for a short time after large storm events.

Engineering limitations of this soil type include very low permeability of the subsoil, moderate depth to the hardpan, and limited ability of the soil to support a load.

193 – Xerofluvents, occasionally flooded: These soils are located adjacent to stream channels and consist primarily of stratified sandy loam, loam, silt loam, and clay loam. They occupy about one-half of the Plan Area (Figure 12-2) to the south of Dry Creek and along the Southern Tributary. Xerofluvents are variable in color and increase in gravel content with depth.

Xerofluvents have moderate to moderately low permeability and are characterized by low runoff potential. The risk of erosion for these soils is slight, and they are considered by the USDA as unsuitable for urban use due to flooding potential.

12.1.5 Seismicity

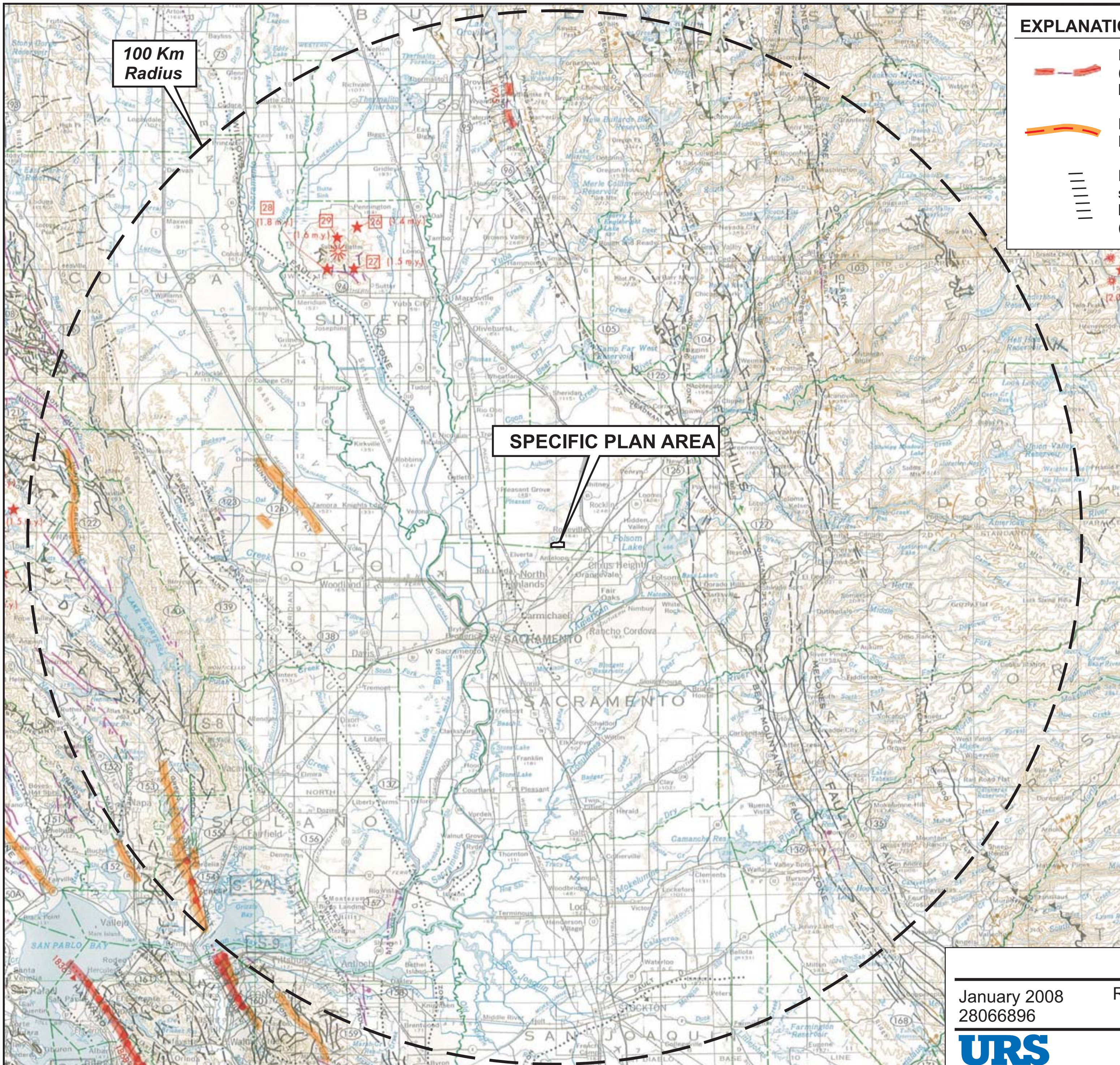
Regional Setting

The study area is located along the eastern edge of the Central Valley of California in a relatively seismically quiescent area between two areas of documented tectonic activity. The Coast Ranges to the west contain many active faults that are associated with the northwest trending San Andreas Fault system (Jennings, 1994). The Coast Ranges-Sierran Block boundary zone follows the physiographic boundary between the Coast Ranges and Great Valley.

The Foothills Fault System, located generally east of the site, forms the boundary between the Sierra Nevada foothills and the Great Valley. The Foothills Fault Zone is characterized by a zone of deformation where there are active faults such as the Cleveland Hills Fault, and older faults (pre-Holocene in age, or greater than 11,000 years before present), such as the Bear Mountain and Melones Fault zones (Figure 12-3).

Other faults, including the Willows Fault to the west of the site, are considered to be inactive, with displacements occurring greater than 2 million years before the present (Jennings, 1994; Harwood and Helley, 1987).

The faults within about 62 miles (100 kilometers) of the study area that are currently zoned as active by the CDMG (now called the California Geological Survey [CGS]) under the Alquist-Priolo Special Studies Zone Act (Hart, 1992) are listed in Table 12-1. Table 12-1 also includes the distance to the fault (in



EXPLANATION

