3.7 Geology and Soils

This section evaluates potential impacts related to geology and soils associated with each of the four scenarios. This section details the existing regulations governing seismic safety, the potential for seismic hazards to occur, and the existing soils. Finally, this section prescribes measures for each of the scenarios, where applicable, to comply with existing regulations and ensure potential impacts due to seismic hazards and soil instability are minimized.

3.7.1 Regulatory Setting

3.7.1.1 State

a. Caltrans Highway Design Manual

Roadways in the City of Riverside (City) are designed in accordance with the California Department of Transportation's (Caltrans) Highway Design Manual (HDM; 2012). The HDM establishes uniform policies and procedures to carry out the State highway and other roadway design functions. The HDM sets forth basic design policies, geometric design and structure standards, and pavement engineering considerations. The guidelines and standards established by Caltrans are based on extensive engineering research and field experience.

b. Caltrans Bridge Design Specifications

The intent of the Caltrans Bridge Design Specifications (2000) is to produce integrity of design in bridges. Designs and details for new bridges should address structural integrity by considering the following:

- The use of continuity and redundancy to provide one or more alternative load paths.
- Structural members and bearing seat widths that are resistant to damage or instability.
- External protection systems to minimize the effects of reasonably conceived severe loads.

The Bridge Design Specifications also provide guidance on general features of bridge design, foundation types, and load bearings, amongst other specifications.

Past earthquakes in California have shown the vulnerability of some older structures, designed with non-ductile design standards to earthquake-induced force sand

deformations. As part of the effort to assure public safety during seismic events, Caltrans developed design standards that have furthered the state of practice of earthquake bridge engineering. The Seismic Design Criteria is an encyclopedia of new and currently practiced seismic design and analysis methodologies for the design of new bridges. The Design Criteria prescribes a performance-based approach specifying minimum levels of structural system performance, component performance, analysis, and design practices for bridges.

c. Seismic Hazards Mapping Act

California Geological Survey provides guidance with regard to seismic hazards. Under the Seismic Hazards Mapping Act, seismic hazard zones are identified and mapped to assist local governments in land use planning. The intent is to protect the public from the effects of strong ground shaking, liquefaction, landslides, ground failure, or other hazards caused by earthquakes. In addition, Special Publication 117, Guidelines for Evaluating and Mitigating Seismic Hazards in California, provides guidance for the evaluation and mitigation of earthquake-related hazards for projects within designated zones.

d. Alquist–Priolo Earthquake Fault Zoning Act

The Alquist–Priolo Earthquake Fault Zoning Act of 1972 prohibits the construction of buildings used for human occupancy on active surface faults, which are faults which have ruptured the ground surface in the past 11,000 years (Holocene Time). New habitable building structures must maintain a minimum 50-foot setback from all known active faults. Special Publication 42 (updated 1999) from the California Geological Survey describes Alquist–Priolo Earthquake Fault hazard zones in California. The Project vicinity is not within an Alquist–Priolo Earthquake Fault Zone (Figure 3.7-1).

3.7.1.2 Local

a. City of Riverside General Plan 2025

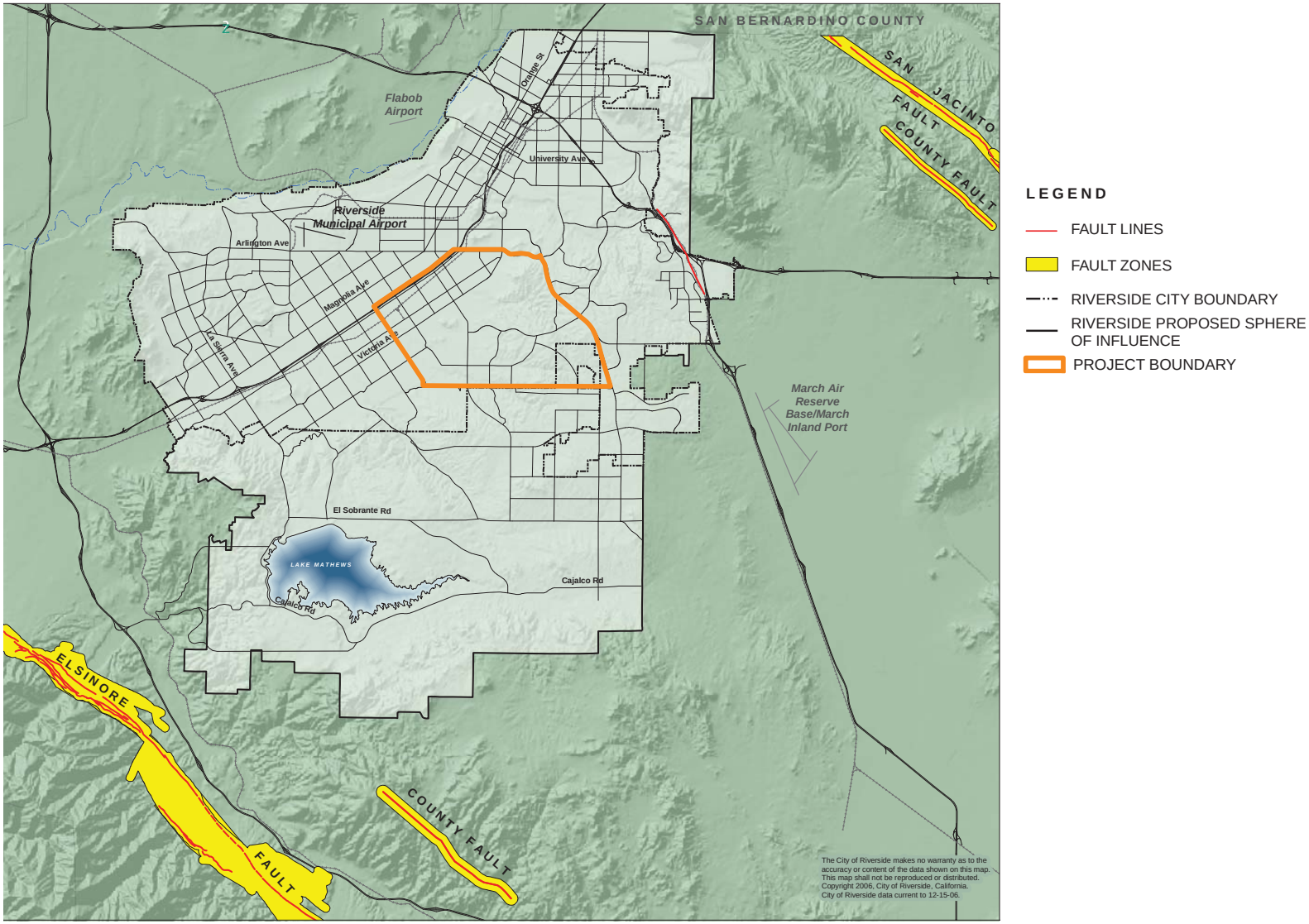
General Plan 2025 contains the following policies related to geological conditions and soils relevant to the Project.

