4.7 Geology/Soils

This section analyzes potentially significant impacts related to geology and soils that could result from implementation of the project, which consists of the 2021 General Plan Update (GPU), Housing Element Update, and Climate Action Plan. The analysis area covers the entire city of Moreno Valley (city) and sphere of influence, which are collectively referred to as the Planning Area. This analysis relies on secondary source information including but not limited to soils data from the California Geological Survey and United States Geological Survey fault and geologic mapping.

4.7.1 Existing Conditions

The city lies in the northern portion of the Peninsular Ranges Physiographic Province of California, at the eastern margin of a structural block known as the Perris Block. This structural block is a mass of granitic rock, generally bound by the San Jacinto Fault, the Elsinore Fault, and the Santa Ana River. The Perris Block has been vertically uplifted several thousand feet. The granitic mountain areas of the Perris Block, including the Box Springs Mountains and the Mount Russell area, are underlain primarily by quartz diorite bedrock. The area is characterized by many rock outcrops and large weathered boulders.

The geologic and seismic setting of Planning Area is dominated by the proximity of the Holocene-active San Jacinto Fault, which traverses the northeastern and eastern city limits (Figure 4.7-1). The potential for major earthquake damage throughout the Planning Area is from activity along this fault zone (Moreno Valley 2006a).

4.7.1.1 Surface Rupture

The Planning Area is located within the seismically active southern California region. Earthquakes resulting from fault movement can result in surface rupture along an active or potentially active fault. The State of California has identified faults that represent a hazard of surface rupture as Alquist-Priolo earthquake fault zones. As shown in Figure 4.7-1, the San Jacinto fault zone, which has been categorized as an Alquist-Priolo earthquake fault zone, traverses the northeastern and eastern boundary of the Planning Area. The San Jacinto fault zone is composed of several parallel faults that together constitute the zone. There are three branches of the San Jacinto Fault in the southeast corner of the study area. The western branch is sometimes referred to as the Casa Loma Fault; the eastern branch, the Claremont Fault. The Farm Road Fault was identified in 1992 in the southeastern portion of the study area. The Casa Loma Fault within the city limits is not identified as an Alquist-Priolo earthquake fault zone. Insufficient information is available to determine if the fault is active (Moreno Valley 2006a).

