4.6 GEOLOGY, SOILS, MINERAL AND PALEONTOLOGICAL RESOURCES

This section contains an analysis of the impacts of adoption and implementation of the Draft General Plan on geology, soils, mineral resources, and paleontological resources in the planning area. The section provides a description of existing soil, geologic and seismic conditions, as well as a description of regulations and plans related to implementation of the Draft General Plan.

4.6.1 REGULATORY FRAMEWORK

FEDERAL PLANS, POLICIES, REGULATIONS, AND LAWS

National Earthquake Hazards Reduction Act

In October 1977, the U.S. Congress passed the Earthquake Hazards Reduction Act to reduce the risks to life and property from future earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards reduction program. To accomplish this goal, the act established the National Earthquake Hazards Reduction Program (NEHRP). This program was substantially amended in November 1990 by the National Earthquake Hazards Reduction Program Act (NEHRPA), which refined the description of agency responsibilities, program goals, and objectives.

The mission of NEHRP includes improved understanding, characterization, and prediction of hazards and vulnerabilities; improved building codes and land use practices; risk reduction through post earthquake investigations and education; development and improvement of design and construction techniques; improved mitigation capacity; and accelerated application of research results. The NEHRPA designates the Federal Emergency Management Agency as the lead agency of the program and assigns several planning, coordinating, and reporting responsibilities. Other NEHRPA agencies include the National Institute of Standards and Technology, National Science Foundation, and the United States Geological Survey.

STATE PLANS, POLICIES, REGULATIONS, AND LAWS

Surface Mining and Reclamation Act

The Surface Mining and Reclamation Act (SMARA, California Public Resources Code [PRC] Section 2710 et seq.) was enacted by the California Legislature in 1975 to regulate activities related to mineral resource extraction. The act requires the prevention of adverse environmental effects caused by mining, the reclamation of mined lands for alternative land uses, and the elimination of hazards to public health and safety from the effects of mining activities. At the same time, SMARA encourages both the conservation and the production of extractive mineral resources, requiring the State Geologist to identify and attach levels of significance to the state's varied extractive resource deposits. Under SMARA, the mining industry in California must plan adequately for the reclamation of mined sites for beneficial uses and provide financial assurances to guarantee that the approved reclamation will occur. Lead agencies with permitting responsibility for proposed mining projects implement SMARA requirements.

SMARA also directs the State Geologist to classify lands in California into Mineral Resource Zones (MRZs), designated MRZ-1 through MRZ-4. The most important zone with respect to the presence of resources is MRZ-2, which is defined as "areas where adequate information indicates that significant mineral (aggregate) deposits are present or where it is judged that there is a high likelihood for their presence." This zone is applied to known mineral deposits or where well-developed lines of reasoning, based on economic geologic principles and adequate data, demonstrate that the likelihood for occurrence of significant mineral deposits is high. MRZ-3 zones suggest the potential for deposits. This zone is less definitive than MRZ-2 and is defined as "areas containing mineral deposits the significance of which cannot be evaluated from available data."

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) (California PRC Sections 2621–2630) was passed in 1972 to mitigate the hazard of surface faulting to structures designed for human occupancy. The main purpose of the law is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. The law addresses only the hazard of surface fault rupture and is not directed toward other earthquake hazards. The Alquist-Priolo Act requires the State Geologist to establish regulatory Earthquake Fault Zones around the surface traces of active faults and to issue appropriate maps. The maps are distributed to all affected cities, counties, and state agencies for their use in planning efforts. Before a project can be permitted in a designated Alquist-Priolo Earthquake Fault Zone, cities and counties must require a geologic investigation to demonstrate that proposed buildings would not be constructed across active faults.

California Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 (California PRC Sections 2690–2699.6) addresses earthquake hazards from nonsurface fault rupture, including liquefaction and seismically induced landslides. The act established a mapping program for areas that have the potential for liquefaction, landslide, strong ground shaking, or other earthquake and geologic hazards. The act also specifies that the lead agency for a project may withhold development permits until geologic or soils investigations are conducted for specific sites and mitigation measures are incorporated into plans to reduce hazards associated with seismicity and unstable soils.

California Building Standards Code, State Housing Law, and Fire Protection Codes

The State of California provides minimum standards for building design through the California Building Standards Code (CBC, California Code of Regulations [CCR] Title 24). Information on current code requirements can be found on the California Building Standard Commission's website (http://www.bsc.ca.gov/). The CBC applies to all occupancies throughout the state unless local amendments have been adopted, and includes regulations for seismic safety, excavation of foundations and retaining walls, and grading activities (including drainage and erosion control and construction on unstable soils).