Public Safety Element

Policy PS-1.1: Ensure that all new development in the City abides by the most recently adopted City and State seismic and geotechnical requirements.

Policy PS-1.2 Locate important public facilities of City importance outside of geologically hazardous areas.

Map Source: City of Riverside



LEGEND

- FAULT LINES
- FAULT ZONES
- RIVERSIDE CITY BOUNDARY
- RIVERSIDE PROPOSED SPHERE OF INFLUENCE
- PROJECT BOUNDARY

Miles 2

FIGURE 3.7-1

Regional Fault Zones

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Policy PS-1-4: Use open space easements and other regulatory techniques to prohibit development and avoid creating public safety hazards where geologic instability is identified and cannot be mitigated.

Policy PS-9.8: Reduce the risk to the community from hazards related to geologic conditions, seismic activity, flooding, and structural and wildland fires by requiring feasible mitigation of such impacts on discretionary development projects.

Historic Preservation Element

Policy HP-1.4: The City shall protect natural resources such as geological features, heritage trees, and landscapes in the planning and development review process and in park and open space planning.

b. City of Riverside Municipal Code

Title 17 of the Riverside Municipal Code (RMC) contains the Grading Ordinance, which sets forth rules and regulations placed on grading to control erosion, grading, and earthwork construction, including fills and embankments. One of the purposes of this Code is to regulate grading in a manner that minimizes the adverse effects of grading on natural landforms, soil erosion, dust control, water runoff, and construction equipment emissions.

Specifically, Section 17.28.020 of the RMC applies to any parcel having an average natural slope of 10 percent or greater, or that is located within or adjacent to a delineated arroyo or a blue-line stream identified on United States Geological Survey (USGS) maps. Because the Alessandro Arroyo is defined as an arroyo in Title 17, it is subject to Section 17.28.020. In designated areas, grading must be confined to the minimum amount necessary and the ungraded terrain must be left in its natural form on the remainder of the site. This section also requires the use of contour grading such as rounded and blended slopes; grading that fits into the natural terrain; structures designed to fit with the contours of the hillside; pad size limitations; and grading in blue-line streams limited to the minimum necessary for access or drainage.

Required roads around structures subject to geologic hazards are required to meet the minimum roadway widths of Title 18, the Subdivision Code, and clearance around any structures are reviewed on a case-by-case basis as part of the review of a project.

3.7.2 Environmental Setting

3.7.2.1 Topography and Geology

The City lies within the northern end of the Peninsular Ranges, approximately 12 miles south of the intersection with the Transverse Range. The Santa Ana Mountains are approximately 15 miles south and southwest of the City, while the San Jacinto Mountains are approximately 10 miles east and northeast of the City. The San Bernardino Mountains are about 20 miles north of the City.

A series of hills and small mountains surround the Project vicinity. These hills and mountains are between the two dominant San Jacinto and Santa Ana mountain ranges. They include La Sierra/Norco Hills, Mount Rubidoux, Box Springs Mountains, and the many smaller ranges south of the City. Within the City, surface elevations range from about 700 feet above mean sea level (msl) near the Santa Ana River to over 1,400 feet above msl west of La Sierra.

Mountains and hills typically have slopes of 15 to 50 percent; valley and basin areas usually have slopes of less than 15 percent. The City and much of the hills in the City are made up of granite and adamellite, Mesozoic granitic rock, granodiorite, Mesozoic basic intrusive rocks, and alluvium (located around the Santa Ana River). Most are dated from the Mesozoic period, except for the alluvium, which is dated from the Quaternary period.

Elevation in the Project vicinity ranges from over 1,600 feet above mean sea level at the southeastern boundary to approximately 860 feet above mean sea level northwest of Overlook Parkway. Specifically, Overlook Parkway near the proposed fill crossing ranges from 1,420 to 1,500 feet above mean sea level; Overlook Parkway near the Alessandro Arroyo ranges from approximately 1,360 to 1,420 feet above mean sea level; and for the Proposed C Street ranges from 880 to 1,040 feet above mean sea level.

3.7.2.2 Soils

Figure 3.7-2 shows the soil types within the Project vicinity. Two soil types are mapped in the immediate area of Overlook Parkway between Sandtrack Road and Brittanee Delk Court, which include Cieneba rocky sandy loam, 15 to 50 percent slopes, eroded, and Fallbrook sandy loam, 8 to 15 percent slopes, eroded (U.S. Department of Agriculture [USDA] 1971).

As shown in Figure 3.7-2, five soil types are mapped near the Alessandro Arroyo, including: Cieneba rocky sandy loam, 15 to 50 percent slopes, eroded; Cieneba sandy loam, 15 to 50 percent slopes, eroded; Cieneba sandy loam, 8 to 15 percent slopes,

eroded; Hanford coarse sandy loam, 2 to 8 percent slopes; and Vista coarse sandy loam, 8 to 15 percent slopes, eroded (USDA 1971).

Nine soil types are mapped along the alignment for the Proposed C Street near Washington Street (see Figure 3.7-2), including: Arlington fine sandy loam, 2 to 8 percent slopes; Arlington loam, 2 to 5 percent slopes; Arlington loam, deep, 5 to 15 percent slopes; Bonsall fine sandy loam, 8 to 15 percent slopes; Buren fine sandy loam, 8 to 15 percent slopes, eroded; Delhi fine sand, 2 to 15 percent slopes, wind-eroded; Fallbrook fine sandy loam, shallow, 8 to 15 percent slopes, eroded; Greenfield sandy loam, 2 to 8 percent slopes, eroded; and Vista coarse sandy loam, 15 to 35 percent slopes, eroded (USDA 1971).