- Fault along which historic (last 200 years) displacement has occurred
- Fault with displacement during Holocene time (last 11,000 years)
- Fault segment associated with a significant linear trend of accurately located earthquake epicenters (magnitude 0.2 or greater)

Source:
Fault Activity Map of California and Adjacent Areas; California Department of Conservation, Division of Mines and Geology, 1994

0 12 24
Approximate Scale in Miles

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FIGURE 12-3

1/11/08 ..vsa/hk \Riolo Vineyard\Graphics\EIR Jan 2008\F12-3_faults_jan08.cdr kilometers) from the site and the fault's MCE (Maximum Credible Earthquake magnitude) based on the Modified Mercalli Scale (MMS). An active fault is one that has had surface displacement within Holocene time (during the last 11,000 years). A list of some of the faults zoned as inactive by the CDMG (those showing Late Quaternary displacement) within about 60 miles of the study area are listed in Table 12-2. These faults are primarily associated with the physiographic boundaries of the Great Valley to the east and west of the site.

The CDMG has classified the south Placer area as a low-severity earthquake zone (City of Roseville, 1992). The maximum expected intensity in a zone of this classification would range between VI and VII on the MMS. Events of this intensity level would include cracking in weak masonry and chimneys, shaking or rustling of trees and bushes, moving of furniture, and breaking of glassware.

Table 12-1
Active Faults Zoned by CDMG Within 60 Miles of the Plan Area

Fault Name	Distance and Direction to Site (kilometers)	Maximum Credible Earthquake Magnitude (MCE)
Cleveland Hill Fault	70 (north-northwest)	6.5
Green Valley Fault	90 (southwest)	6.3-6.9
Dunnigan Hills Fault	42 (west)	6.5
Hunting Creek Fault	90 (west)	6.7

Source: Hart, 1992; Jennings, 1994; WGCEP, 1999

Table 12-2
Selected Inactive Faults Within 60 Miles of the Plan Area

Fault Name	Distance and Direction to Site (kilometers)
Spenceville Fault	32 (northeast)
Swain Ravine Fault	30 (north-northeast)
Bear Mountain Fault Zone	40 (east)
DeWitt Fault	30 (west)
Melones Fault Zone	88 (northeast)
Vaca-Kirby Hills Faults	60 (southwest)
Willows Fault	10 (west)

Source: Jennings, 1994
Note: Not all faults identified on Figure 12-3 are listed, only representative structures.

