3.5 Geology, Soils, and Seismicity

This section addresses issues pertaining to geology, surface soils, and seismicity as they relate to the Proposed Project. This section presents existing conditions by describing the topography, regional and local geology, site soils, and seismic setting. This section also describes various geologic and seismic hazards that could be present as existing conditions. The evaluation and analysis of geology, soils, and seismicity are based, in part, on review of various geologic maps and reports. The primary sources include available resources from the United States Geological Survey (USGS) and the California Geological Survey (CGS). This environmental setting description is also based on information from U.S. Department of Agriculture, Natural Resources Conservation Service; the Solano County General Plan; and the City of Vacaville General Plan.

3.5.1 Environmental Setting

The Proposed Project site is located primarily within the Nut Tree Airport property. Nut Tree Airport is located in the City of Vacaville in northern Solano County, between the cities of Fairfield and Dixon, approximately 35 miles southwest of the City of Sacramento and 45 miles northeast of the City of San Francisco. The Proposed Project site is located at an elevation of 117 feet above mean sea level (MSL). Rapidly rising terrain associated with the Vaca Mountain Range is located to the west, northwest of Nut Tree Airport. Terrain is relatively flat south and east of the Airport.

Regional Geology

Solano County is located within the geologic region known as the Great Valley geomorphic province. The Great Valley province is made up largely of wide alluvial fans sourced from the Sierra Nevada Range to the east, the Coastal Range to the west, and to some degree the Tehachapi Mountains to the south. Weathering of these mountain ranges combined with surface water flows and flooding have resulted in accumulation of alluvial (river), lacustrine (lake), and marine (ocean) deposits throughout the province (CGS, 2002a).

Soils

The characterization of soils on the Project site is based on a review of soil survey mapping by the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS). Based on the generalized mapping, soils present within the Project site include the following types (see **Figure 3.5-1**):

- **Capay silty clay loam (Ca).** The central portion of the Project site is mapped with small areas of Capay silty clay loam soils (5.5%). Capay Silty clay loam is a deep, moderately well drained soil that generally occurs at elevations between 10 and 130 feet MSL. The soil is characterized as having a slight hazard of erosion, a high shrink-swell potential, and being moderately corrosive to concrete and highly corrosive to steel. (NRCS, 2012).

- **Rincon clay loam (RoA).** Rincon clay loam (2.2%) is located in the northeast corner of the project area. Rincon clay loam is well drained, generally occurs at elevations between 20 and 200 feet MSL, posses a high shrink-swell potential, a low rating for corrosion to concrete, and high rating of corrosion to steel (NRCS, 2012).
- **Clear Lake clay (CeA).** Clear Lake clay soils are mapped in the central portion of the Project site (42.9%). Clear Lake clay soils are poorly drained and generally occur at elevations between 10 and 100 feet MSL. They have a moderate to high shrink-swell potential and moderate erosion hazard. Clear Lake clay soils have a moderate potential for corrosion of concrete and high potential for corrosion to steel (NRCS, 2012).
- **Corning gravelly loam (CvD2).** Corning gravelly loam soils are mapped in the northern central portion of the Project site (43.6%). Corning gravelly loam soils are well drained, generally occurs at elevations between 30 and 250 feet MSL, and have a high shrink-swell potential and a relatively moderate erosion hazard. Corning gravelly loam soils have a high potential for corrosion of concrete and steel (NRCS, 2012).
- **San Ysidro sandy loam (SeA).** San Ysidro sandy loam soils are mapped in the eastern central portion of the Project site (5.9%). San Ysidro sandy loam is a moderately well drained soil which generally occurs at elevations between 30 and 100 feet MSL. This soil has a slight hazard of erosion, a high shrink-swell potential, and is moderately corrosive to concrete and highly corrosive to steel. (NRCS, 2012).