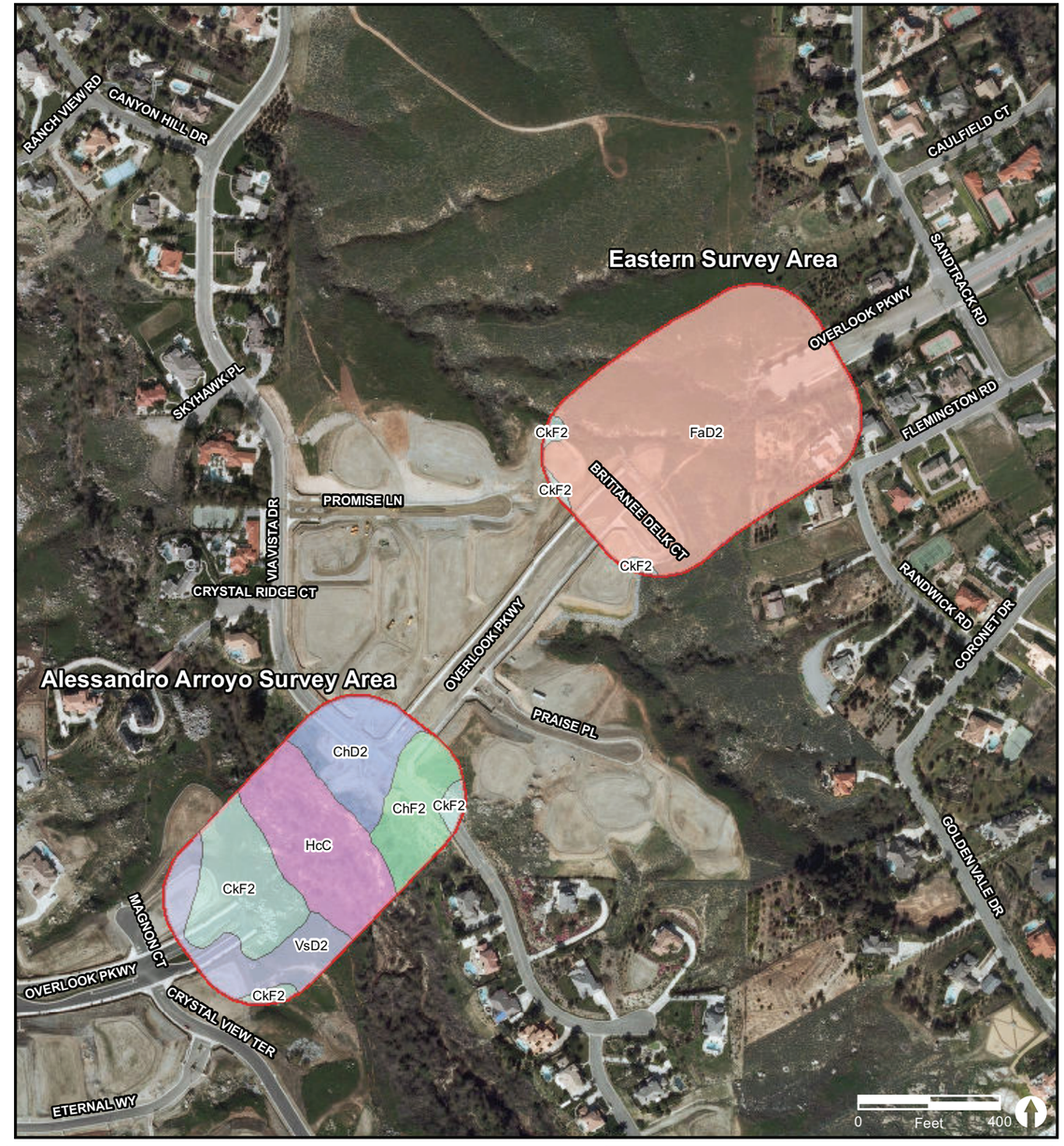
Both Hanford coarse sandy loam and Greenfield sandy loam are alluvial soils often found in drainages and creek beds. Hanford coarse sandy loam is found within the entire Alessandro Arroyo, a well-defined drainage. However, Greenfield sandy loam is found within upland habitats, including non-native grassland and orchard, near Washington Street. The other soil types are typically used for irrigated citrus, dryland grain, pasture, and range purposes (USDA 1971).

TABLE 3.7-1
SOIL TYPES WITHIN EACH PROJECT IMPACT AREA

Soil Type	Erosivity	Permeability	Shrink-Swell Potential	Texture
Eastern Project Impact Area (fill crossing)				
Cieneba	High	Rapid	Low	Gravelly coarse sandy loam
Fallbrook	Moderate	Moderate	Moderate	Sandy loam
Arroyo Project Impact Area (bridge)				
Cieneba	High	Rapid	Low	Gravelly coarse sandy loam
Hanford	Slight to Moderate	Moderately rapid to rapid	Low	Coarse sandy loam
Vista	Moderate	Moderately rapid	Low	Coarse sandy loam, gravelly in places
Western Project Impact Area (Proposed C Street)				
Arlington	Slight to moderate	Moderately slow	Low to Moderate	Loam
Bonsall	High	Very slow	Moderate	Loam
Buren	Slight to Moderate	Moderately slow over very slow	Moderate	Clay loam
Delhi	Water: Slight Wind: High	Rapid	Low	Fine sand and loamy fine sand
Fallbrook	Moderate	Moderate	Moderate	Sandy loam
Greenfield	Slight to Moderate	Moderate	Low	Sandy loam
Vista	Moderate	Moderately rapid	Low	Coarse sandy loam, gravelly in places

Source: U.S Department of Agriculture Soil Conservation Service, *General Soil Map, Riverside and Western Part of Riverside Counties, California*, compiled 1971.