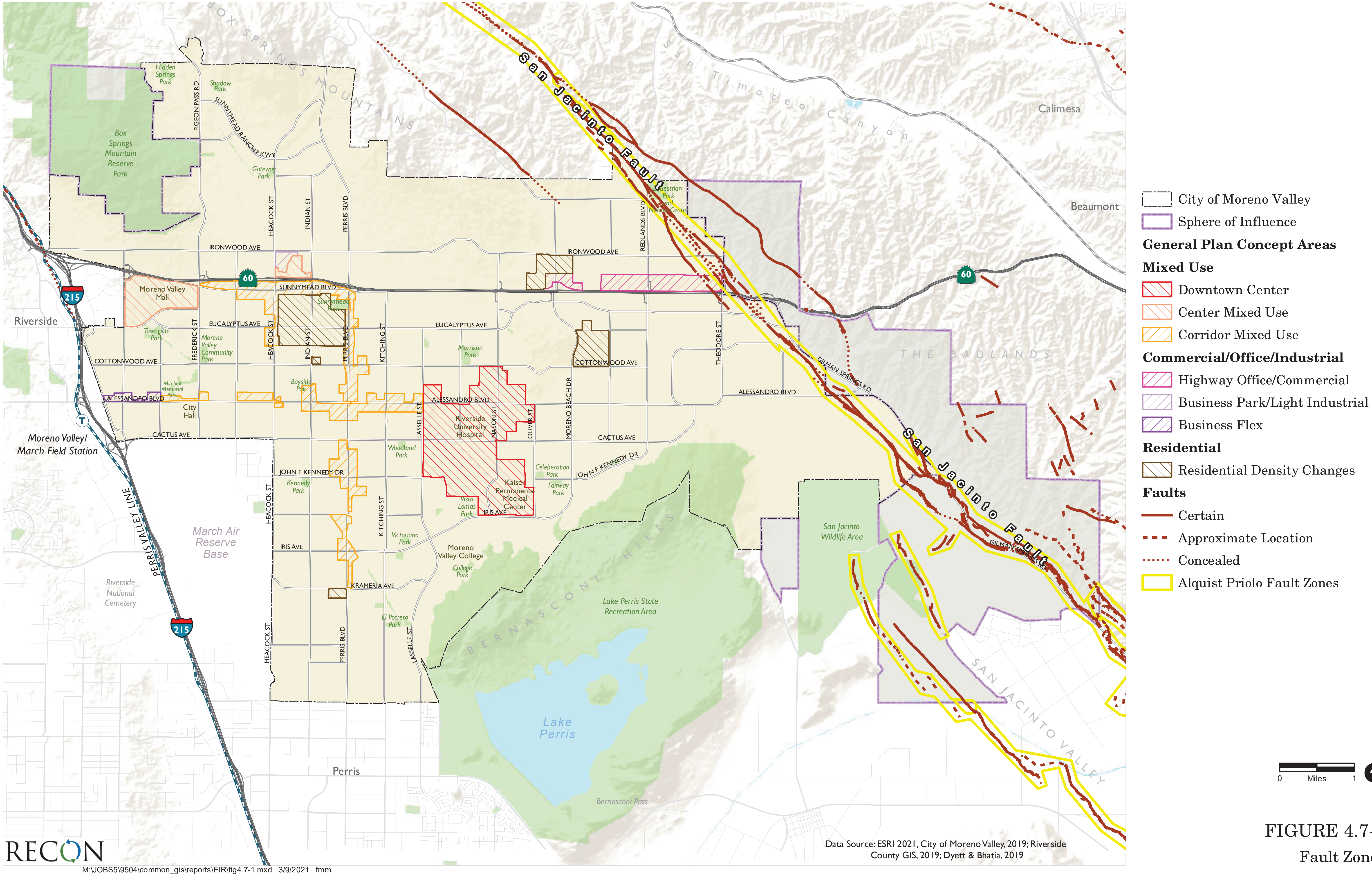

FIGURE 4.7-1

Fault Zones

4.7.1.2 Ground Shaking

Ground shaking is the effect of surface motion generated by an earthquake that results in the vast majority of damage during seismic events. Several factors control how ground motion interacts with structures, making the hazard of ground shaking difficult to predict. Seismic waves propagating through the Earth's crust are responsible for the ground vibrations normally felt during an earthquake. Structures throughout the Planning Area could be affected by ground shaking during a seismic event associated with the San Jacinto fault zone. Additionally, seismic events associated with the active San Andreas Fault located approximately 15 miles northeast and the active Elsinore Fault located approximately 17 miles southwest could also generate ground shaking within the Planning Area.

4.7.1.3 Liquefaction

Liquefaction is a seismic phenomenon in which loose, saturated, granular soils behave similarly to a fluid when subject to high -intensity ground shaking. Liquefaction occurs when three general conditions exist: (1) shallow groundwater; (2) low -density non-cohesive (granular) soils; and (3) high -intensity ground motion. Liquefaction is typified by a buildup of pore-water pressure in the affected soil layer to a point where a total loss of shear strength occurs, causing the soil to behave as a liquid. Studies indicate that saturated, loose to medium dense, near surface cohesionless soils exhibit the highest liquefaction potential, while dry, dense, cohesionless soils and cohesive soils exhibit low to negligible liquefaction potential.

Figure 4.7-2 presents liquefaction susceptibility classifications throughout the Planning Area, and Table 4.7-1 presents the acreage of land within the Planning Area designated under each liquefaction susceptibility classification. As shown in Figure 4.7-2, the majority of the Planning Area is classified as having low or moderate potential for liquefaction susceptibility. Small amounts of land within the western and southern portion of the Planning Area are classified as having high potential for liquefaction susceptibility, and a small amount of land along the southern border is classified as having very high potential for liquefaction susceptibility. However, geotechnical analysis completed for recent site-specific projects located within the area identified as having a high liquefaction potential north of Cactus Avenue did not identify any soils within the proposed footprints with high potential for liquefaction.

Table 4.7-1
Liquefaction Susceptibility Classification Acreages

Row Labels	Acres	Percent
Very High	38.01	0.09%
High	625.44	1.46%
Moderate	14,204.81	33.10%
Low	16,026.75	37.34%
Very low	649.33	1.51%
No Rating	11,372.66	26.50%
TOTAL	**42,917.00**	**100.00%**

SOURCE: Riverside County GIS 2019.