Existing Site Conditions

There are no known active faults zoned beneath or near the Plan Area, and no active fault trace is known to pass beneath the Plan Area. The nearest active zoned fault to the study area is the Cleveland Hills Fault, approximately 70 kilometers north-northwest and the source of a magnitude 5.7 earthquake in 1975.

The MCE postulated for each of the known active faults within approximately 100 kilometers of the study area is also listed in Table 12-1. MCE magnitudes were empirically derived for each fault based on a combination of parameters known for each fault, including the potential fault rupture length and regional seismic data (Slemmons, 1982).

It is not anticipated that any provisions will be required to comply with the Alquist-Priolo Special Studies Zones Act of 1972 because the Plan Area is not located in an area that is classified as a “Special Studies Zone” under this Act.

12.1.6 Landslides

Landslides occur as a result of the downward movement of masses of loosened soil and/or rock down a hillside or moderately steep slope. Fundamentally, landslides are the result of a hillslope material’s loss of strength or cohesion due to an increase in pore water pressures and gravity. The high variability of landslides are due in part to many factors, including but not limited to steepness of slope, type of material, water content of slope soils, amount of vegetation, areas subject or prone to erosion due to manmade activities, and earthquake or strong ground motions. Landslide categories include fast-moving debris flows to slow-moving soil creep.

The annual precipitation in Placer County is 19 to 42 inches per year (Placer County, 1990). Based on the presence of relatively level topography across the Plan Area and relatively low annual precipitation, the overall risk for landslides is low. However, the southern portion of the Plan Area includes areas adjacent to moderately sloping terrain, where the risk of landslides may be considered moderate. Areas adjacent to Dry Creek at the northern Plan Area boundary may have a greater risk for landsliding, especially along steeper riverbanks.

12.1.7 Liquefaction

Soil liquefaction is a process by which the shear strength of saturated granular soils is reduced due to an increase in pore pressure during human-induced events or seismic shaking. Requisite conditions for liquefaction to occur include saturated granular soils with a loose-packed structure capable of progressive rearrangement of grains during repeated cycles of seismic loading. Due to the anticipated depth to groundwater (on the order of 100 feet) and age of geologic materials underlying the Plan Area, the liquefaction potential is low.

12.1.8 Seiches and Tsunamis

A seiche refers to the movement of a body of water such as a bay, lake, river, or reservoir due to periodic oscillation. Seiches commonly occur as a result of intense seismic shaking or catastrophic landslides that displace large amounts of water in a short period of time. The period of oscillation varies and depends on the size of the water body. The period of a seiche can be last for minutes to several hours and depend on the magnitude of oscillations. Seiches have been recorded to cause significant damage to nearby structures including dams, shoreline facilities, and levees or embankments. Because ground shaking in the study area is considered to be low and large bodies of water are not located close to the Plan Area, the risk of damage from seiches is low.

A tsunami is a large ocean wave that develops as a result of the displacement of large amounts of water over a short period of time. Tsunamis are commonly associated with submarine faults that displace water in the ocean over long distances. The effect of a tsunami on a shoreline is closely associated with the bathymetric properties of an ocean basin. Tsunamis can also occur as a result of submarine as well as land-based landslides, which displace large volumes of water over a short period of time. Because the Plan Area is located primarily within alluvial valleys and is adjacent to granitic hills and mountains with considerable distance to a large water body, the potential for tsunami is nonexistent.

12.1.9 Subsidence

Subsidence is the result of the sinking of a ground surface by which material is displaced vertically downward. There is little to no horizontal component to ground subsidence. Subsidence hazards occur as a result of many factors, including but not limited to groundwater or gas and oil removal, the removal or breakage of subsurface supports such as pipes, voids beneath the upper soils such as caves/sinkholes, and/or shaking as a result of earthquakes.

Subsidence, usually as a direct result of groundwater withdrawal or oil and gas withdrawal, is common in several areas of California, including parts of the Sacramento Valley. Subsidence is a greater hazard in areas where the subsurface geology includes compressible layers of silt and clay.