Image Source: City of Riverside, 2009



PIAs

Soils

- AoC - Arlington fine sandy loam, deep, 2 to 8 percent slopes
- ApB - Arlington loam, 2 to 5 percent slopes
- ArD - Arlington loam, deep, 5 to 15 percent slopes
- BdD - Bonsall fine sandy loam, 8 to 15 percent slopes
- BuD2 - Buren fine sandy loam, 8 to 15 percent slopes, eroded
- ChD2 - Cieneba sandy loam, 8 to 15 percent slopes, eroded
- ChF2 - Cieneba sandy loam, 15 to 50 percent slopes, eroded
- CkF2 - Cieneba rocky sandy loam, 15 to 50 percent slopes, eroded
- DaD2 - Delhi fine sand, 2 to 15 percent slopes, wind-eroded
- FaD2 - Fallbrook sandy loam, 8 to 15 percent slopes, eroded
- FkD2 - Fallbrook fine sandy loam, shallow, 8 to 15 percent slopes, eroded
- GyC2 - Greenfield sandy loam, 2 to 8 percent slopes, eroded
- HcC - Hanford coarse sandy loam, 2 to 8 percent slopes
- VsD2 - Vista coarse sandy loam, 8 to 15 percent slopes, eroded
- VsF2 - Vista coarse sandy loam, 15 to 35 percent slopes, eroded

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FIGURE 3.7-2

Soil Types

Expansive soils possess a “shrink–swell” behavior. Shrink-swell is the cyclic change in volume (expansion and contraction) that occurs in fine-grained clay sediments from the process of wetting and drying. Figure 3.7-3 shows the soil types within the Project vicinity that typically possess a shrink–swell behavior. Structural damage may result over an extended period of time, usually the result of inadequate soil and foundation engineering or the placement of structures directly on expansive soils. Typically, soils that exhibit expansive characteristics comprise the upper five feet of the surface. The effects of expansive soils could damage foundations of above-ground structures, paved roads and streets, and concrete slabs. Expansion and contraction of soils, depending on the season and the amount of surface water infiltration, could exert enough pressure on structures to result in cracking, settlement, and uplift.

3.7.2.3 Seismic Hazards

a. Fault Rupture

The City is located in a region with several active fault lines. As shown in Figure 3.7-1, the San Andreas Fault is at its closest point approximately 11 miles from the Project vicinity, abutting the San Bernardino Mountains. The San Andreas Fault extends 600 miles from Eureka in northern California’s Humboldt County south to the Mexican border. The San Andreas Fault is estimated to have the capability of producing up to an 8.3 magnitude earthquake. The San Jacinto fault runs more than 125 miles, from northwest of El Centro in Imperial County to northwest of San Bernardino, passing through the intersection of Interstates 10 and 215, the City of Loma Linda, and the Box Springs Mountains. This fault is estimated to have the capability of producing up to a 7.0 magnitude earthquake. The Elsinore fault runs approximately four miles west of Lake Mathews and Corona and south into the City of Lake Elsinore. This northwest-southwest trending fault is estimated to have the capability of producing up to a 6.0 magnitude earthquake.

b. Ground Shaking

The Project vicinity, like all of southern California, could be subject to ground acceleration and seismic shaking in the event of an earthquake centered on a major regional fault. Seismic activity poses two types of hazards: primary and secondary. Primary hazards include ground rupture, ground shaking, ground displacement, and subsidence and uplift from earth movement. Primary hazards can induce secondary hazards such as ground failure (lurch cracking, lateral spreading, and slope failure), liquefaction, movement on nearby faults (sympathetic fault movement), dam failure, and fires. Potential seismic hazards affecting the Project vicinity include ground shaking, ground failure, and liquefaction. Seismic shaking is the geological hazard that has the greatest potential to impact the Project vicinity, given that the area is located near several significant faults that have the potential to cause moderate to large earthquakes.

The regulations discussed above outline engineering measures and design features for roadways and roadway bridges that reduce hazards associated with ground shaking.

c. Ground Failure

The major geologic hazards associated with ground shaking include liquefaction and ground failure. Liquefaction occurs when ground shaking causes water-saturated soils to become fluid and lose strength. The City is underlain by areas susceptible to varying degrees of liquefaction, ranging from moderate to very high. Figure 3.7-4 shows the liquefaction zones within the Project vicinity. Within the City, the four primary liquefaction areas include the area along the Santa Ana River, a broad area south and west of the Riverside Municipal Airport, a portion in western Riverside spanning La Sierra Avenue, and a smaller area along the City's southern boundary. According to the Riverside County Land Information System (2012; see Figure 3.7-4), none of the Project Impact Areas (PIAs) are within a high liquefaction zone. Subsidence hazards involve either the sudden collapse of the ground to form a depression or the slow compaction of the sediments near the Earth's surface. As shown in Figure 3.7-5, the entire Western PIA is located in an area that is susceptible to subsidence.

d. Landslides

A few areas of the City could be prone to seismically induced landslides and rockfalls. Some areas in western Riverside have susceptibility to seismically induced landslides and rock falls, ranging from low to locally moderate to high. In addition, some areas in northeastern Riverside are designated with low to locally moderate susceptibility to seismically induced landslides and rockfalls. Seismically induced landslides and rockfalls are common during large earthquakes. Structures located below a hazard area could be subject to damage. Large boulders dislodged from high steep slopes may travel as far as 40 to 80 feet from the slope across adjacent, gently sloping surfaces.