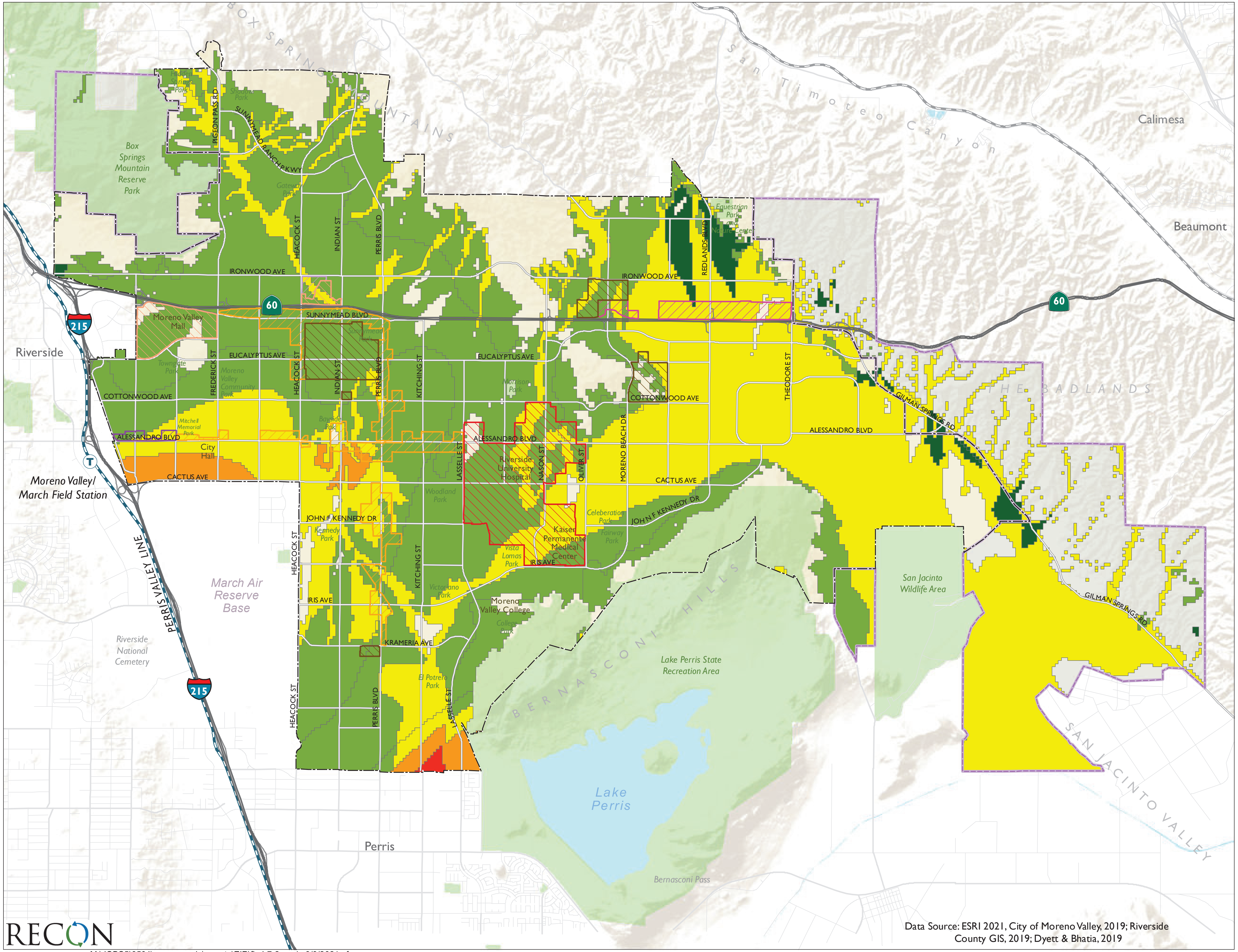

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FIGURE 4.7-2
Liquefaction

4.7.1.4 Soil Stability and Landslides

Five soil associations occur within the Planning Area. The five soil types are: Monserate Arlington-Exeter; Hanford-Tujunga-Greenfield; Cieneba-Rock Land-Fallbrook; San Emigdio-Grangeville-Metz; and the Badlands-San Timoteo. Each is briefly described below.

Monserate-Arlington-Exeter. This soil association is found adjacent to and within the eastern half of the March Air Reserve Base. It consists of well-drained soils that developed in alluvium from predominantly granitic materials. Soil stability is considered fair to good with minimal erosion potential.

Hanford-Tujunga-Greenfield. This soil association is found within the central portion of the study area, generally extending northeast to southeast of March Air Reserve Base. It consists of well drained to somewhat excessively drained soils, developed in granitic alluvium. Soil stability is considered poor to fair with significant erosion potential.

Cieneba-Rock Land-Fallbrook. This soil association is found on uplands located in the Box Springs Mountains area, and extends east to Reche Canyon, and into the Mount Russell area. It consists of somewhat excessively drained soils on undulating steep slopes. Soil stability is generally considered fair with marginal potential for erosion.

San Emigdio-Grangeville-Metz. This soil association is found along the western side of Gilman Springs Road. It consists of well-drained soils on nearly level to steep slopes. Soil stability is considered poor to fair with significant potential for erosion.

Badlands-San Timoteo. This soil association is found along the northern portion of Gilman Springs Road into the Badlands region. It consists of well-drained soils on steep to very steep slopes. The soils are variable consisting of soft sandstone, siltstone, and beds of gravel. Soil stability is considered poor to fair with significant potential for erosion.

The primary factors that determine an area's susceptibility to slope instability are the underlying geologic and soils characteristics. As described, some of these soils have poor to fair stability and are considered to be potentially expansive. Expansive soils are prone to collapse and are commonly associated with wind-laid sands and silts, and alluvial fan and mudflow sediments deposited during flash floods. For example, the abundant shales and siltstones underlying the Badlands are highly porous and do not hold together well when wet, which can lead to slope instability and landslides. Secondary factors contributing to slope instability and landslides include rainfall and earthquakes.

Landslides occur when masses of rock, earth, or debris move down a slope, including rock falls, deep failure of slopes, and shallow debris flows. Landslides are influenced by human activities such as grading and other construction activities, irrigation of slopes, mining activity, and by natural factors such as precipitation, geology/soil types, surface/subsurface flow of water, and topography. Frequently, they may be triggered by other hazards such as floods and earthquakes. The majority of the city is relatively flat and has been assigned a landslide susceptibility class of III (Low Risk) by the California Geological Survey

(Figure 4.7-3). However, some areas within the northern, northeastern, and southeastern portions of the Planning Area have been assigned landslide susceptibility class ranging from V (Moderate Risk) to X (High Risk). Some areas within the central portion of the city have also been assigned a landslide susceptibility class ranging from V (Moderate Risk) to X (High Risk).

4.7.1.5 Paleontological Resources

Figure 4.7-4 presents the paleontological sensitive ratings for soils located within the Planning Area. Sensitivity ratings are based on the California Department of Transportation Standard Environmental Reference guidelines for paleontology, which classifies geologic units and formations as having high, low, or no potential for paleontological resources (Caltrans 2017). Sensitivity is also based on depth of excavation. Some geologic units and formations have low potential at a depth of excavation ranging from 0 to 10 feet, but have high sensitivity when the depth of excavation exceeds 10 feet.