In the Sacramento Valley, preliminary studies suggest that much smaller levels of subsidence (0.5 to 2 feet) may have occurred, primarily due to water extraction (Sutter County, 1994).

The amount of subsidence caused by groundwater withdrawal depends on several factors, including: (1) the extent of water level decline, (2) the thickness of the water-bearing strata tapped, (3) the thickness and compressibility of silt-clay layers within the vertical sections where groundwater withdrawal is occurring, (4) the duration of maintained groundwater level decline, (5) the number and magnitude of water withdrawals in a given area, and(6) the general geology and geologic structure of the groundwater basin (Sutter County General Plan, 1994).

Subsidence can have significant damaging effects, including damage to infrastructure such as roads, bridges, and railway lines. Slight changes in grade due to subsidence can have a significant impact on these types of structures.

Due to the age and nature of Plan Area soils, subsidence would not be expected across the majority of the Plan Area.

12.1.10 Differential Compaction and Seismic Settlement

If near surface soils vary in composition both vertically and horizontally, strong shaking as a result of earthquakes can cause nonuniform compaction of soil layers, resulting in movement of soils located near the surface. Due to the age of subsurface soils, the probability of differential compaction occurring within and around the Plan Area (including offsite components) is low.

12.1.11 Lateral Spreading

Lateral spreading occurs as a form of horizontal displacement and is as a result of the loss of strength of materials located adjacent to an open or "free" face such as an open body of water, channel, or deeper excavation. The failures associated with lateral spreading usually are a result of failure along a weak plane within a soil type's inherent structure. Cracks may develop that weaken the material where blocks of soil displace laterally towards the open space. As cracks propagate through the geologic materials and/or materials associated with construction grading activities, blocks may break free and fall and/or slide towards the open face.

Dry Creek is located to the north of the Plan Area and may qualify as a spatially oriented open face where lateral spreading may occur. Based on proposed development within the Plan Area, no construction is anticipated within 1,200 feet of Dry Creek. Therefore the chance of damage to structures due to lateral spreading occurring within and adjacent to Dry Creek is low.

12.2 REGULATORY SETTING

12.2.1 Federal and State Regulations

No federal regulations apply to soil, geologic, or seismologic aspects of the proposed project.

The only state regulation applicable to the proposed project from a soils, geologic, or seismologic standpoint is the Alquist-Priolo Earthquake Fault Zone Act (California Public Resources Code, Division 2, Chapter 7.5, Sections 2621-2630), which relates to the siting of structures for human occupancy in the vicinity of faults considered active by the CGS.

12.2.2 Local Regulations

Placer County General Plan

The *Placer County General Plan* presents a wide range of goals and policies that may influence the treatment of geologic and soil resources as well as consideration of geologically related and seismic safety considerations. The scale and extent of grading operations may be affected by the County's basic land use goals as well as goals related to preserving other resources (especially visual and biological resources). For example, achieving the goal listed below may require restricting the area of disturbance when in proximity to drainageways, limiting depths of cuts and fills within the Plan Area, adjusting the grading schedule to minimize the amount of land exposure to potential wind and water erosion, and replanting graded areas. The goal listed below was judged to be applicable to the proposed project.

Visual and Scenic Resources

Policy 1.K.1 The County shall require that new development in scenic areas (e.g., river canyons, lake watersheds, scenic highway corridors, ridgelines and steep slopes) is planned and designed in a manner which employs design, construction, and maintenance techniques that:

a. Avoids locating structures along ridgelines and steep slopes;

b. Incorporates design and screening measures to minimize the visibility of structures and graded areas;

c. Maintains the character and visual quality of the area.

Policy 1.K.4 The County shall require that new development incorporates sound soil conservation practices and minimizes land alterations. Land alterations should comply with the following guidelines:

a. Limit cuts and fills;

b. Limit grading to the smallest practical area of land;

c. Limit land exposure to the shortest practical amount of time;

d. Replant graded areas to ensure establishment of plant cover before the next rainy season; and

e. Create grading contours that blend with the natural contours on site or with contours on property immediately adjacent to the area of development.

Policy 1.K.5 The County shall require that new roads, parking, and utilities be designed to minimize visual impacts. Unless limited by geological or engineering constraints, utilities should be installed underground and roadways and parking areas should be designed to fit the natural terrain.