3.7.3 Significance Determination Thresholds

Based on Appendix G of the California Environmental Quality Act (CEQA) Guidelines, impacts related to geology and soils would be significant if the proposed Project would:

1. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving
    - Strong seismic ground shaking;
    - Seismic-related ground failure, including liquefaction; or
    - Landslides;

Image Source: City of Riverside, 2009

PIAs
Permanent Impacts
Temporary Impacts
Vacated Roads
Soils with High Shrink-Swell Potential:
BdD – Bonsall fine sandy loam, 8 to 15 percent slopes

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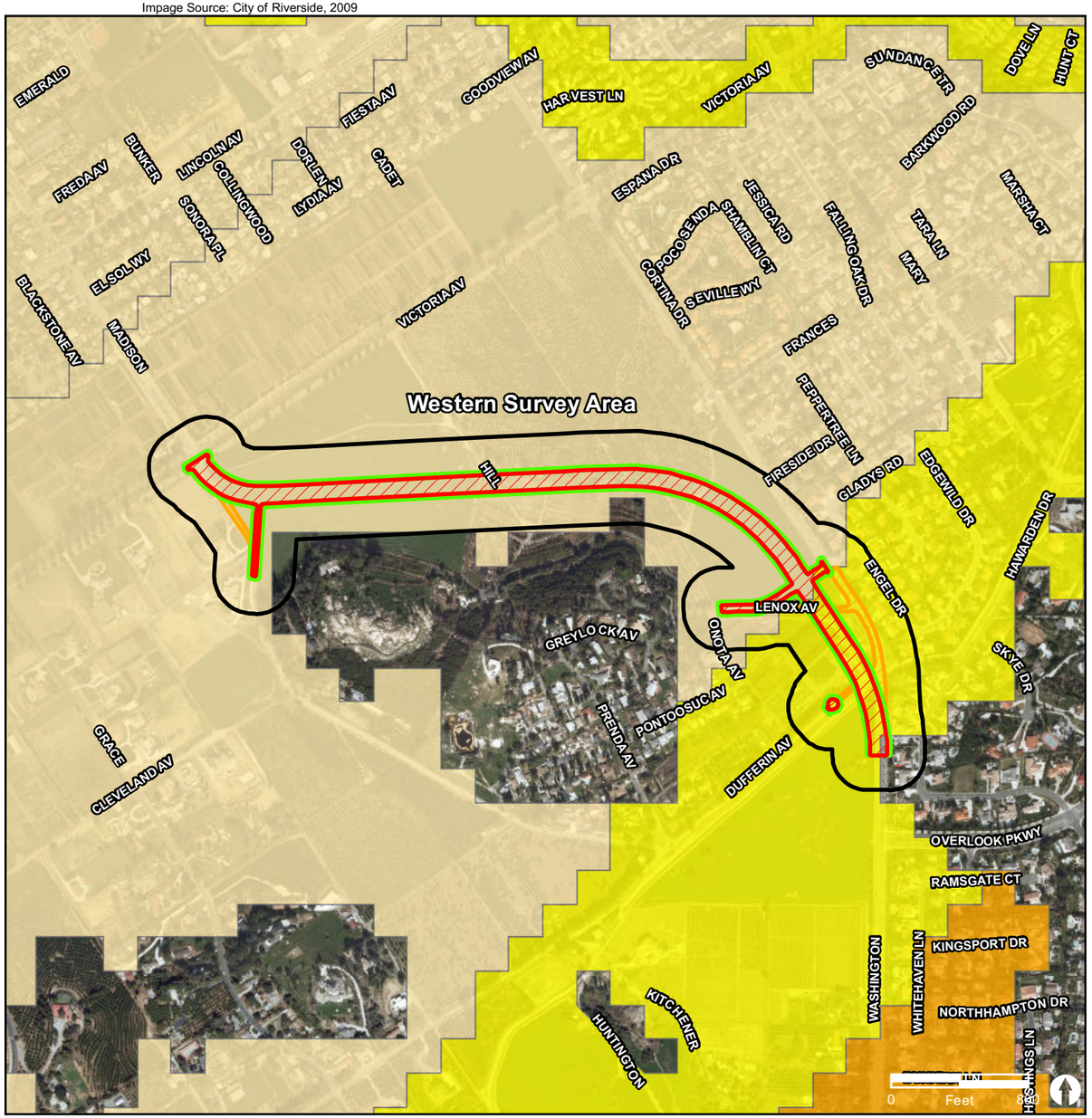
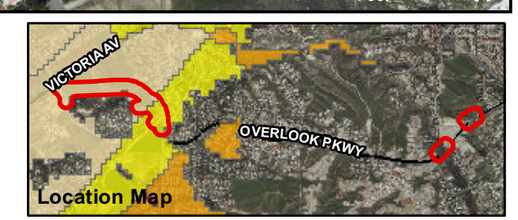
FIGURE 3.7-3