Seismicity

Solano County is located in Northern California in an area considered to be seismically active. The county is crossed by a number of active faults, predominantly in the western side. In Solano County, earthquake-triggered geologic hazards include ground shaking, fault rupture, landslides, liquefaction, and subsidence. Surface fault rupture involves ground displacement during an earthquake typically along the surface trace of a fault. As seismic ground displacement tends to occur repeatedly along the same planes of weakness (i.e., faults), the potential for future surface rupture is concentrated along known active faults. According to the United States Geological Survey (USGS) Earthquake Hazards Program, the nearest fault is the potentially active Great Valley Fault Zone, located approximately 0.3 miles east of the project site. The Green Valley fault 13.3 miles southwest of the project site is the closest active fault to the site

Richter magnitude (M) is a measure of the size of an earthquake as recorded by a seismograph, the standard instrument that records ground shaking. 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. Earthquake magnitudes are also measured by their moment magnitude (Mw), which is related to the physical characteristics of a fault, including the rigidity of the rock, the size of fault rupture, and the movement or displacement across a fault (CGS, 2002b).

Geologic Hazards

The Proposed Project could experience the effects of a major earthquake from any one of the active or potentially active faults located near the Project site. The major hazards associated with earthquakes are surface fault rupture (ground displacement), ground motion (or ground shaking),

SOURCE: USDA, 2012; ESRI, 2012; SSURGO, 2012; and ESA, 2013

Figure 3.5-1
Soils

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ground failure (i.e., liquefaction), earthquake induced landslides, and differential settlement. These potential geologic hazards are discussed in the following text.

Surface Fault Rupture

Seismically induced ground rupture is defined as the physical displacement of surface deposits in response to an earthquake's seismic waves. The magnitude and nature of fault rupture can vary for different faults, or even along different strands of the same fault. Ground rupture is considered most likely along active faults. Because no active faults have been mapped across the project site by the California Geological Survey or USGS, nor is the project site located within an Alquist-Priolo Earthquake Special Study Zone, fault ground rupture is not considered a hazard at the project site.

Ground Motion

Strong ground shaking from a major earthquake in the region could affect the Proposed Project. Ground shaking may affect areas hundreds of miles distant from the earthquake's epicenter. Ground shaking intensity is partly related to the size of an earthquake, the distance to the site, and the response of the geologic materials that underlie a site. As a rule, the greater the earthquake magnitude and the closer the fault rupture to a site, the greater the intensity of ground shaking. Violent ground shaking is generally expected at and near the epicenter of a large earthquake; however, different types of geologic materials respond differently to earthquake waves. For instance, deep unconsolidated materials can amplify earthquake waves and cause longer periods of ground shaking resulting in potentially greater damage than structures located on bedrock.

While the moment and Richter magnitudes are a measure of the energy released in an earthquake, intensity is a measure of the earthquake ground shaking effects at a particular location. Intensity will vary depending on the overall magnitude, distance to the fault, focus of earthquake energy, and type of geologic material underlying an area. The Modified Mercalli Intensity (MMI) scale (**Table 3.5-1**) is commonly used to express the earthquake intensity and damage severity caused by earthquakes because it expresses ground shaking relative to actual physical effects observed by people and therefore is a useful scale for comparing different seismic events. MMI values range from I (earthquake not felt) to XII (damage nearly total).

Ground motion, or ground shaking, during an earthquake is commonly expressed with the motion parameters of acceleration, velocity, and the duration of the shaking. A 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.

TABLE 3.5-1
MODIFIED MERCALLI INTENSITY SCALE

Intensity Value	Intensity Description	Average Peak Acceleration
I	Not felt except by a very few persons under especially favorable circumstances.	< 0.0017 g[a]
II	Felt only by a few persons at rest, especially on upper floors on buildings. Delicately suspended objects may swing.	< 0.014 g
III	Felt noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly, vibration similar to a passing truck. Duration estimated.	< 0.014 g
IV	During the day felt indoors by many, outdoors by few. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.	0.014–0.04 g
V	Felt by nearly everyone, many awakened. Some dishes and windows broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles may be noticed. Pendulum clocks may stop.	0.04–0.09 g
VI	Felt by all, many frightened and run outdoors. Some heavy furniture moved; and fallen plaster or damaged chimneys. Damage slight.	0.09–0.18 g
VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.	0.18–0.34 g
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.	0.34–0.65 g
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.	0.65–1.24 g
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from riverbanks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.	> 1.24 g
XI	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.	> 1.24 g
XII	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted. Objects are thrown upward into the air.	> 1.24 g

a. g (gravity) = 980 centimeters per second squared. 1.0 g of acceleration is a rate of increase in speed equivalent to a car traveling 328 feet from rest in 4.5 seconds.