4.7.2 Applicable Regulatory Requirements

4.7.2.1 State Regulations

a. Earthquake Fault Zoning Act (Alquist-Priolo Act)

The State of California Alquist-Priolo Earthquake Fault Zoning Act (1972) was established to mitigate the hazard of surface faulting to structures for human occupancy. Pursuant to the act, the state geologist has established regulatory zones (known as earthquake fault zones) around surface traces of active faults. These have been mapped for affected cities, including Moreno Valley. Application for a development permit for any project within a delineated earthquake fault zone shall be accompanied by a geologic report, prepared by a geologist registered in the state of California, that is directed to the problem of potential surface fault displacement through a project site.

b. Seismic Hazard Mapping Act

The Seismic Hazard Mapping Act (SHMA) was adopted by the state in 1990 to protect the public from the effects of nonsurface fault rupture earthquake hazards, including strong ground shaking, liquefaction, seismically induced landslides, ground amplification or other ground failure caused by earthquakes. The goal of the act is to minimize loss of life and property by identifying and mitigating seismic hazards. The California Geological Survey (CGS) is the primary agency responsible for the implementation of the SHMA. The CGS prepares maps identifying seismic hazard zones and provides them to local governments, which include areas susceptible to amplified shaking, liquefaction, earthquake-induced landslides, and other ground failures. SHMA requires responsible agencies to only approve projects within these zones following a site-specific investigation to determine if the hazard is present, and if so, the inclusion of appropriate mitigation(s). In addition, the SHMA requires real estate sellers and agents at the time of sale to disclose whether a property is within one of the designated seismic hazard zones.

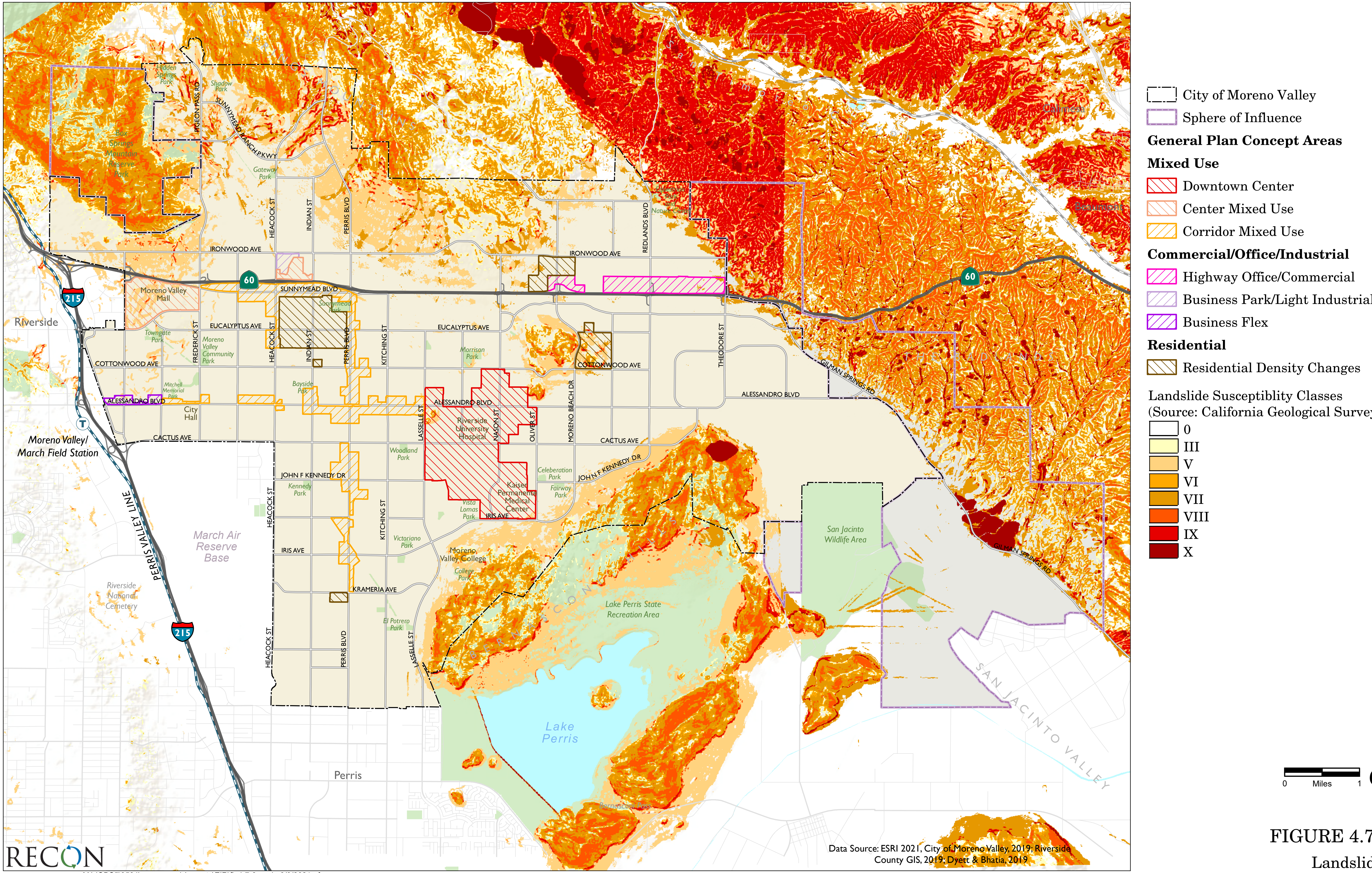
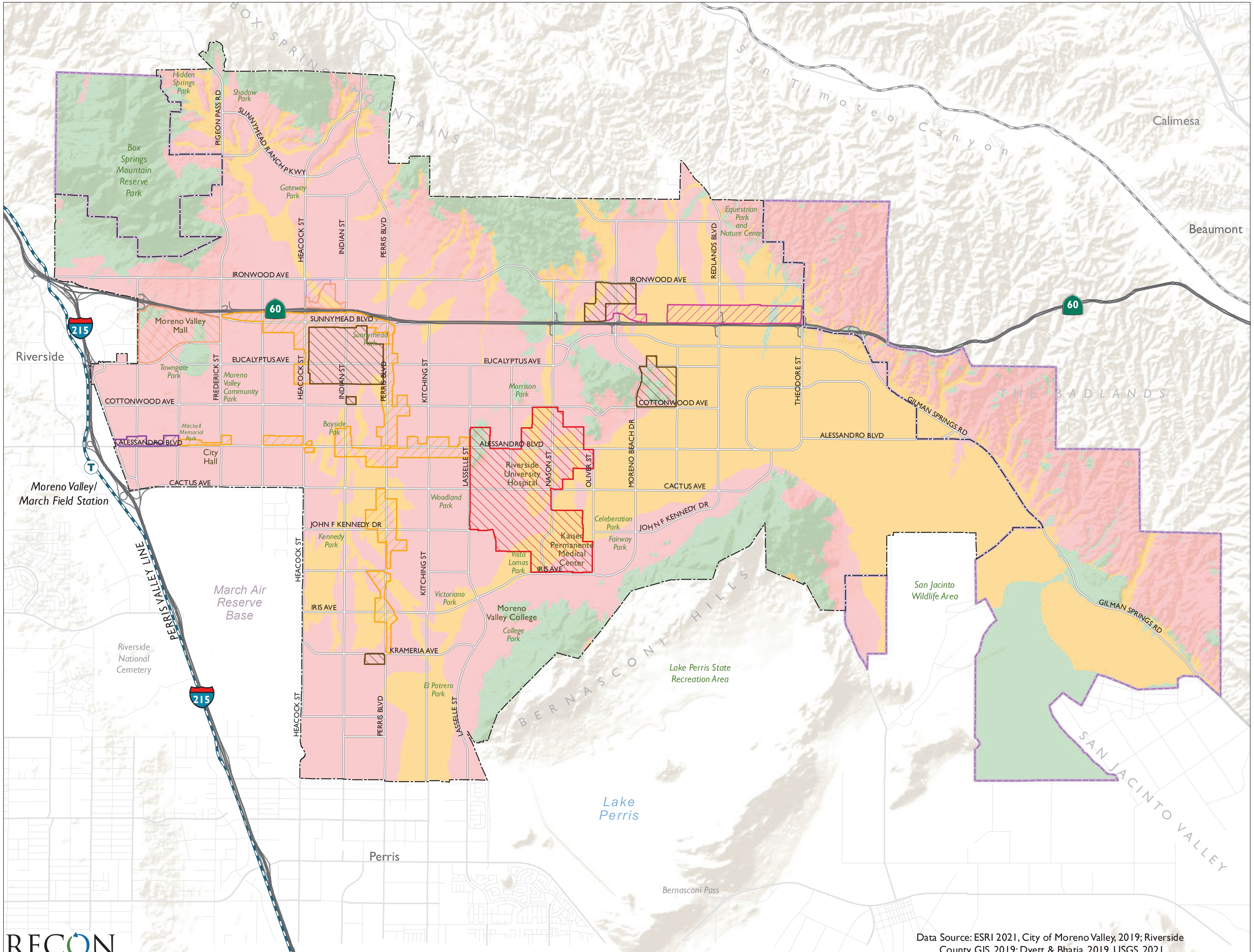