Soils with High Shrink-Swell Potential

Impage Source: City of Riverside, 2009





PIAs
Permanent Impacts
Temporary Impacts
Vacated Roads

Liquefaction Zones
Low
Moderate
High

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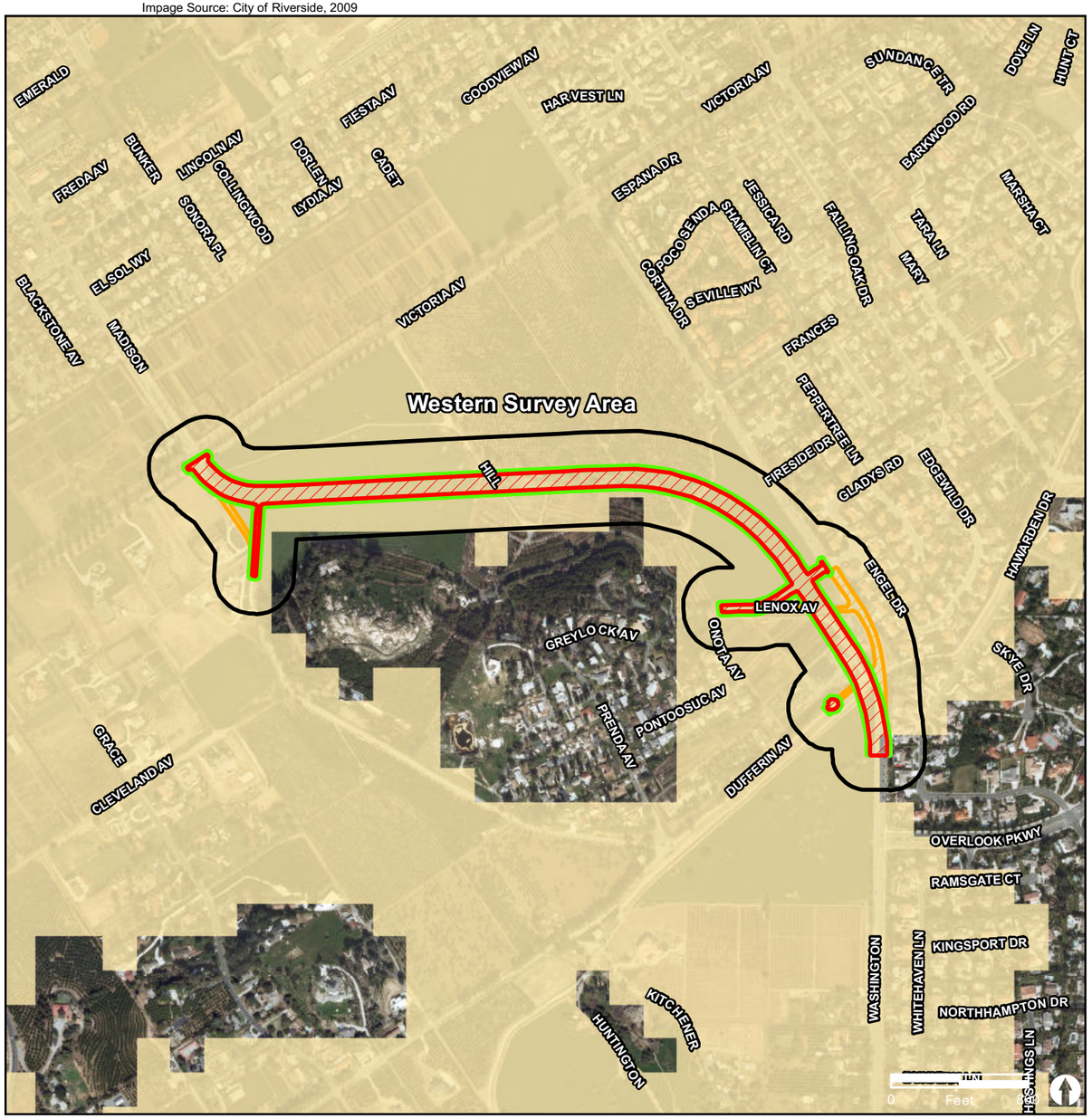
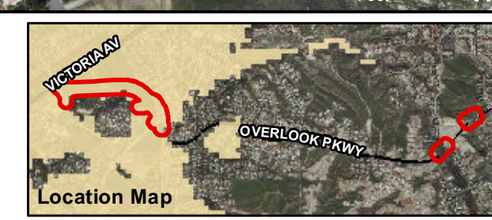
FIGURE 3.7-4

Liquefaction Zones

Impage Source: City of Riverside, 2009





PIAs
Permanent Impacts
Temporary Impacts
Vacated Roads
Subsidence Zones

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FIGURE 3.7-5

Subsidence Zones

2. Result in substantial soil erosion or the loss of topsoil;

3. 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;

4. 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.

As discussed in the Initial Study Checklist (Appendix B), the proposed Project would have no impact in regard to the following criteria and thus will not be addressed further in this section:

- 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 (refer to Division of Mines and Geology Special Publication 42);

- 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 waste water (refer to Section 7.0, Effects Found Not To Be Significant).

3.7.4 Issue 1: Seismic Hazards

Would the proposed Project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure (including liquefaction), or landslides?

3.7.4.1 Impact Analysis

Scenario 1

Under Scenario 1, both Crystal View Terrace and Green Orchard Place gates would remain in place and be closed until Overlook Parkway is connected across the Alessandro Arroyo and to Alessandro Boulevard. No construction or ground-disturbing activities would occur under Scenario 1. The gates are currently in place and would remain; therefore, people or structures would not be exposed to potential seismic hazards beyond what currently exists. **No impact** would occur.

Scenario 2

Under Scenario 2, the gates at both Crystal View Terrace and Green Orchard Place would be removed, and there would be no connection of Overlook Parkway across the Alessandro Arroyo and to Alessandro Boulevard. Like Scenario 1, no construction would occur under Scenario 2, as the removal of the gates does not involve construction equipment. Removing the gates is a minor procedure that would occur within the City's right-of-way, and which would not expose people or structures to potential seismic hazards beyond what currently exists. **No impact** would occur.

Scenario 3

Under Scenario 3, the gates at Crystal View Terrace and Green Orchard Place would be removed and Overlook Parkway would be connected across the Alessandro Arroyo and to Alessandro Boulevard through construction of a fill crossing and a bridge. In addition, storm drains, water lines, and gas and electric power lines would be extended to tie into existing lines concurrent with roadway construction. Temporary construction activities would occur within a construction easement on either side of the proposed roadways.

a. Faulting

The areas of the fill crossing and bridge are not crossed by a known active fault. However, like all of southern California, there is a potential for strong ground shaking as a result of their proximity to nearby active fault zones. The fault zones, specifically the San Jacinto fault zone (approximately nine miles to the northeast) and the Elsinore fault zone (12 miles to the southwest), have the potential to cause moderate to large earthquakes that would cause intense ground shaking in their vicinity. Although the construction and roadway connections are located in a seismically active area, there is no unusual or heightened seismic risk comparative to the Riverside region.

b. Strong Seismic Ground Shaking

Unlike impacts from fault rupture, which are limited to the immediate area of the fault zone where the fault breaks along the surface, damage from ground shaking can occur at great distances from the fault. The fill crossing would conform to the Caltrans HDM and additional standard roadway design features used by the City. The bridge has been preliminarily designed to conform to the Caltrans' Bridge Design Specifications. These regulations provide detailed guidance for the preliminary and final designs of roadways, bridge foundations, and all structural components. The foundation design of the roadway bridge would be developed using the latest analytical methods and applicable codes to ensure that ground shaking issues are fully addressed within the design. Adherence to these regulations would ensure that seismic hazards related to ground shaking would be **less than significant.**

c. Seismic-related Ground Failure

Seismic-related ground failure can result in phenomena such as liquefaction or subsidence. Liquefaction occurs when ground shaking causes water-saturated soils to become fluid and lose strength. Subsidence hazards involve either the sudden collapse of the ground to form a depression or the slow compaction of the sediments near the Earth's surface. As shown in Figures 3.7-4 and 3.7-5, the fill crossing and bridge are not proposed within a liquefaction or subsidence zone. Final design for Project components proposed under this scenario would require subsurface exploration of the soils. Implementation of standard engineering practices would ensure impacts related to seismic-related ground failure would be avoided. Specifically, the City would be required to demonstrate conformance with the Caltrans HDM and Bridge Design Specifications, which provide detailed guidance for the preliminary and final designs of roadways, bridge foundations, and all structural components. This would ensure that potential impacts associated with seismic-related ground failure—including liquefaction and subsidence—would be **less than significant.**

d. Landslides

Slope stability (landslide) hazards typically occur where buildout is proposed on or adjacent to steep slopes underlain by weak geologic units. There are no steep slopes (15–30 percent) within the area proposed for the fill crossing.