Seismic and Geological Hazards

Goal 8.A To minimize the loss of life, injury, and property damage due to seismic and geological hazards.

Policy 8.A.1 The County shall require the preparation of a soils engineering and geologic-seismic analysis prior to permitting development in areas prone to geological or seismic hazards (i.e., ground shaking, landslides, liquefaction, critically expansive soils, avalanche).

Policy 8.A.2 The County shall require submission of a preliminary soils report, prepared by a registered civil engineer and based upon adequate test borings, for every major subdivision and for each individual lot where critically expansive soils have been identified or are expected to exist.

Policy 8.A.3 The County shall prohibit the placement of habitable structures or individual sewage disposal systems on or in critically expansive soils unless suitable mitigation measures are incorporated to prevent the potential risks of these conditions.

Appendix D of this Draft EIR provides an evaluation of the proposed project's consistency with applicable General Plan policies.

Dry Creek/West Placer Community Plan

Environmental Resources Management: Natural Resources

Policy 23 Require the application of measures which mitigate soil erosion and air and water pollution from earth-disturbing activities related to land development.

12.3 IMPACTS

12.3.1 Significance Criteria

This section identifies and discusses the environmental impacts resulting from the proposed project, and suggests mitigation measures to reduce the level of impact. A detailed discussion of mitigation measures is included in Section 12.4, Mitigation Measures.

Potential significant impacts associated with soils, geology, and seismicity have been evaluated using the following criteria:

- Substantial alteration of existing topographic features of the Plan Area;
- Potential constraints to development as a result of seismic hazards within the study area;
- Increased erosion during construction activities and following completion of the proposed project;
- Loss of availability of important mineral resources; and
- Potential constraints to development as a result of soils and geologic conditions in the area of the proposed project.

12.3.2 Project-Level Impacts

IMPACT 12-1:	Topographic alteration resulting from earth grading
SIGNIFICANCE:	Potentially Significant
MITIGATION:	Mitigation Measures 12-1a and 12-1b
Proposed:	Mitigation Measures 12-1a and 12-1b
Significance After Proposed Mitigation:	Less than Significant
Recommended:	None
RESIDUAL SIGNIFICANCE:	Less than Significant

Grading for building pads, recreational facilities, roads, and public facilities and services would alter site topography. The bulk of the grading would consist of constructing building pads and roadways for planned residential subdivisions and the proposed PFE Road/Watt Avenue and PFE Road/Walerga Road commercial businesses. It is expected that at buildout, the Applicant would develop about 142.3 acres for residential uses (for project-level parcels) and about 250.1 acres for agricultural, open space, commercial, and public or quasi-public land uses. Placer County's Engineering and Surveying Division (ESD) has the authority to review and approve all Improvement Plans (which are required to show any pertinent topographical features) for future construction within the Plan Area. This review would allow any identification and avoidance of any significant site-specific impacts to topography. Additionally, following General Grading Concepts in Article 12.48 of the Placer County Code and adhering to Placer County ordinances for grading, drainage, and construction, and implementing a grading and erosion control plan would reduce the effects of topographic alteration to a less-than-significant level.

IMPACT 12-2:	Potential for seismic activity
SIGNIFICANCE:	Less than Significant
MITIGATION:	None Warranted

As discussed in Section 12.1.5, Seismicity, the zoned active fault closest to the Plan Area is located 70 kilometers to the north-northwest. No active fault traces are found beneath the study area for this EIR. Therefore, the probability of surface ground rupture is negligible, and the possibility of strong ground motion is low. In addition, the proposed project would not impose surface loading that would induce seismic activity. Therefore, impacts associated with the potential for seismic activity would be less than significant.

IMPACT 12-3:	Potential for increased erosion during and after construction
SIGNIFICANCE:	Potentially Significant
MITIGATION:	Mitigation Measures 12-3a through 12-3d
Proposed:	Mitigation Measures 12-3a, 12-3b, 12-3c, and 12-3d
Significance After Proposed Mitigation:	Less than Significant
Recommended:	None
RESIDUAL SIGNIFICANCE:	Less than Significant

Construction of specific project features with the potential to produce and/or enhance erosion would occur primarily from construction of the residential developments, the commercial parcel, and both onsite and offsite infrastructure.