The 2010 CBC became effective on January 1, 2011, and updated all the subsequent codes under CCR Title 24. The 2010 CBC uses Seismic Design Categories A through F (where F requires the most earthquake-resistant design) for structures designed for a project site. These Seismic Design Categories provide protection through "collapse prevention," meaning that structures are designed to prevent collapse from the maximum level of ground shaking that could occur. Chapter 16 of the CBC specifies exactly how each seismic design category is to be determined on a site-specific basis depending on soil characteristics and proximity to potential seismic hazards.

Chapter 18 of the CBC regulates the excavation of foundations and retaining walls. This chapter describes the preparation of a preliminary soil report, engineering geologic report, geotechnical report, and supplemental ground-response report. Chapter 18 also describes analysis of expansive soils and the determination of the depth to groundwater table. For Seismic Design Category C, Chapter 18 requires analysis of slope instability, liquefaction, and surface rupture attributable to faulting or lateral spreading. For Seismic Design Categories D, E, and F, Chapter 18 requires these same analyses, plus an evaluation of lateral pressures on basement and retaining walls, liquefaction and soil strength loss, and lateral movement or reduction in foundation soil-bearing capacity. It also addresses mitigation measures to be considered in structural design, which may include ground stabilization, selecting appropriate foundation type and depths, selecting appropriate structural systems to accommodate anticipated displacements, or any combination of these measures. The potential for liquefaction and soil strength loss must be evaluated for site-specific peak ground acceleration magnitudes and source characteristics consistent with the design earthquake ground motions.

The Department of Housing and Community Development has adopted regulations implementing the State Housing Law in CCR, Title 25, for residential structures subject to the State Housing Law. These regulations, the CBC, and the requirements of the State Housing Law, are applicable in all parts of the state.

Building standards in the CBC are adopted by the State Fire Marshal to provide protection from fire and other public safety objectives. These provisions are adopted as state law administered in part by local fire protection districts.

National Pollutant Discharge Elimination System Permit

In California, the State Water Resources Control Board (SWRCB) administers regulations promulgated by the U.S. Environmental Protection Agency (55 Code of Federal Regulations [CFR] 47990) requiring the permitting of stormwater-generated pollution under the National Pollutant Discharge Elimination System (NPDES). In turn, the SWRCB's jurisdiction is administered through nine regional water quality control boards, including the Santa Ana Regional Water Quality Control Board, which includes the Hemet planning area. Under these Federal regulations, an operator must obtain a general permit through the NPDES Stormwater Program for all construction activities with ground disturbance of 1 acre or more. The general permit requires the implementation of best management practices (BMPs) to reduce sedimentation into surface waters and to control erosion. One element of compliance with the NPDES permit is preparation of a storm water pollution prevention plan (SWPPP) that addresses control of water pollution, including sediment, in runoff during construction. (See Section 4.9, "Hydrology and Water Quality," for more information about the NPDES and SWPPPs.)

Unreinforced Masonry Law

Enacted in 1986, the Unreinforced Masonry Law (Section 8875 et seq. of the California Government Code) required all cities and counties in Seismic Zone 4 (zones near historically active faults) to identify potentially hazardous URM buildings in their jurisdictions, establish a URM loss reduction program, and report their progress to the State by 1990. The owners of such buildings were to be notified of the potential earthquake hazard these buildings pose. The loss reduction program to be implemented, however, was left to each local jurisdiction, although the law recommends that local governments adopt mandatory strengthening programs by ordinance and that they establish seismic retrofit standards. Some jurisdictions implemented mandatory retrofit programs, others established voluntary programs, and a few cities only notified the building owners, but did not adopt any type of strengthening program. (California Seismic Safety Commission 2004)

REGIONAL AND LOCAL PLANS, POLICIES, REGULATIONS, AND LAWS

Riverside County Environmental Health Requirements

The Riverside County Department of Environmental Health regulates the installation of on-site wastewater treatment systems (septic systems). County approval of septic system applications requires a percolator test, installation of a soil boring to evaluate depth to groundwater, and statements by a registered civil engineer, engineering geologist, or registered environmental health specialist that on-site soils are appropriate to permit safe operation of a septic system, and that depth to groundwater is sufficient to meet Regional Water Quality Control Board requirements. (Riverside County DEH 2010)

Hemet Municipal Code

The Hemet Municipal Code provides regulations for buildings and construction, including adoption of the CBC (Section 14-31). The codes ensure structural integrity during seismic and other hazardous events, and prevent injury, loss of life and substantial property damage. To protect public safety, planned development in the City is subject to these structural codes.