SOURCE: ABAG, 2003

A useful tool that seismologists use to describe ground-shaking hazard is a probabilistic seismic hazard assessment (PSHA). The PSHA for the State of California takes into consideration the range of possible earthquake sources and estimates their characteristic magnitudes to generate a probability map for ground-shaking. The PSHA maps depict values of peak ground acceleration (PGA) that have a 10 percent probability of being exceeded in 50 years[1]. For purposes of the EIR, the California

1 A probabilistic seismic hazard map shows the predicted level of hazard from earthquakes that seismologists and geologist believe could occur. The map's analysis takes into consideration uncertainties in the size and location of earthquakes and the resulting ground motions that can affect a particular site. The maps are typically expressed in terms of probability of exceeding a certain ground motion. These maps depict a 10 percent probability of being exceeded in 50 years. There is a 90 percent chance that these ground motions will NOT be exceeded. This probability level allows engineers

Geological Survey's Probabilistic Seismic Hazards Mapping Ground Motion Page was consulted to estimate site-specific probabilistic ground acceleration for the Project site. The Project site has a 10 percent chance of exceeding ground motions of 0.438 g for firm rock and soft rock, and 0.46 g for alluvium over the next 50 years (CGS, 2012). Because PGA is a measure of ground motion, MM intensities increase along with PGA values. **Table 3.5-1** relates a range of average PGA values to earthquake intensities. The PGA for the Project site corresponds to MM intensity of VIII that could occur on the Project site.

Liquefaction

Liquefaction is the sudden temporary loss of shear strength in saturated, loose to medium dense, granular sediments subjected to ground shaking. Liquefaction generally occurs when seismically induced ground shaking causes pore water pressure to increase to a point equal to the overburden pressure. Liquefaction can cause foundation failure of buildings and other facilities due to the reduction of foundation bearing strength.

The potential for liquefaction depends on the duration and intensity of earthquake shaking, particle size distribution of the soil, density of the soil, and elevation of the groundwater. Areas at risk due to the effects of liquefaction are typified by a high groundwater table and underlying loose to medium-dense, granular sediments, particularly younger alluvium and artificial fill. Liquefaction has been responsible for ground failures during almost all of California's large earthquakes. The Proposed Project site has been characterized as an area that has a moderate susceptibility for liquefaction (see **Figure 3.5-2**) (Vacaville, 2007).

Earthquake-Induced Landslides

Earthquake motions can induce significant horizontal and vertical dynamic stresses in slopes that produce dynamic normal and shear stresses along potential failure surfaces within a slope. The susceptibility for native and engineered slopes to fail depends on the gradient and localized geology as well as the amount of rainfall, excavation, or seismic activities. During a slope failure, a mass of rock, soil, and debris is displaced down slope by sliding, flowing, or falling. Steep slopes and down slope creep of surface materials characterize areas most susceptible to failure. Engineered slopes have a tendency to fail during an earthquake if not properly designed, constructed or compacted. The Project site and adjacent areas are relatively flat and would not be susceptible to earthquake-induced landsliding.

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to design buildings for larger ground motions than seismologists think will occur during a 50-year interval, making buildings safer than if they were only designed for the ground motions that are expected to occur in the 50 years. Seismic shaking maps are prepared using consensus information on historical earthquakes and faults. These levels of ground shaking are used primarily for formulating building codes and for designing buildings (CGS, 2010).

Earthquake-Induced Settlement

Settlement of the ground surface can be accelerated and accentuated by earthquakes. During an earthquake, settlement can occur as a result of the relatively rapid compaction and settling of subsurface materials (particularly loose, non-compacted, and variable sandy sediments) due to the rearrangement of soil particles during prolonged ground shaking. Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different rates). Typically, areas underlain by artificial fills, unconsolidated alluvial sediments, slope wash, and areas with improperly engineered construction fills are susceptible to this type of settlement. Settlement commonly occurs as a result of building construction or other large projects are placed on un-engineered fills. The Project site contains soils formed from alluvium which could make it susceptible to settlement if not addressed appropriately prior to construction.