The Applicant proposes to develop 597 residential units on about 142.3 acres of the Plan Area. About 250.1 acres would be set aside for agricultural, open space, commercial, and public or quasi-public uses. Approximately 5.3 percent, or 27.6 acres, of the site would be used for a cemetery, lift station, electrical substation, and rights-of-way for roadways and landscape corridors. Clearing, grading, and excavation activities would remove vegetative cover from the soils and expose soils to the effects of wind, rain, and surface flow as a result of construction activities. As discussed in Section 12.1, the onsite soils are not classified as having a high erosion potential and there are no areas with steep slopes on the site.

Summer construction activities would increase soil exposure to wind erosion, and winter construction would increase soil exposure to water erosion, both representing potentially significant impacts. When construction of the project is complete, increased potential for erosion would exist in all areas that have not been properly revegetated.

In addition to the potential for increased erosion caused by construction activities, slight-to-moderate natural soil erosion hazards exist within the boundaries of the proposed Plan Area based on the soil types known to occur on the site.

Compliance with Section 5 of Placer County's *Land Development Manual* and the Placer County *Storm Water Management Manual* would reduce these impacts to a less-than-significant level.

IMPACT 12-4:	Loss of availability of important mineral resources
SIGNIFICANCE:	Less than Significant
MITIGATION:	None Warranted

As discussed in Section 12.1.3, Mineral Resources, it is unlikely that the study area represents a source of known mineral reserves, and no mineral resources of value are known to exist in the Plan Area. Therefore, loss of accessibility to mineral resources on the site as a result of proposed project construction would be a less-than-significant impact, and no mitigation is warranted or proposed.

IMPACT 12-5:	Safety risk related to soil stability
SIGNIFICANCE:	Potentially Significant
MITIGATION:	Mitigation Measure 12-5a
Proposed:	Mitigation Measure 12-5a
Significance After Proposed Mitigation:	Less than Significant
Recommended:	None
RESIDUAL SIGNIFICANCE:	Less than Significant

Review of the Preliminary Geotechnical Engineering Report (Wallace-Kuhl & Associates, 2003) indicates that the Plan Area is suitable for the planned construction if designed and constructed in accordance with generally accepted geotechnical principles, provided that detailed, site-specific investigations are conducted at appropriate times and the recommendations of each investigation are followed, as required by Mitigation Measure 12-5a. The potential of expansive soils occurring within the Plan Area is considered to be moderate based on review of available information provided in the USDA Soil Survey of Placer County, California, Western Part (1980), and the Preliminary Geotechnical Engineering Report. Laboratory test results performed on bulk samples of near-surface soils indicate native soils consisting of brown sandy silty clay that possess moderate expansion potential. These soils were tested in accordance with Uniform Building Code (UBC) Standard No. 29-2 ASTM D4829 test method (Wallace & Kuhl, 2003). Measures to mitigate soils with moderate expansion potentials include treating near-surface soils with chemical lime, maintaining higher moisture content percentages of subgrade soils that support foundation systems, and/or requiring deepened or post-tensioned foundation systems.

12.3.3 Program-Level Impacts

Potential impacts associated with development of the program-level parcels within the Plan Area are included in the discussion of project-level impacts. Applicants for program-level parcels would need to undergo the County's Subsequent Conformity Review Process to ensure that their development proposals conform to the Riolo Vineyard Specific Plan, CEQA regulations, and program-level mitigation measures identified in this Draft EIR. Upon conclusion of the Subsequent Conformity Review Process, the County will determine whether the proposed development entitlement is consistent with the Specific Plan, whether additional environmental review is required, and if so, the scope of such additional review.

12.4 MITIGATION MEASURES

This section discusses mitigation measures that will be implemented to reduce project-related impacts to soils, geology, and seismicity. Mitigation measures are separately identified as those "Proposed" by the Applicant and those "Recommended" by County staff.