The City has adopted several local modifications to the CBC. Modifications which pertain to geology and soils include modifications to Appendix J concerning erosion and sediment control. These modifications are found in Section 14.46 of the Hemet Municipal Code.

The Hemet Municipal Code also includes Hazardous Fault Zone Regulations in Section 14-311. These regulations implement State law requirements and govern development within Alquist-Priolo Zones.

4.6.2 ENVIRONMENTAL SETTING

This section presents geologic and seismic hazards, as well as the soils, mineral, and paleontological resources in the planning area.

TOPOGRAPHY AND REGIONAL GEOLOGY

Geology

Clay, silt, and fine-grained sand deposits located beneath the San Jacinto Valley floor are sometimes soft, expansive, and prone to consolidation under building loads. The most common types of soil include Grangeville, Dello, San Emigdio, Traver, and Metz (Natural Resource Conservation Service 1971). Groundwater, which is a source of public water supply in the planning area, can range from less than 30 feet deep in certain areas to several hundred feet deep in the vicinity of pumping wells.

The Lakeview Mountains have a granitic bedrock character consisting of moderately hard to hard, layered material that is generally stable and suitable for foundations. Park Hill is composed of older uplifted alluvium that consists of sand, silt, and clay which is generally stable, but susceptible to debris slides. The San Jacinto Mountain foothills and the San Timoteo badlands are geologically complex; made up of sedimentary, granitic, and metamorphic rock types, as well as landslides and debris flows. Spring flow is found in these foothill areas due to upland runoff and fractured bedrock.

SEISMICITY

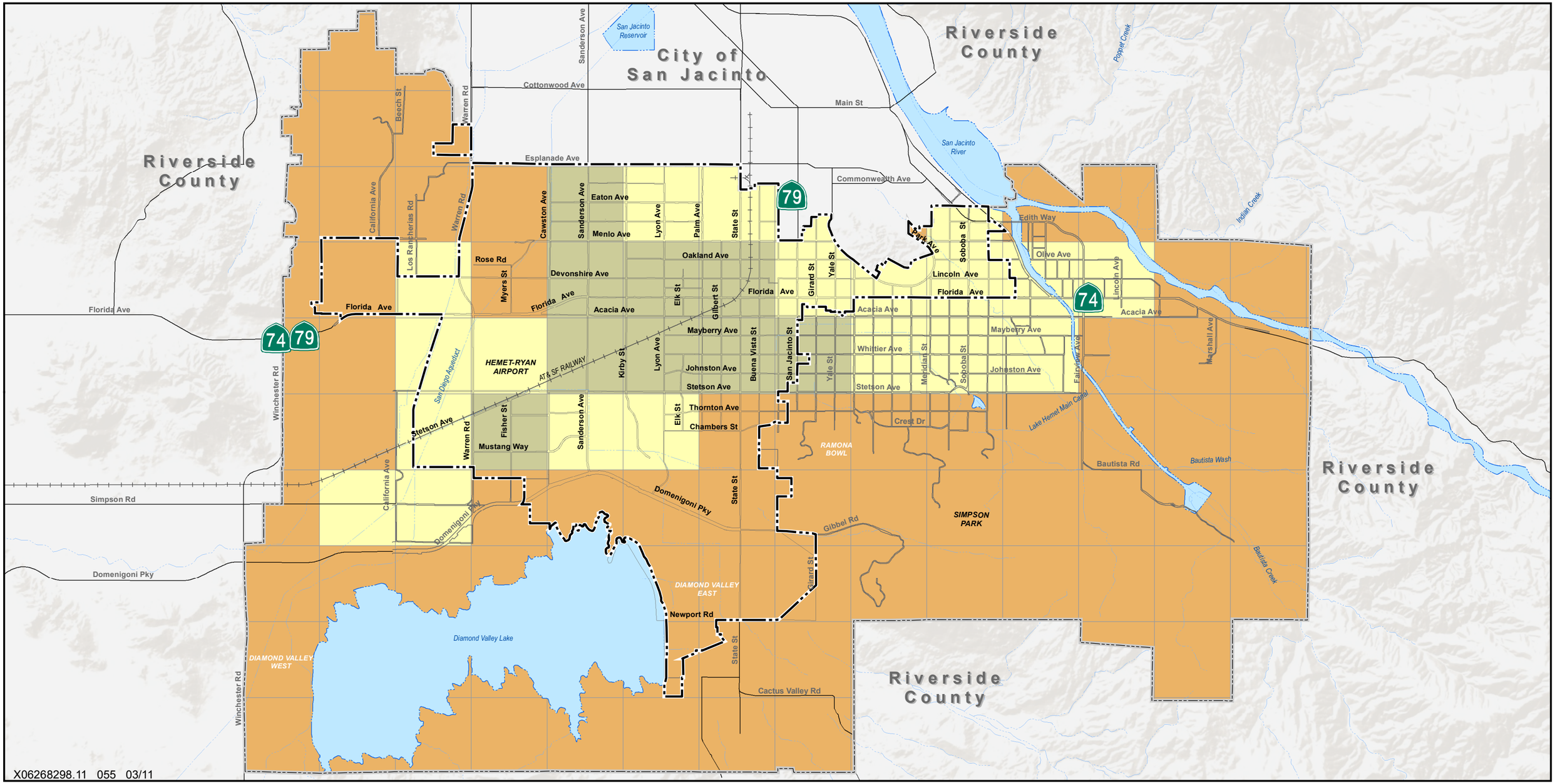
Seismic activity may result in seismically induced fault displacement and rupture, ground shaking, liquefaction, lateral spreading, landslides and avalanches, and structural hazards.