Other Geologic Hazards

Soil Erosion

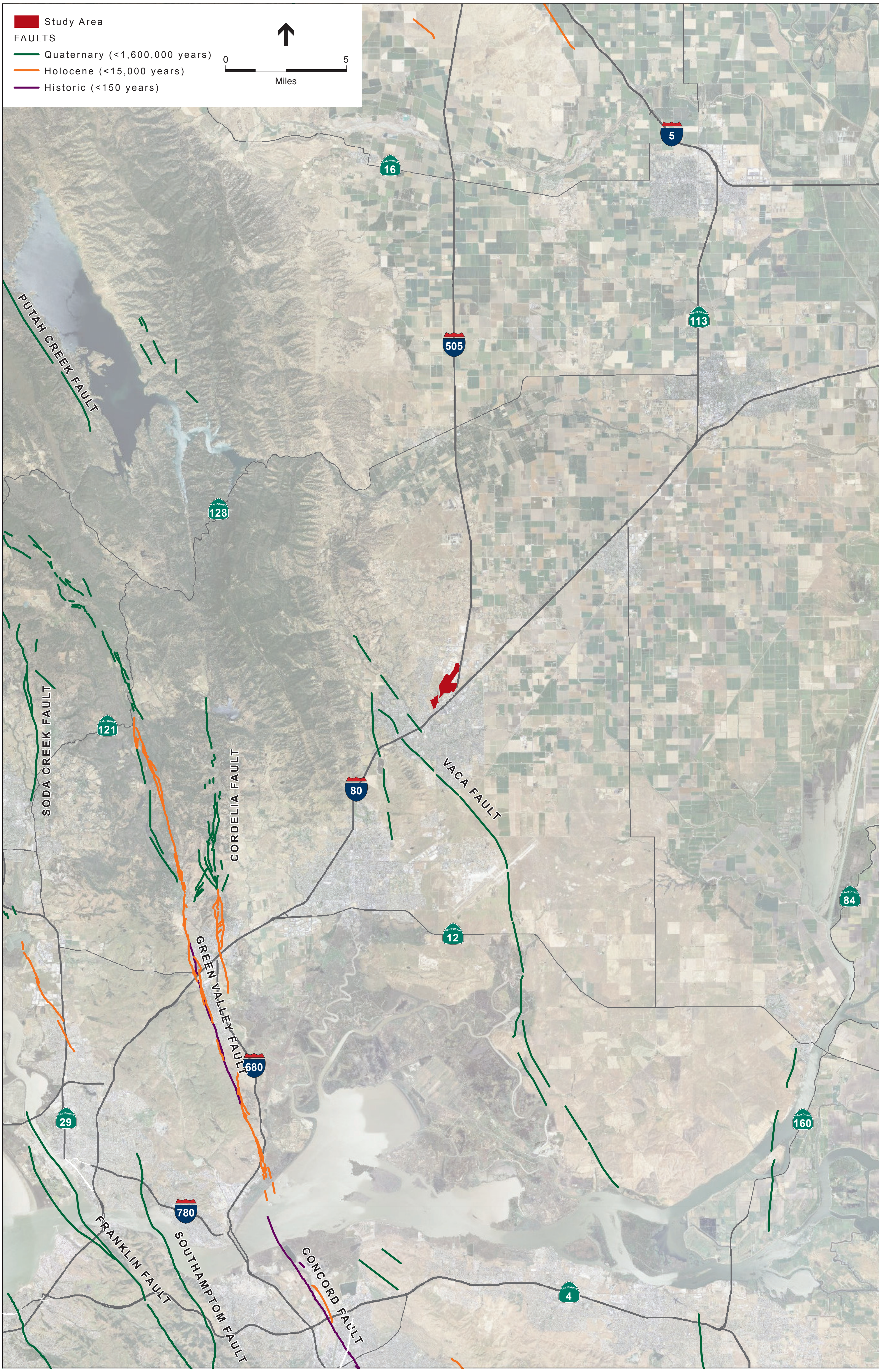
Soil erosion is the process whereby soil materials are worn away and transported to another area either by wind or water. Rates of erosion can vary depending on the soil texture, structure, and amount of organic matter. In general, soil containing high amounts of silt can be more easily erodible while sandy soils are less susceptible. The corresponding slope, length, and degree of steepness are also prime factors in determining the potential for soil erosion. Excessive soil erosion can eventually lead to damage of building foundations and roadways. Typically, the soil erosion potential is reduced once the soil is graded and covered with concrete, structures, asphalt, or vegetation. The Project site is primarily characterized by soils with low to moderate soil erosion potential.