Mitigation Measure 12-1a: Submit Improvement Plans (Proposed)

For future construction projects within the Plan Area, Improvement Plans, specifications, and cost estimates (per the requirements of Section II of the Land Development Manual that are in effect at the time of submittal) will be prepared and submitted to the Placer County ESD for review and approval of each new development project. The plans shall show the following:

- All conditions for the project as well as pertinent topographical features both on site and off site;
- All existing and proposed utilities and easements, on site and adjacent to the Plan Area, that may be affected by planned construction; and
- All proposed landscaping and irrigation facilities within the public right-of-way (or pubic easements), or landscaping within sight distance areas at intersections.

The Applicant shall prepare and submit Improvement Plans, specifications, and cost estimates (per the requirements of Section II of the Land Development Manual that are in effect at the time of submittal) to the ESD for review and approval of each project phase. The plans shall show all conditions for the project as well as pertinent topographical features both on and off site. All existing and proposed utilities and easements, on site and adjacent to the project, which may be affected by planned construction, shall be shown on the plans. All landscaping and irrigation facilities within the public right-of-way (or public easements), or landscaping within sight distance areas at intersections, shall be included in the Improvement Plans. The Applicant shall pay plan check and inspection fees. Prior to plan approval, all applicable recording and reproduction costs shall be paid. The cost of the above-noted landscape and irrigation facilities shall be included in the estimates used to determine these fees. It will be the Applicant's responsibility to obtain all required agency signatures on the plans and to secure department approvals. If the Design/Site Review process and/or Design Review Committee (DRC) review is required as a condition of approval for the project, this review process shall be completed prior to submittal of Improvement Plans. Record drawings shall be prepared and signed by a California Registered Civil Engineer at the Applicant's expense and shall be submitted to the ESD prior to acceptance by the County of site improvements (Placer County Community Development Resource Agency, 2006).

Mitigation Measure 12-1b: Comply with the County Grading Ordinance (Proposed)

All proposed grading, drainage improvements, vegetation, and tree removal shall be shown on the proposed project's Improvement Plans, and all work shall conform to provisions of the County Grading Ordinance (Ref. Article 15.48, Placer County Code) that is in effect at the time of submittal. No grading, clearing, or tree disturbance shall occur until the Improvement Plans are approved and all temporary construction fencing has been installed and inspected by a member of the DRC. All cut/fill slopes shall be at a maximum of 2:1 (horizontal:vertical) unless a soils report supports a steeper slope and the ESD concurs with said recommendation.

The Applicant shall revegetate all disturbed areas. Revegetation undertaken from April 1 to October 1 shall include regular watering to ensure adequate growth. A winterization plan shall be provided with project Improvement Plans. It will be the Applicant's responsibility to ensure proper installation and maintenance of erosion control/winterization during project construction. Where soil stockpiling or borrow areas are to remain for more than one construction season, proper erosion control measures shall be applied as specified in the Improvement Plans/Grading Plans. Where roadside drainage is off of the pavement, erosion control shall be provided for to the satisfaction of the ESD.

The Applicant shall submit to the ESD a letter of credit or cash deposit in the amount of 110 percent of an approved engineer's estimate for winterization and permanent erosion control work, prior to Improvement Plan approval, to guarantee protection against erosion and improper grading practices. Upon the County's acceptance of improvements and satisfactory completion of a one-year maintenance period, unused portions of this deposit will be refunded to the Applicant or authorized agent.

If at any time during construction a field review by County personnel indicates a significant deviation from the proposed grading shown on the Improvement Plans, specifically with regard to slope heights, slope ratios, erosion control, winterization, tree disturbance, and/or pad elevations and configurations, the plans shall be reviewed by the DRC/ESD for a determination of substantial conformance to the project approvals prior to any further work proceeding. Failure of the DRC/ESD to make a determination of substantial conformance may serve as grounds for the revocation/modification of the project approval by the appropriate hearing body (Placer County Community Development Resource Agency, 2006).

The project's erosion control plan shall indicate that proper control of siltation, sedimentation, and other pollutants will be implemented in accordance with National Pollutant Discharge and Elimination System (NPDES) permit requirements and County ordinance standards. The plan shall propose best management practices (BMPs) to reduce erosion and water quality degradation during construction to the maximum extent practicable.