Earthquakes are measured based on either energy released or the intensity of ground shaking at a particular location. The Richter Magnitude (m) scale measures the magnitude of an earthquake based on the logarithm of the amplitude of waves recorded by seismographs, with adjustments made for the variation in the distance between the various seismographs and the epicenter of the earthquake. The Richter scale starts with 1.0 and has no maximum limit. The scale is logarithmic—an earthquake with a magnitude of 2.0m is 10 times the magnitude (30 times the energy) of an earthquake with a magnitude of 1.0m.

Faults

Natural landforms in the Hemet-San Jacinto Valley play an important role in shaping the planning area. While they provide a dramatic and varied topographic setting for the community, the region's areas of steep slopes, unstable soils and seismic hazards also create the potential for human safety and property risks.

Earthquakes have the greatest potential for far-reaching loss of life or property, as well as economic damage. This is true for most of southern California, since damaging earthquakes are frequent, affect widespread areas, trigger many secondary effects, and can overwhelm the ability of local jurisdictions to respond. Hemet lies within a region with several active faults, and therefore is subject to earthquake risks and hazards. Earthquake-related effects include landslides, liquefaction, fires, reservoir failures, and toxic chemical releases. Exhibit 4.6-1 shows the earthquake faults that traverse the planning area.



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Sources:
Census Tiger Line Data 2005
Applied Earthworks 2010
ESRI 2010

1 0.5 0 1 2 Miles

LEGEND

Archeological Sensitivity
- Low
- Medium
- High

- Hemet City Boundary
- Planning Area
- Street
- Railroad
- Creek/Canal
- River/Lake

Exhibit 4.5-1

CULTURAL RESOURCE SENSITIVITY

Hemet General Plan

- The **San Andreas Fault** is, at its closest point, approximately 15 miles northeast of Downtown Hemet in the San Bernardino Mountains. The San Andreas Fault extends the length of California from Eureka in the north to the Mexican border and beyond. The fault is shallow and earthquakes associated with shallow faults are more destructive at the surface than those originating from deep-seated faults (Singer 2001). From the vicinity of Cajon Pass, the southern California segment of the San Andreas Fault becomes fragmented with no distinctive single trace as in the north. Instead, it is divided into several elements, principal among these are the San Jacinto and Elsinore faults (SCEC 2005). The San Andreas Fault is estimated to have the capability to produce up to an 8.0m earthquake (SCEC 2005).

- The **San Jacinto Fault** lies along the northeast portion of the city and bisects the eastern sphere of influence. This fault runs more than 125 miles, from northwest of El Centro to northwest of San Bernardino. The San Jacinto fault is a major element of the San Andreas system and is considered one of the most seismically active fault systems in southern California. It separates from the San Andreas Fault west of Cajon Pass and runs behind the San Jacinto Mountains, passing the communities of San Jacinto and Hemet. Along the mountain front in this area, the fault has dammed groundwater channels, forcing water to the surface as hot springs. This fault has the capability to produce up to a 7.5m earthquake. (Singer 2001, SCEC 2005)

- The **Elsinore Fault** is located about 18 miles from Downtown Hemet, southwest of Lake Matthews. This fault runs through Corona and south into Lake Elsinore. Of the three known faults affecting the planning area, the Elsinore Fault has been considerably less active in recent history. It has the capability to produce up to a 7.5m earthquake (SCEC 2005).