FIGURE 4.7-3
Landslides



City of Moreno Valley
Sphere of Influence

General Plan Concept Areas

Mixed Use

Downtown Center
Center Mixed Use
Corridor Mixed Use

Commercial/Office/Industrial

Highway Office/Commercial
Business Park/Light Industrial
Business Flex

Residential

Residential Density Changes

Paleontological Sensitivity

No
Low: 0 to 10 ft Below the Surface
High: Deeper than 10 ft
High

0 Miles 1

FIGURE 4-7.4
Paleontological Sensitivity

c. California Building Standards Code (Title 24)

Title 24 of the California Code of Regulations (CCR) provides state regulations that govern the design and construction of buildings, associated facilities, and equipment. These regulations are also known as building standards (reference California Health and Safety Code § 18909). Cities and counties are required by state law to enforce CCR Title 24, and may adopt ordinances making more restrictive requirements than provided by CCR Title 24 due to local climatic, geological, or topographical conditions.

4.7.2.2 Local Regulations

a. Municipal Code

Title 8, Chapter 8.21 Grading Regulations of the Municipal Code contains requirements that address potential geological hazards associated with new development. Municipal Code Section 8.21.050 (Grading Permit Requirements) specifies that a geotechnical report is required for all grading projects unless otherwise waived by the city engineer. Recommendations included in the reports and approved by the city engineer, shall be incorporated into the grading plans and specifications. A preliminary soil report, preliminary engineering geology report and/or seismicity report may be required depending on site specific conditions. Engineering geologic reports are required for all developments on hillside sites where geologic conditions are considered to have a substantial effect on existing and/or future site stability. The required reports must provide specific recommendations to facilitate a safe and stable development.

b. Local Hazard Mitigation Plan

The City developed the Local Hazard Mitigation Plan (LHMP), most recently updated in May 2017, to identify the hazards, estimate the probability of future occurrences, and set goals to mitigate potential risks to reduce or eliminate long-term natural or man-made hazard risks to human life and property for the city and its residents. The goals of the LHMP are to:

1. Protect life, property, and the environment;
2. Provide public awareness;
3. Protect the continuity of government; and
4. Improve emergency management, preparedness, collaboration and outreach.