Mitigation Measure 12-3a: Identify stockpiling and vehicle staging areas on Improvement Plans (Proposed)

For each construction phase within the Plan Area, stockpiling and/or vehicle staging areas shall be identified on the Improvement Plans. These areas shall be located as far as practical from existing dwellings and protected resources in the area.

Mitigation Measure 12-3b: Comply with NPDES requirements for construction (Proposed)

This project is subject to construction-related stormwater permit requirements of the federal Clean Water Act NPDES program. Each applicant/developer for future construction projects within the Plan Area shall implement Mitigation Measure 13-1c, which requires an applicant to submit a Notice of Intent (NOI) to comply with the NPDES General Permit for Stormwater Discharges associated with Construction Activities to the State Regional Water Quality Control Board if the specific project would disturb 1 acre of land or more. The project applicant/developer shall provide to the ESD evidence of a state-issued Waste Discharge Identification (WDID) number or filing of a NOI and fees prior to start of construction, as required by the County's Sample Conditions and Improvement Plans, paragraph ip15 (Placer County Community Development Resource Agency, 2006).

Mitigation Measure 12-3c: Comply with NPDES Phase II requirements (Proposed)

Development within the Plan Area must comply with the NPDES Phase II General Permit for the Discharge of Stormwater from small municipal separate storm sewer systems. Placer County is operating under the NPDES Phase II Rule permit, and as such, new development within the County must comply with the permit requirements. New development is subject to Attachment 4 Design Standards of the State Water Resource Control Board NPDES Phase II General Permit. These standards require that new development must be designed so as to minimize, to the maximum extent practicable, the introduction of pollutants of concern that may result in significant impacts, generated from site runoff of directly connected impervious areas, to the stormwater conveyance system as approved by the building official.

Mitigation Measure 12-3d: Prepare and implement stormwater pollution prevention plan for construction (Proposed)

For all construction activities that will disturb 1 or more acre of land, a stormwater pollution prevention plan (SWPPP) for the construction phase must be prepared and implemented.

The SWPPP will include development of site-specific structural and operational BMPs to prevent and control impacts to runoff quality, measures to be implemented before each storm event, inspection and maintenance of BMPs, and monitoring of runoff quality by visual and/or analytical means. The contents of the SWPPP are set forth in detail in the permit application package. BMPs shall be designed according to the California Stormwater Quality Association Stormwater *Best Management Practice Handbooks* for Construction (or other similar source as approved by the DPW). BMPs for the proposed project include, but are not limited to, silt fencing (Sediment Control SE -1), straw bale barriers (Sediment Control SE-9), fiber rolls (Sediment Control SE-5), storm drain inlet protection (Sediment Control SE-10), hydraulic mulch (Erosion Control EC-3), and stabilized construction entrance (Tracking Control TR-1). The SWPPP shall also include erosion control measures, to be implemented during construction, that conform to the NPDES, Storm Drain Standards, and local standards.

Mitigation Measure 12-5a: Prepare a geotechnical report for all elements of proposed development (Proposed)

For each development phase or construction project within the Plan Area, a geotechnical engineering report produced by a California Registered Civil Engineer or Geotechnical Engineer shall be submitted to the ESD for review and approval. The report shall address and make recommendations on the following:

- Road, pavement, and parking area design;
- Structural foundations, including retaining wall design (if applicable);
- Grading practices;
- Erosion/winterization;
- Special problems discovered on site (i.e., groundwater, expansive/unstable soils, etc.); and
- Slope stability.

When approved by the ESD, two copies of the final report shall be provided to the ESD and one copy to the Building Department for their use. If the soils report indicates the presence of critically expansive soils or other soils problems which, if not corrected, could lead to structural defects, a certification of completion of the requirements of the soils report will be required for subdivisions and other entitlements, prior to issuance of building permits. This certification may be completed on a lot by lot basis or on a tract basis, or other defined project basis. This shall be so noted in the Covenants, Conditions, and Restrictions and on the informational sheet filed with the final map(s). It is the responsibility of the developer to provide for engineering inspection and certification that earthwork has been performed in conformity with recommendations contained in the report.