Several faults within the San Jacinto fault system located within and adjacent to the planning area have been identified as Alquist-Priolo Earthquake Fault Zones, as shown in Exhibit 4.6-1. One of the fault zones extends from Palm Avenue at the north city limits and travels southeasterly through the planning area. Another zone is located northeast of the planning area and runs approximately parallel to the San Jacinto River. Two smaller zones are located northeast of Bautista Wash, and near Lake Street and Acacia and Mayberry Avenues.

Seismically-Induced Hazards

Local geological conditions can create additional hazards associated with seismic activity, including landslides, liquefaction, and hazards related to unreinforced masonry buildings (URMs).

Landslides

Steep topography, fractured and unconsolidated bedrock conditions, and expansive soils make many hillside areas highly unstable. Landslides are typical on moderate to steep slopes. The potential for future landslides is highest in the unincorporated portion of the planning area located east of the city and along hillsides in West Hemet due to the prevalence of steep slopes. Landsliding may result from heavy rain, erosion, removal of vegetation, seismic activity, or combinations of these and other factors.

Liquefaction

Liquefaction, which may occur under strong ground shaking during earthquakes, is the transformation of granular sediment or fill material from a solid state to a temporarily liquid state. Liquefaction is a hazard because buildings on liquefying ground may sink or suffer structural damage. Evidence of liquefaction includes “sand boils,” which are expulsions of sand and water from below the surface due to increased pore-water pressure below the surface. Liquefaction during an earthquake requires strong shaking continuing for a long time and loose, clean granular materials (particularly sands) that may settle and compact because of the shaking.

When liquefaction occurs, soil strength decreases and the ability of a soil deposit to support foundations is reduced. Liquefaction typically occurs within the upper 50 feet of the surface, in saturated, loose, fine- to medium-grained soils (i.e., sand and silt). Earthquake shaking suddenly increases pressure in the water that fills

the pores between soil grains, causing the soil to lose strength and behave as a liquid (Johansson 2000). Liquefaction has been responsible for tremendous amounts of damage in historical earthquakes around the world. The type of geologic process that created a soil deposit has a strong influence on its liquefaction susceptibility. Saturated soil deposits created by sedimentation in rivers and lakes can be very susceptible to liquefaction (University of Washington 2005). Since liquefaction occurs in saturated soil, its effects commonly occur in low-lying areas near bodies of water such as rivers, lakes, bays, and oceans. Liquefaction hazards are a concern throughout the planning area, as it lies within close proximity to the San Jacinto River and numerous tributary creeks.

Exhibit 4.6-1 identifies portions of the planning area most susceptible to seismically-induced liquefaction. Areas east of Diamond Valley Lake have very high potential for liquefaction due to the presence of high groundwater and sediment rich soils. Areas along the western border of the planning area and near the San Jacinto River have high potential for liquefaction. An area generally along Harrison Avenue and Domenigoni Parkway between Warren Road and Sanderson Avenue has a low potential for liquefaction. The remainder of the valley floor in the planning area is moderately susceptible to liquefaction.

Unreinforced Masonry Buildings

The Hemet/San Jacinto Valley area lies within Seismic Zone 4. Therefore, and in compliance with the Unreinforced Masonry Law, the City inventoried the URMs in its jurisdiction. As of 2004, Hemet reported to the Seismic Safety Commission that 12 URMs had been identified in the city. Of these, three were considered of historical significance. Furthermore, all 12 building owners had been notified about the hazards of URM construction, and two buildings were demolished. To encourage URM building owners to strengthen their structures, the City funded engineering and planning for building owners. (Seismic Safety Commission 2004)

Ground Shaking

Hemet is located near several known potential sources of strong seismic shaking (up to about 60 percent the force of gravity, "g"), including the numerous faults located within and near the planning area and described above under "Faults." A major earthquake associated with any of these faults could result in moderate to severe ground shaking in the Hemet planning area.

Tsunamis and Seiches

Tsunamis are long-period waves commonly caused by vertical faulting of the ocean floor. Such earthquake-associated waves (often erroneously called tidal waves) can cause considerable damage when they reach shallow coastal areas. A seiche is a stationary wave produced in reservoirs, lakes, and other closed or restricted bodies of water by ground shaking. The phenomenon is similar to the oscillations which result when a bowl of water is shaken. When they occur in large reservoirs, such waves can cause overtopping of dams, posing a serious threat to adjacent areas. Hemet lies well inland from the coastline, which should provide sufficient distance and protection from tsunamis. However, the planning area includes Diamond Valley Lake, which could potentially experience seiche as a result of seismic shaking. Seiche hazards posed by Diamond Valley Lake and its impoundments are discussed in Section 4.9, "Hydrology and Water Quality."