The LHMP identifies local faults that may generate earthquakes and identifies potential vulnerabilities within the city that could be adversely affected by seismic events. The LHMP also identifies a mitigation strategy for reducing losses associated with seismic events.

Local fault mapping presented in the LHMP is consistent with the fault mapping presented in Figure 4.7-1. The LHMP states that the San Jacinto fault zone, which traverses the northeastern boundary of the Planning Area, is considered one of the more seismically active fault zones in southern California and has the potential to host a 7.2 magnitude earthquake. The LHMP documents historic southern California earthquakes that affected the Moreno Valley region. In 1923, the North San Jacinto Fault earthquake damaged the San Bernardino and Redlands area. The epicenter was located just northeast of the Planning Area in San Timoteo Canyon, and is the last known time that this fault ruptured in this area. The largest earthquake to occur within 100 miles of the Planning Area was the 7.4 magnitude Hector Mine earthquake in 1999 that occurred approximately 61 miles from the city. Additional earthquakes that have occurred within the Moreno Valley region since 1992 are presented in Table 4.7-2.

Table 4.7-2
History of Major Southern California Earthquakes Since 1992

Year	Richter Scale Magnitude	Description
1992	7.2	Occurred near Landers, California and caused the rupture of five different faults. Those faults were: Johnson Valley, Landers, Homestead Valley, Emerson, and Camp Rock.
1992	7.3	Occurred 3 hours after the Landers Earthquake with an epicenter near Big Bear, California, just 34.4 miles from Moreno Valley.
1994	6.8	Northridge Earthquake occurred in a neighborhood of the city of Los Angeles and is located 78.8 miles from Moreno Valley.
1999	7.4	Hector Mine Earthquake, located 25 miles from the Landers Earthquake and just 61 miles from Moreno Valley.
2010	5.4	Borrego Springs Earthquake believed by seismologists to have been possibly triggered by the strong earthquake which occurred near Calexico in 2010.
2016	4.3	California Governor's Office of Emergency Services issued an earthquake advisory for all southern California counties following a series of small magnitude earthquakes that occurred in Bombay Beach (located in Imperial County and south of where the San Andreas fault ends). This swarm included a 4.3 magnitude quake on September 26.
2019	7.1	Occurred roughly 11 miles northeast of Ridgecrest, California or approximately 185 miles north of Moreno Valley.

4.7.3 Methodologies for Determining Impacts

The potential for significant impacts associated with the proposed GPU has been determined based upon review of existing secondary source information and data relative to the geology and soils resources available for the Planning Area.

4.7.4 Basis for Determining Significance

Thresholds used to evaluate impacts related to geology and soils are based on applicable criteria in the California Environmental Quality Act (CEQA) Guidelines (California Code of Regulations Sections 15000-15387), Appendix G. A significant impact would occur if the project would:

1) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:

   i) 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);
   ii) Strong seismic ground shaking;
   iii) Seismic-related ground failure, including liquefaction;
   iv) Landslides;
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 direct or indirect risks to life or property; or
5) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

4.7.5 Impact Analysis

4.7.5.1 Topics 1 and 3: Seismic Hazards and Unstable Geology

Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving: (i) 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); (ii) strong seismic ground shaking? (iii) seismic-related ground failure, including liquefaction; or (iv) landslides? Would the project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?

The Planning Area is underlain primarily by Perris Bedrock, which is considered to be a relatively stable geologic formation. However, due to its location within southern California, and the proximity of major fault lines throughout the Planning Area, impacts associated with seismic events could occur.

a. Fault Rupture

As shown in Figure 4.7-1, the San Jacinto fault zone, which has been categorized as an Alquist-Priolo earthquake fault zone, traverses the northeastern and eastern boundary of the Planning Area. Specifically, the eastern portion of the Highway Office/Commercial Concept Area falls within the San Jacinto fault zone. Although the San Jacinto fault zone would be the primary source of potential damage due to fault rupture, all development within the Planning Area would be susceptible to damage due to the seismically active nature of the region. However, the Safety Element of the 2021 GPU includes the following goals, policies, and actions that would address potential geologic and seismic hazards.

Goal

S-1: Protect life and property from natural and human made hazards.

Policies

S.1-1 Continue to restrict the development of habitable structures within Alquist-Priolo Earthquake Fault Zones consistent with state law.

S.1-2 In areas of high liquefaction risk (see Map S-2), require that project proponents submit geotechnical investigation reports and demonstration that the project conforms to all recommended mitigation measures prior to City approval.

S.1-3 Require geotechnical studies for new development in areas where sewers are not available to ensure that the surrounding soil can support alternative wastewater disposal systems.

S.1-4 Ensure that structures intended for human occupancy are designed and constructed to retain their structural integrity when subjected to seismic activity, in accordance with the California Building Code.

S.1-5 Continue to regulate development on hillsides where average slope is greater than 10 percent and limit the removal of natural vegetation in hillside areas when retaining natural habitat does not pose threats to public safety.

Actions

S.1-A Implement the seismic upgrade projects identified in the LHMP for overcrossing bridges at State Route 60 (SR-60)/Moreno Beach, SR-60/Redlands Avenue, and SR-60/World Logistics Parkway to ensure the seismic safety of critical transportation infrastructure in the city.

S.1-B Use the building inspection program to inventory and evaluate earthquake hazards in existing buildings, especially buildings with unreinforced masonry (URM), using the most current seismic design standards and hazard reduction measures. Explore measures to encourage building owners to upgrade and retrofit structures to render them seismically safe.