Land Subsidence

Subsidence is the gradual lowering of the land surface due to loss or compaction of underlying materials. Subsidence can occur as the result of hydro-compaction; groundwater, gas and oil extraction; or the decomposition of highly organic soils. Hydro-compaction is the process of volume decrease and density increase upon saturation of moisture deficient deposits. Subsidence in Solano County has been caused by removing water from the soil, through agricultural pumping, or by placing heavy loads on the soil (County of Solano, 2008). The effects of subsidence from placement of new loads are typically reduced through site preparations such as compaction of engineered fills.

Expansive Soils

Expansive soils are characterized by their potential “shrink-swell” behavior. Shrink-swell is the cyclic change in volume (expansion and contraction) that occurs in certain fine-grained clay sediments from the process of wetting and drying. The higher the percentage of expansive minerals present in near surface soils, the higher the potential for significant expansion. The greatest effects occur when there are significant or repeated moisture content changes. Expansions of ten percent or more in volume are not uncommon. This change in volume can exert enough force on a building or other structure to cause cracked foundations, floors and basement walls. Structural damage



SOURCE: USGS, 2010; USDA, 2012; ESRI, 2012; and ESA, 2013

Nut Tree Airport Master Plan EIR . 120526

Figure 3.5-2
Faults

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typically occurs over a long period of time, usually the result of inadequate soil and foundation engineering or the placement of structures directly on expansive soils. As described above under "Soils", according to soil survey data the Project site contains some soils with a moderate to high shrink-swell potential (NRCS, 2012). However, the presence of expansive soils can typically only be determined through site specific analysis.

Corrosive Soils

Corrosive soils can damage underground utilities including pipelines and cables, and can weaken roadway structures. Rates of steel corrosion of uncoated steel are related to soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. As described above under "Soils", the Project site contains some soils with a moderate to high potential for corrosion (NRCS, 2012).

Naturally Occurring Asbestos

Asbestos is a friable mineral that when disturbed can become airborne. The fiber-like airborne asbestos particles are easily inhaled and can result in lung disease or other respiratory illnesses. If asbestos is not disturbed (*in situ*), the friable mineral typically remains naturally cemented and does not become an airborne pollutant. According to California Division of Mines and Geology (CDMG), Solano County is not likely to contain naturally occurring asbestos (CDMG, 2000). Consequently, potential hazards associated with naturally occurring asbestos are not discussed further.

3.5.2 Regulatory Setting

State

California Building Standards Code

The California Building Code (CBC) has been codified in the California Code of Regulations (CCR) 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 facilities, and general stability by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all building and structures within its jurisdiction. The CBC is based on the International Building Code. The 2010 CBC is based on the 2009 International Building Code (IBC) 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 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.

Local

Below are policies pertaining to geology, soils, and seismicity that could affect or be affected by the Proposed Project. This discussion begins with a description of Solano County's General Plan and follows with the City of Vacaville general plan.

Solano County

The 2008 Solano County General Plan Public Health and Safety Chapter includes policies intended to address seismic safety and land stability. Policies relevant to the proposed project are described below.

> **Policy HS.P-15:** Reduce risk of failure and reduce potential effects of failure during seismic events through standards for the construction and placement of utilities, pipelines, or other public facilities located on or crossing active fault zones.
>
> **Policy HS.I-22:** Require geotechnical evaluation and recommendations before new development in moderate or higher-hazard areas. Such geotechnical evaluation shall analyze the potential hazards from: landslides, liquefaction, expansive soils, steep slopes, erosion, subsidence, Alquist-Priolo earthquake fault zones or other identified fault zones, tsunamis, and seiches.
>
> Require new development to incorporate project features that avoid or minimize the identified hazards. Costs related to providing or confirming required geotechnical reports will be borne by the applicant.