SLOPE STABILITY AND LANDSLIDING

Landslide susceptibility is a function of various combinations of factors including rainfall, rock and soil types, slope, aspect, vegetation, seismic conditions, and human construction. Generally, landslides are expected to occur most often on slopes steeper than 15%, in areas with a history of landslides, and in areas underlain by certain geologic units. Based on these criteria, most of the Planning Area is not at risk for landsliding. However, locally steep slopes (including those in some portions of West Hemet, along the southern edge of the planning area, on Park Hill, and along water courses) may be locally susceptible to slope failure.

One of the most common forms of slope instability in southern California are debris flows or mudslides, which are shallow landslides of water-saturated soil and rock fragments that travel downslope as a muddy slurry. Debris flows commonly form after heavy rainfall onto relatively steep slopes underlain by colluvial soils and weak weathered bedrock. Damaging debris flows can occur during intense rainfall, and particularly when runoff is concentrated by misdirected drainage from roads, large paved areas, or blocked or damaged drainage swales. Hillsides left denuded by brushfires are susceptible to debris flows during heavy rainstorms. Hillsides in southern California generally become susceptible to debris flows after 10 inches of seasonal rainfall has accumulated. Subsequent intense rainfall totaling more than 2 inches in 4 to 6 hours can typically trigger debris flows. Although the likelihood of debris flows begins to decline after several days of dry weather, deeper-seated bedrock landslides are possible weeks or months following a period of prolonged rainfall as the precipitation percolates into the rock. Mudslides are considered a hazard to properties at the base of undeveloped or unimproved slopes, including some steep slopes in West Hemet and the southeastern portion of the planning area.

SOILS

The Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture (USDA) provides soils surveys and reports for Riverside County, including the Hemet planning area. Soil properties influence the development of building sites, including site selection, structure design, construction, performance after construction, and site and structure maintenance. General soil associations present in the planning area include:

- **Friant-Lodo-Escondido**: Well-drained and somewhat excessively drained, undulating to steep, shallow to deep soils that have a surface layer of fine sandy loam and gravelly loam; on metamorphosed sandstone and mica-schist.
- **Cieneba-Rock land-Fallbrook**: Well-drained and somewhat excessively drained, undulating to steep, very shallow to moderately deep soils that have a surface layer of sandy loam and fine sandy loam; on granitic rock.
- **Badland-San Timoteo**: Well-drained, rolling to very steep, moderately deep calcareous loam, and very shallow soils; on inland sea sediment and soft sandstone.
- **Hanford-Tujunga-Greenfield**: Very deep, well-drained to excessively drained, nearly level to moderately steep soils that have a surface layer of sand to sandy loam; on alluvial fans and flood plains.
- **Monserate-Arlington-Exeter**: Well-drained, nearly level to moderately steep soils that have a surface layer of sandy loam to loam and are shallow to deep to a hardpan.
- **San Emigdio-Grangeville-Metz**: Very deep, poorly drained to somewhat excessively drained, nearly level to strongly sloping soils that have a surface layer of calcareous loamy sand to loam; on alluvial fans and floodplains.
- **Traver-Domino-Willows**: Moderately well drained to poorly drained, nearly level to gently sloping, saline-alkali soils that have a surface layer of loamy fine sand to silty clay and are moderately deep to very deep to a calcareous hardpan. (USDA 1971)

Site-specific soil characteristics often vary from the general descriptions of the soil associations described above.

Soil Hazards

Shrink-Swell Potential

Most planning area soils have a low or moderate shrink-swell potential; however, there are some areas of high shrink-swell potential. Expansive or shrink-swell soils contain substantial amounts of clay minerals that swell when wet and shrink when dry. These clays tend to swell despite the heavy loads imposed by large structures.

Damage (e.g., cracking of foundations) results from differential movement and from the repetition of the shrink-swell cycle. In some cases, this problem may be avoided by removing the top soil layer before placing a foundation. Although these soils can be an expensive nuisance, awareness of their existence before construction often means that the problem can be eliminated through foundation design.

Erosion

NRCS evaluates soil erosivity based on slope and soil erodibility factors. Soil loss is caused by sheet or rill erosion in areas where 50–75% of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance (USDA 2004). Erosion hazards of disturbed soil are described as slight, moderate, severe, or very severe. In areas with a slight erosion hazard, erosion is unlikely under ordinary climatic conditions. Erosion control measures may be needed in areas of moderate or severe erosion hazard. In areas with very severe erosion hazard, erosion control measures can be both costly and impractical.