The Alessandro Arroyo, however, contains naturally vegetated slopes that range from 10 to 30 percent. Compliance with the standards in the Caltrans HDM and Bridge Design Specifications would require an assessment of hazards related to landslides and the incorporation of additional design measures into structures. In addition, the Municipal Code requires provisions to grading and development on or near hillsides. The bridge includes retaining walls at the north and south abutments to secure the bridge structure. In addition, revegetation of areas temporarily disturbed by construction activities would also serve to stabilize surface soils on the slopes. Compliance with existing regulations, such as the Caltrans HDM and Bridge Design Specifications, would ensure that landslide impacts would be **less than significant.**

Scenario 4

Under Scenario 4, both Crystal View Terrace and Green Orchard Place gates would be removed and Overlook Parkway would be connected east across the Alessandro Arroyo and to Alessandro Boulevard. In addition, the Proposed C Street would be constructed west of Washington Street to provide a connection to SR-91. The scenario is required to conform to the Caltrans HDM and the City’s Grading Ordinance, which include standards to protect structures, including roadways. As discussed above, impacts from construction of the fill crossing and bridge would be **less than significant**.

a. Faulting

The alignment for the Proposed C Street would not be crossed by a known active fault; however, this area has potential to be affected by strong ground shaking as a result of its proximity to nearby active fault zones. The fault zones, specifically the San Jacinto fault zone (11 miles to the northeast) and the Elsinore fault zone (approximately 11 miles to the southwest), have the potential to cause moderate to large earthquakes that would cause intense ground shaking in their vicinity.

b. Strong Seismic Ground Shaking

The Proposed C Street would be required to conform to the Caltrans HDM and additional standard roadway design features used by the City. The Project is required to conform to these regulations that require roadways to withstand the effects of ground shaking. Therefore, impacts would be **less than significant.**

c. Seismic-related Ground Failure

As shown in Figures 3.7-4 and 3.7-5, the alignment for the Proposed C Street would be located within a low and moderate liquefaction potential zone. This is also an area that is susceptible to subsidence. The Caltrans HDM provides detailed guidance for the preliminary and final designs of roadways. Final design for the roadway proposed under this scenario would require subsurface exploration of the soils in detail. Implementation of standard engineering practices would ensure that impacts related to seismic-related ground failure would be avoided. Specifically, the City would be required to demonstrate conformance with the Caltrans HDM and Bridge Design Specifications, which provide detailed guidance for the preliminary and final designs of roadways, bridge foundations, and all structural components. This would ensure that potential impacts associated with seismic-related ground failure—including liquefaction and subsidence—would be **less than significant.**

d. Landslides

The Western PIA contains slopes that range from 10 percent to 30 percent. As detailed above, compliance with the standards in the Caltrans HDM would require the incorporation of additional design measures into structures to mitigate potential landslide hazard if development were considered feasible. The final design of the Proposed C Street would be required to conform to the Caltrans HDM. Construction activities would conform to Section 17.28.020 of the Grading Code in the Municipal Code, which applies to any land having an average natural slope of 10 percent or greater or within a designated arroyo. Grading would be confined to the minimum amount necessary and the ungraded terrain would be left in its natural form on the remainder of the site. Compliance with existing regulations, such as the Caltrans HDM would ensure that landslide impacts would be **less than significant.**

Off-site

Mitigation measures are identified in the Traffic/Transportation section of this EIR (see Section 3.11.4.3). These consist of improvements such as changing a two-way stop controlled intersection to a four-way stop control, installing traffic signals, changing traffic signal operations, and adding new or additional right- or left-turn lanes. These improvements would have **no impact** on risks associated with rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure (including liquefaction), or landslides.

3.7.4.2 Significance of Impacts

Scenarios 1 and 2 would not involve construction or expose people or structures to potential seismic hazards beyond what currently exists. No impact would occur.

As with most of southern California, roadways proposed under Scenarios 3 and 4 have the potential to be affected by strong ground shaking and associated seismic hazards as a result of their proximity to nearby active fault zones. The final design of the fill crossing and roadway bridge would be required to meet specifications of the Caltrans (specifically the HDM, Bridge Design Specifications, and Seismic Design Criteria), and additional standard roadway design features used by the City. Compliance with existing regulations would ensure that potential impacts associated with seismic hazards would be less than significant.

No impacts would occur from implementation of off-site improvements.

3.7.4.3 Mitigation, Monitoring, and Reporting

No mitigation is required.

3.7.5 Issue 2: Soil Erosion

Would the proposed Project result in substantial soil erosion or the loss of topsoil?

3.7.5.1 Impact Analysis

Scenario 1

Under Scenario 1, both Crystal View Terrace and Green Orchard Place gates would remain in place. No ground disturbing activities are proposed; therefore, no soil erosion or loss of topsoil would occur. **No impact** would occur.

Scenario 2

Under Scenario 2, both gates at Crystal View Terrace and Green Orchard Place would be removed. This is a minor procedure to be conducted within the City's right-of-way adjacent to the curb. Removing the support poles would not result in any soil erosion or the loss of topsoil. **No impact** would occur.