City of Vacaville

The 2007 City of Vacaville General Plan Safety Element includes policies intended to guide development in limiting potential adverse effects of geologic and seismic hazards. Policies relevant to the proposed project are described below.

> **Policy 9.1-I2** Analyze proposed development sites at the earliest stage of the detailed planning process to determine geologic suitability. The analysis should include the structural engineering for the actual site and possible impacts of the project on adjacent lands.

Policy 9.1-I4 To the extent practicable, do not allow critical facilities, structures involving high occupancies, and public facilities to be sited in areas of high damage susceptibility. Where such location is deemed essential to the public welfare, these structures will be sited, designed and constructed with due consideration of the potential for earthquake damage due to ground shaking, associated ground deformation, seismically triggered flooding, liquefaction and landslide.

Policy 9.1-I11 Require contour rounding and revegetation to preserve natural qualities of sloping terrains and mitigate the artificial appearance of engineered slopes, and control erosion.

3.5.3 Analysis, Impacts, and Mitigation

Significance Criteria

Significance Criteria

Based on Appendix G of the CEQA Guidelines, an impact is considered significant if implementation of the proposed project 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 in 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 potentially active fault (refer to Division of Mines and Geology Special Publication 42),
  - 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 systems where sewers are not available for the disposal of water.

Methodology and Assumptions

The impact assessment provides a qualitative analysis to address soil resources, geologic hazards and primary and secondary effects of earthquakes. The level of significance of an impact is dependent on how close the Proposed Project is located in relation to known or potential soil, seismic, and geologic hazards that exist in the County.

Impacts Not Further Evaluated

Expose people or structures to potential substantial adverse effects associated with landslides caused by seismic events and/or unstable soil conditions. The project is located within an area of low relief, having nearly flat terrain. High relief landforms containing unconsolidated sediments that could be subject to landslides during seismic events are not located within the project area. Therefore, there would be no potential for exposure to structure damage associated with landslides and no impact would occur.

Have soils incapable of supporting use of septic tanks or alternative waste water disposal systems. Wastewater service is provided to the project site by the Easterly Wastewater Treatment Plant (WWTP), which is located in the unincorporated town of Elmira just east of the city. Therefore, the project would not require or result in the use of a septic system or other alternative waste disposal system and no impact would occur.

Impacts and Mitigation Measures

Impact 3.5-1: Would the Proposed Project expose people to injury or structures to damage from potential rupture of a known earthquake fault, strong groundshaking, or seismic-related ground failure? (*Less Than Significant*)

Phase I Projects and Project Build-out

The Project site is not within a designated Alquist-Priolo Earthquake Fault Zone. The Project site is located 13 miles northeast of the active Green Valley Fault, and 0.3 miles southwest of the potentially active Great Valley Fault, both of which have the potential to expose the Project site to strong seismic ground shaking. The Proposed Project would increase the number of people or structures that could be exposed to ground shaking from an earthquake. Although the Proposed Project improvements could be subject to seismic ground shaking, compliance with the CBC (as described in Section 3.5.2, Regulatory Setting) would require that the Project site's seismic design response spectrum be determined and incorporated into the design of all new buildings and associated improvements; this is also consistent with Health and Safety policies identified above in Section 3.5.2. The potential impact from strong seismic ground shaking or seismic-related ground failure would therefore be less than significant.

Mitigation Measures: None required.

Impact 3.5-2: Would the Proposed Project result in substantial soil erosion or the loss of topsoil? (*Less Than Significant*)

Phase I Projects and Project Build-out

Construction of the Proposed Project would include excavation, paving, construction of new facilities, and removal of an existing structure, and storm drain improvements that would expose areas of soil that have previously been covered with concrete or vegetation. Project site soils are characterized by a moderate potential for erosion. Concentrated water erosion, if not managed or controlled, can eventually result in significant soil loss and/or discharging of sediment into installed utilities and/or adjacent lots. Sediment from Proposed Project-induced on-site erosion can also accumulate in downstream drainage facilities, interfere with flow, and aggravate downstream flooding conditions. Erosion impacts are addressed under Section 3.8 "Hydrology and Water Quality".