MINERAL RESOURCES

Although areas along the eastern and southern end of the planning area have not been studied under the SMARA Mineral Land Classification system, the balance of the Hemet planning area is designated as MRZ-3. MRZ-3 includes those areas where geologic evidence indicates that mineral deposits exist or likely exist, but the significance of these deposits has not been determined (Riverside County 2003). In addition, some minerals are present which have the potential to have local significance. Historically, limestone, serpentine, and sand and gravel were mined in the Bautista Canyon, Diamond Valley, and the Salt Creek and San Jacinto riverbeds, respectively.

PALEONTOLOGICAL RESOURCES

Geologic mapping (Rogers 1965, Morton and Matti 2005, Morton 2003) indicates that the northern and eastern portion of the Hemet planning area is located primarily on surface exposures of Holocene alluvial valley deposits. However, these young alluvial sediments overlie older Pleistocene sediments present in the subsurface. These older Pleistocene sediments are also present in the surface in the southern (generally south of Johnston Avenue), and also in the western (generally west of Warren Road) portion of the planning area. Surface exposure of older Pleistocene sediments generally occurs on the lower slopes of hills or mountains.

These older Pleistocene alluvial deposits have high potential to contain paleontological resources, and so are considered to have high paleontological sensitivity. Pleistocene sediments in the Diamond and Domenigoni Valleys yielded tens of thousands of Pleistocene age vertebrate fossils. Older Pleistocene alluvial sediments elsewhere throughout Riverside and inland San Bernardino Counties and the Inland Empire have been reported to yield significant fossils of plants and extinct animals. Fossils recovered from these Pleistocene sediments represent extinct taxa including mammoths, mastodons, ground sloths, dire wolves, short-faced bears, saber-toothed cats, large and small horses, large and small camels, and bison (SBCM 2005).

4.6.3 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

THRESHOLDS OF SIGNIFICANCE

Geology, Soils, and Mineral Resources

Based on Appendix G of the State CEQA Guidelines, an impact on geologic resources is considered significant if adoption and implementation of the Draft General Plan would:

- expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

- rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault;
- strong seismic ground shaking;
- seismic-related ground failure, including liquefaction; or
- landslides;

- result in substantial soil erosion or the loss of topsoil;
- be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse;
- be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property;
- have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater;
- result in the loss of availability of a known mineral resource that would be of value to the region and residents of the state; or
- result in the loss of availability of a locally important mineral resource recovery site.

Paleontological Resources

For the purpose of the analysis of impacts to paleontological resources (Impact 4.6-9), the threshold of significance is based on the State CEQA Guidelines, which state that a paleontological resources impact is considered significant if implementation of the proposed project would directly or indirectly destroy a unique paleontological resource or site.

A paleontologically important rock unit is one that: 1) has a high potential paleontological productivity rating, and 2) is known to have produced unique, scientifically important fossils. The potential paleontological productivity rating of a rock unit exposed at a project site refers to the abundance/densities of fossil specimens and/or previously recorded fossil sites in exposures of the unit in and near the project site. Exposures of a specific rock unit at a project site are most likely to yield fossil remains representing particular species in quantities or densities similar to those previously recorded from the unit in and near a project site. An individual vertebrate fossil specimen may be considered unique or significant if it is identifiable and well preserved, and it meets one of the following criteria:

- a type specimen (i.e., the individual from which a species or subspecies has been described);
- a member of a rare species;
- a species that is part of a diverse assemblage (i.e., a site where more than one fossil has been discovered) wherein other species are also identifiable, and important information regarding life history of individuals can be drawn;
- a skeletal element different from, or a specimen more complete than, those now available for its species; or
- a complete specimen (i.e., all or substantially all of the entire skeleton is present).

ANALYSIS APPROACH

The analysis of impacts is based on the likely consequences of adoption and implementation of the Draft General Plan, including future land uses consistent with the Land Use Diagram, and supporting roadways, infrastructure, and public services; along with implementation of Draft General Plan policies and programs.

For geology, soils, and mineral and paleontological resources impacts, compliance with existing regulations presented in Section 4.6.1, "Regulatory Framework," and/or implementation of Draft General Plan policies and programs listed below results in a less-than-significant impact. Policies and programs that reduce geology, soils, and mineral and paleontological resource impacts include:

Policies

- **PS-1.1 Seismic Standards.** Strictly enforce the most recent state regulations governing seismic safety and structural design to minimize damage to structures from seismic or geologic hazards.
- **PS-1.3 Slope Stability.** Require adequate mitigation of potential impacts from erosion, slope instability, or other hazardous slope conditions for development occurring on slope and hillside areas.
- **OS-4.2 Protect Mineral Resources**. Protect and conserve mineral resource deposits in designated areas to ensure that such deposits are available for future use..
- **HR-2.3: Evaluation.** Resources found prior to or during site development shall be evaluated by a qualified archaeologist or paleontologist, and appropriate mitigation measures shall be applied before resumption of development activities. Development project proponents shall bear all costs associated with the monitoring and disposition of cultural resources management within the project site.