Additionally, Title 8, Chapter 8.21 Grading Regulations of the Municipal Code specifies that a geotechnical report is required for all grading projects, and a preliminary soil report, preliminary engineering geology report, and/or seismicity report may be required depending on site specific conditions. Engineering geologic reports are required for all developments on hillside sites where geologic conditions are considered to have a substantial effect on existing and/or future site stability. The required reports must provide specific recommendations to facilitate a safe and stable development. Therefore, adherence to GPU Safety Element goals and policies and Municipal Code requirements would ensure that future development would not cause substantial adverse effects associated with fault rupture, and impacts would be less than significant.

b. Ground Shaking

As described in Section 4.7.1.2 above, structures throughout the Planning Area could be affected by ground shaking during a seismic event associated with the San Jacinto fault zone that traverses the northeastern and eastern boundary of the Planning Area, as well as the San Andreas Fault located approximately 15 miles northeast and the Elsinore Fault located approximately 17 miles southwest. The project would increase the number of people and structures that could be exposed to ground shaking during a seismic event. However, future development would be required to comply with the GPU Safety Element goals and policies and Municipal Code requirements described in Section 4.7.5.1.b above. Therefore, adherence to GPU Safety Element goals and policies and Municipal Code requirements would ensure that future development would not cause substantial adverse effects associated with ground shaking, and impacts would be less than significant.

c. Liquefaction and Landslide

Liquefaction susceptibility ranges throughout the Planning Area from very low with deep groundwater in the northern and eastern portions of the city to very high with shallow groundwater generally west of Perris Boulevard. The areas which are subject to high and very high liquefaction potential are largely already developed (see Figure 4.7-2). Future development and redevelopment would primarily be focused within Concept Areas, which would be located within portions of the Planning Area where liquefaction risk is low. However, future development would also occur outside the Concept Areas, which may be located in areas designated with a higher liquefaction susceptibility rating.

Landslide susceptibility areas within the Planning Area are shown in Figure 4.7-3. While most of the city is flat, there are some portions of the city that have been assigned moderate and high risk for landslide, largely in slope areas. Although the Concept Areas would primarily be located within low risk areas the Residential Density Change area located at Moreno Beach Drive and Cottonwood Avenue has been assigned a moderate landslide susceptibility rating. Additionally, future development would also occur outside the Concept Areas, which may be located in areas designated with a higher landslide susceptibility rating.

All future development would be required to adhere to relevant regulations contained in the Municipal Code, including Municipal Code Section 8.21.050 which specifies that a geotechnical report would be required for all grading projects, unless otherwise waived by the city engineer. The required geotechnical report requirement would provide specific recommendations to facilitate a safe and stable development. Additionally, future development would be required to adhere to applicable GPU Safety Element goals and policies. Therefore, adherence to GPU Safety Element goals and policies and Municipal Code requirements would ensure that future development would not cause substantial adverse effects associated with liquefaction or landslides, and impacts would be less than significant.

4.7.5.2 Topic 2: Soil Erosion

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

As detailed in Section 4.7.1.4, some soil types within the Planning Area are relatively stable, while others may be susceptible to collapse that may pose a hazard to new development and result in substantial soil erosion. Grading, excavation, demolition, and construction activities associated with future development would increase the potential to expose topsoil to erosion. While graded or excavated areas and fill materials would be stabilized through efforts such as compaction and installation of hardscape and landscaping, erosion potential would be higher during construction activities as the plan is built out. Erosion and sedimentation would primarily be a concern during construction phases as future developed areas would be stabilized through the installation of hardscape, landscaping, or native revegetation as appropriate. Future development would also incorporate long-term water quality controls pursuant to storm water standards including the National Pollutant Discharge Elimination System (NPDES) Municipal Permit requirements. Measures implemented to avoid or reduce erosion and sedimentation effects are discussed in Section 4.10, Hydrology and Water Quality. Short-term erosion and sedimentation impacts would be addressed through conformance with the NPDES and associated Municipal Code requirements (Title 8, Chapter 8.10 Stormwater/urban Runoff Management and Discharge Controls). These regulations required erosion and sedimentation control during construction and implementation of best management practices to avoid erosion and off-site drainage. Municipal Code Title 9, Chapter 9.17 Landscape and Water Efficiency Requirements provides additional guidance for erosion control and slope planting (Section 9.17.110). Therefore, adherence to applicable Municipal Code requirements would ensure that future development would not result in substantial soil erosion or the loss of topsoil, and impacts would be less than significant.

4.7.5.3 Topic 4: Expansive Soils

Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?

As described in Section 4.7.1.4 above, some of the soils that occur within the Planning Area have poor to fair stability and are considered to be potentially expansive. Development within these soils could result in a significant impact due to the soils inability to support the proposed structures, especially during major rain events and/or flash floods. Future development would be required to adhere to policies included in the Safety Element of the GPU that support focusing development where risk to property and people from natural disasters would be minimized. Additionally, future development would be evaluated during site specific discretionary reviews for consistency with applicable Safety Element policies and Municipal Code requirements for project-specific geotechnical reports. Therefore, adherence to GPU Safety Element goals and policies and Municipal Code requirements would ensure that future development would not create substantial direct or indirect risks associated with expansive soils, and impacts would be less than significant.