Scenario 3

Under Scenario 3, the gates at Crystal View Terrace and Green Orchard Place would be removed and Overlook Parkway would be connected. The potential for on- or off-site erosion due to the construction and operation of the fill crossing and bridge could occur due to construction activities associated with this scenario. As discussed in Section 3.5 (Drainage, Hydrology, and Water Quality), construction activities would be required to comply with the National Pollutant Discharge Elimination System (NPDES) Construction General Permit. Per this permit, the City and/or contractor would be required to submit a Notice of Intent (NOI) to the State Water Resources Control Board (SWRCB) and prepare a Storm Water Pollution Prevention Plan (SWPPP) detailing the storm water management and erosion and sediment control Best Management Practices (BMPs) that would be utilized on the construction site. A Construction Site Monitoring Program (CSMP) would also be prepared, in accordance with requirements set forth in the Construction General Permit. Implementation of the SWPPP and CSMP would be subject to inspection and enforcement by the Regional Water Quality Control Board (RWQCB). Erosion and sediment control BMPs would be detailed in the SWPPP. In addition, the final design of this scenario would include recommendations for grading, including unsuitable soil removal and compaction requirements. Activities associated with this scenario would not result in substantial soil erosion or the loss of topsoil. Conformance with these plans would ensure that impacts would be **less than significant**.

Scenario 4

Under Scenario 4, both Crystal View Terrace and Green Orchard Place gates would be removed and Overlook Parkway would be connected. In addition, the Proposed C Street would be constructed west of Washington Street to provide a connection to SR-91. As discussed above, construction and operation of the fill crossing and bridge would not result in substantial soil erosion or the loss of topsoil.

The construction and operation of the Proposed C Street could result in on- or off-site erosion. However, the Proposed C Street would be subject to the same requirements as the fill crossing and bridge, as discussed above. The City and/or contractor would prepare a SWPPP that would detail the erosion and sediment control BMPs that would be utilized on the construction site. Therefore, the Proposed C Street would not result in

substantial soil erosion or the loss of topsoil. Impacts would therefore be **less than significant**.

Off-site

Mitigation measures identified in the Traffic/Transportation section of this Draft Environmental Impact Report (DEIR) (see Section 3.11.4.3), such as signalization, restriping, and repaving for additional turn lanes at key intersections are required in previously developed areas and would have **no impact** on erosion or the loss of topsoil.

3.7.5.2 Significance of Impacts

Scenarios 1 and 2 would not result in any soil erosion or the loss of topsoil. No impact would occur.

Compliance with the NPDES Construction General Permit would require the preparation of a SWPPP that would detail the erosion and sediment control BMPs that would be utilized on each construction site for the fill crossing and bridge for Scenarios 3 and 4, and additionally the Proposed C Street for Scenario 4. Impacts would be less than significant.

There would be no impacts from off-site improvements.

3.7.5.3 Mitigation, Monitoring, and Reporting

No mitigation is required.

3.7.6 Issue 3: Geologic Stability and Expansive Soils

Would the proposed 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 landslide, lateral spreading, subsidence, liquefaction, or collapse; or 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?

3.7.6.1 Impact Analysis

Scenario 1

Under Scenario 1, both Crystal View Terrace and Green Orchard Place gates would remain in place. This would not result in geologic hazards, nor create substantial risks to life or property. **No impact** would occur.

Scenario 2

Under Scenario 2, both gates at Crystal View Terrace and Green Orchard Place would be removed. This would not result in geologic hazards, nor create substantial risks to life or property. **No impact** would occur.

Scenario 3

Under Scenario 3, the gates at Crystal View Terrace and Green Orchard Place would be removed and Overlook Parkway would be connected.

No expansive soil types were mapped in the area proposed for roadway connections (see Figure 3.7-3). All work would be required to comply with standards set by the Caltrans HDM, Bridge Design Specifications, and the Municipal Code. Final design for this scenario would require subsurface exploration of the soils in detail. Implementation of standard engineering practices would ensure that impacts related to expansive soils would be avoided. Specifically, the City would be required to demonstrate conformance with the Caltrans HDM and Bridge Design Specifications. Upon reviewing the results of the proposed exploration, the appropriate engineering solution would be applied (if necessary). Compliance with existing regulations and the incorporation of engineering measures during the final design stages (if necessary) would ensure that impacts associated with expansive soils would be **less than significant**.

Scenario 4

Under Scenario 4, both Crystal View Terrace and Green Orchard Place gates would be removed, Overlook Parkway would be connected, and the Proposed C Street would be constructed. As discussed above, because work for the proposed fill crossing and bridge would not be located on soils that are unstable or expansive, impacts would be **less than significant**.

Expansive soils possess a shrink–swell behavior, have high clay content, and often exhibit a relatively high potential to expand when saturated and to contract when dried out. Soils in the area of Proposed C Street include mainly sandy loam soil types typically used for agriculture. Expansive soil types (as identified in the General Plan 2025 and reproduced as Figure 3.7-3) include Bonsall (fine sandy loam). However, this soil type is located within the temporary impact area for this scenario, and the Proposed C Street would not be constructed on the Bonsall soil type.

Furthermore, work performed for construction of proposed C Street would be required to comply with standards set by the Caltrans HDM, Bridge Design Specifications, and Municipal Code. As there are no expansive soils within these PIAs, and all proposed work would be required to comply with existing regulations, impacts would be **less than significant**.

Off-site

The Traffic/Transportation section of this EIR (see Section 3.11.4.3) identifies mitigation measures such as adding stop signs, signals, and turn lanes at key intersections. These improvements would not be of a level or depth that would affect expansive soils, if present. **No impacts** are identified.

3.7.6.2 Significance of Impacts

Scenarios 1 and 2 involve activities that would only require roadway restriping and repaving in previously developed areas. These actions would not result in geologic hazards, nor create substantial risks to life or property. No impact would occur.

There are no expansive soil types in the PIAs associated with Scenario 3. There is one expansive soil type within the PIA of Scenario 4; however, this is only within the temporary work area that would be used during construction of the road. The Proposed C Street would not be located on an expansive soil type. Additionally, both scenarios would be required to comply with existing regulations that specify design measures and additional requirements concerning expansive soils. Impacts would be less than significant.

No impacts associated with off-site improvements would occur.

3.7.6.3 Mitigation, Monitoring, and Reporting

No mitigation is required.

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