Potentially significant construction related impacts would be reduced to less-than-significant with the implementation of BMP's provided under the National Pollutant Discharge Elimination System (NPDES) General Construction Permit. As a condition of construction, the applicant would be required to obtain coverage under the NPDES Permit for Discharges of Stormwater Associated with Construction Activities (NPDES General Permit), under the Regional Water Quality Control Board. Conditions of this permit would include adherence to requirements of the revised NPDES General Construction Permit, effective July 1, 2010. Among other things, the conditions of the permit include mandatory implementation of BMPs concerning erosion control. Adherence to the NPDES General Construction Permit including the implementation of a SWPPP and associated BMPs will result in a less-than-significant erosion impacts. No additional mitigation is required.

Mitigation Measures: None required.

Impact 3.5-3: Would the Proposed Project be located on soils that are expansive, corrosive, or otherwise potentially unstable, or that could become unstable as a result of the Proposed Project, and potentially result in lateral spreading, subsidence, liquefaction, or collapse? (*Less Than Significant)*

Phase I Projects and Project Build-out

While review of existing literature determined that the project site has a high shrink-swell potential, site specific hazards such as expansion, corrosivity or subsidence can only be determined from a site specific geotechnical evaluation which would be required for any proposed construction. Generally, site preparations such as compaction, surcharging, and use of engineered fill can reduce the potential for hazards to less-than-significant levels, but a site specific geotechnical evaluation is required prior to approval of the building permit to demonstrate that the site is geotechnically sounds and meets building code requirements. (Performance of a geotechnical evaluation is also required by County Policy HS.I-22.) This impact is considered less-than-significant and no additional mitigation is required.

Mitigation Measures: None required.

Impact 3.5-4: Would the Proposed Project be located on expansive soil, creating substantial risks to life or property? (*Less Than Significant)*

Phase I Projects and Project Build-out

As described in the Environmental Setting discussion above, the Project site contains some soils with a moderate-to-high shrink-swell potential (NRCS, 2012). Site preparations such as compaction, surcharging, and use of engineered fill can reduce the potential for expansion hazards to less-than-significant levels, but a site specific geotechnical evaluation is required prior to approval of the building permit to demonstrate that the site is geotechnically sound and meets building code requirements. (Performance of a geotechnical evaluation is also required by County Policy HS.I-22.) Furthermore, compliance with all County building standards and practices, as well as application of the existing regulations identified in the CBC, shall ensure that the effects of expansion and corrosive soils are reduced. Adherence to all construction techniques recommended in a geotechnical evaluation as well as applicable building standards and regulations will ensure that potential impacts are less than significant.

Mitigation Measures: None required.

Cumulative Impacts

Impact 3.5-5: Would development of the Proposed Project in combination with future projects in the City of Vacaville result in cumulative effects associated with geology and soils? (*Less Than Significant*).

Implementation of the Proposed Project and other potential cumulative projects in the region (as identified in **Table 2-7**), including growth resulting from build-out of the City's General Plan**,** could result in increased erosion and soil hazards and could expose additional structures and people to seismic hazards. Potential soil and seismic hazards from cumulative development could represent a significant cumulative impact if projects do not incorporate grading/erosion plans and are not developed to the latest building standards incorporating recommendations from site-specific geotechnical reports prepared for these projects. The City or project proponent would implement mitigation measures and project implementation requirements, such as building permit regulation and erosion controls, specifically designed to avoid, reduce, or mitigate potential impacts associated with geology and soils. Implementation of these measures would reduce potential project-specific impacts to less-than-significant-levels; thus avoiding a cumulatively considerable impact. Therefore, cumulative impacts associated with geology and soils as a result of the Proposed Project and other proposed development in the vicinity of the Airport is considered less than significant.

Mitigation Measures: None required.

3.5.4 References

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