4.7.5.4 Topic 5: Paleontological Resources and Unique Geology

Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

As shown in Figure 4.7-4, the western portion of the Planning Area is primarily classified with a high paleontological sensitivity rating, while the eastern portion of the Planning Area is classified as having a low paleontological sensitivity rating, so long as excavation does not exceed 10 feet. Impacts would be most likely to occur in native soil that has not been previously disturbed. Many areas that are classified with a high paleontological sensitivity rating have already been developed. Therefore, redevelopment projects within these areas that do not exceed the original depth of excavation are unlikely to encounter paleontological resources. Additionally, some sites that are currently vacant may have been disturbed during mass grading associated with adjacent project, and therefore are unlikely to possess any paleontological resources. The project has been designed to minimize impacts to native soil by primarily focusing on future development and redevelopment within the proposed Concept Areas. Nonetheless, construction-related ground-disturbing activities could result in significant impacts (loss) of nonrenewable paleontological resources. Because site-specific details and locations of future development projects are not known at this program-level of analysis, impacts to paleontological resources would be potentially significant.

Regarding unique geology, the city is largely flat with the exception of a few areas with rock outcroppings. Additionally, areas surrounding the city such as the badlands have unique landforms. The GPU does not propose any land use changes in the badlands and retains a low density residential designation. Rock outcrop areas within the city are not proposed for land use changes. Therefore, the project would not destroy a unique geologic feature, and impacts would be less than significant.

4.7.6 Cumulative Analysis

Future development could increase the number of people exposed to seismic and geologic hazards, and erosion rates could be accelerated by earthwork for new construction. Additionally, increased development could encroach on areas with paleontological resources which could be lost if not monitored properly. Therefore, the project could contribute to a cumulatively significant impact related to geology and soils, including paleontological resources. However, all future development would be required to adhere to all relevant Municipal Code regulations and proposed policies contained in the Safety Element of the GPU. Specifically, future projects would be required to submit geotechnical reports to identify constraints and develop engineering parameters, the implementation of which would ensure potential impacts related to seismic and geological hazards would be less than significant. Implementation of mitigation measure PAL-1 described below would reduce impacts related to paleontological resources to a level less than significant. Therefore, the project would not contribute to a cumulative impact related to geology and soils.

4.7.7 Significance of Impacts before Mitigation

4.7.7.1 Topics 1 and 3: Seismic Hazards and Unstable Geology and Topic 4: Expansive Soils

Future development would be required to adhere to GPU Safety Element policies supporting the safety of future land uses throughout the Planning Area, thereby minimizing potential adverse impacts. Additionally, compliance with Title 8, Chapter 8.21 Grading Regulations of the Municipal Code requires a geotechnical report be prepared for all grading projects and a preliminary soil report, preliminary engineering geology report and/or seismicity report may be required depending on site specific conditions. Engineering geologic reports are required for all developments on hillside sites where geologic conditions are considered to have a substantial effect on existing and/or future site stability. The required reports must provide specific recommendations to facilitate a safe and stable development. Future development would be required to comply with GPU Safety Element policies and Municipal Code requirements for geologic reports, which would ensure that impacts related to seismic hazards and unstable geological units would be less than significant.

4.7.7.2 Topic 2: Soil Erosion

Future development would incorporate long-term water quality controls pursuant to storm water standards including the NPDES Municipal Permit requirements. Municipal Code requirements (Title 8, Chapter 8.10 Stormwater/urban Runoff Management and Discharge Controls and Title 9, Chapter 9.17 Landscape and Water Efficiency Requirements) provides additional guidance for storm water management, erosion control and slope planting. Implementation of these regulations would ensure that future development would not result in substantial soil erosion or the loss of topsoil, and impacts would be less than significant.

4.7.7.3 Topic 5: Paleontological Resources and Unique Geology

Construction-related ground-disturbing activities associated with future development could result in significant impacts (loss) of nonrenewable paleontological resources. Because site-specific details and locations of future development projects are not known at this program-level of analysis, impacts to paleontological resources would be potentially significant. The land use plan avoids unique geologic features in the City including rock outcroppings and maintains low density land uses within the badlands areas. Therefore, the project would not destroy a unique geologic feature, and impacts would be less than significant.

4.7.8 Mitigation

4.7.8.1 Topics 1 and 3: Seismic Hazards and Unstable Geology and Topic 3: Expansive Soils

Impacts would be less than significant. No mitigation is required.

4.7.8.2 Topic 2: Soil Erosion

Impacts would be less than significant. No mitigation is required.

4.7.8.3 Topic 4: Paleontological Resources and Unique Geology

PAL-1: Applications for future development, wherein the Community Development Director or his or her designee has determined a potential for impacts to paleontological resources, shall review the underlying geology and paleontological sensitivity of the site. If it is determined that the potential exists that sensitive paleontological resources are present, the applicant shall be required to comply with the following mitigation framework.

A qualified paleontological monitor shall be present during grading in project areas where a project specific geological technical study has determined that such monitoring is necessary due to the potential for paleontological resources to reside within the underlying geologic formations. The geologic technical study shall also provide specific duties of the monitor, and detailed measures to address fossil remains, if found.

4.7.9 Significance of Impacts after Mitigation

4.7.9.1 Topics 1 and 3: Seismic Hazards and Unstable Geology and Topic 4: Expansive Soils

Impacts related to seismic hazards and unstable geology, soil erosion, and expansive soils would be less than significant. No mitigation is required.

4.7.9.2 Topic 2: Soil Erosion

Impacts would be less than significant. No mitigation is required.

4.7.9.3 Topic 5: Paleontological Resources

Impacts related to paleontological resources would be mitigated to a level less than significant.