Programs

- **PS-P-2: Seismic Hazard Mitigation.** Develop hazard mitigation approaches for areas with identified geological, seismic-related, or other natural hazards to minimize potential future damage. Require structural and nonstructural assessment and, when necessary, mitigation of potentially hazardous buildings.
- **PS-P-3: Seismic Safety Studies**. During review of development and redevelopment proposals, require state-licensed surveys of soil and geologic conditions, as appropriate. Examples of when these surveys are required are: (1) for projects within earthquake fault regulatory zones delineated by the state for liquefaction, fault ruptures, and seismically induced landsliding, in accordance with the California Geologic Survey; and (2) before any area with slopes more than 15 percent are developed. Ensure that site-specific seismic analysis is conducted for critical and emergency facilities and sites that use or store acute hazardous materials.
- **PS-P-4: Geological Mitigation for Slope and Hillside Areas**. For development occurring on steep terrain, require geotechnical and geologic investigations and an evaluation of site stability, including any possible impact on adjacent properties, before final project design is approved, pursuant to all applicable building codes. Require that engineered slopes be designed to resist seismically induced failure or settlement. During permit review, identify, and require mitigation of on-site and off-site slope instability, debris flow, and erosion hazards on lots undergoing substantial improvements. Support mitigation on existing public and private property located on unstable hillside areas, especially slopes with recurring failures where City property or public right-of-way is threatened from slope instability, or where considered appropriate and urgent by the City of Hemet Public Works Department, Fire Department, or Police Department.
- **OS-P-15: Mineral Resources and Williamson Act.** Accept California Land Conservation (Williamson Act) contracts, subject to the use and acreage limitations established by Riverside County, on land identified by the state as containing significant mineral deposits.

- **HR-P-10: Studies and Surveys.** Use the development and environmental review processes for private sector, public facilities, and public infrastructure projects to require effective mitigation where development may affect archaeological or paleontological resources. Require appropriate archaeological and paleontological surveys and documentation of findings prior to project approval.

IMPACT ANALYSIS

IMPACT 4.6-1 Fault Rupture. *Adoption and implementation of the Draft General Plan would result in future land uses in areas potentially subject to surface rupture during future earthquake events. However, implementation of Draft General Plan policies and programs requires compliance with existing state and local regulations, which would result in a less-than-significant impact.*

Ground surface rupture is a serious threat to structures and infrastructure that span active faults. Ground surface rupture has historically occurred in southern California, and known faults in the Hemet planning area, including several faults associated with the San Jacinto fault system (see Exhibit 4.6.1) within Alquist-Priolo Earthquake Fault Zones, could produce surface rupture during future earthquake events.

Future land uses consistent with the Draft General Plan could expose new people or structures to hazards associated with fault rupture. However, Draft General Plan policies and programs include a variety of actions aimed at protecting people and structures from fault rupture. Policy PS-1.1 requires enforcement of state and local seismic and structural regulations (i.e., Alquist-Priolo Earthquake Fault Zoning Act, California Seismic Hazards Mapping Act, California Building Standards Code, Hemet Municipal Code), and Program PS-P-3 requires state-licensed surveys of soil and geologic conditions for projects within state-delineated Earthquake Fault Zones.

Adherence to and implementation of Draft General Plan policies and programs requires compliance with existing state and local laws and regulations concerning fault rupture. Therefore, program-level impacts related to fault rupture would be **less than significant**. No mitigation measures are required.

IMPACT 4.6-2 Exposure to Seismic Ground Shaking. *Adoption and implementation of the Draft General Plan would result in future land uses in areas prone to strong seismic ground shaking. However, implementation of Draft General Plan policies and programs require compliance with existing state and local regulations and require structural assessments and mitigation to reduce the potential for substantial adverse effects due to exposure to seismic ground shaking. This impact would be less than significant.*

The San Jacinto Fault system and a number of other regional faults are the main contributors to the seismic exposure of the Hemet planning area and the surrounding region. The effect of an earthquake originating on any given source fault will depend primarily on the earthquake magnitude (amount of energy released) and upon the distance of the planning area from the earthquake source. In general, the more distant the source fault is from the affected area and the smaller the magnitude of the potential earthquake, the smaller the expected ground shaking effect. Fault systems in and near the planning area have the potential for earthquakes with magnitudes of 7.5m to 8.0m at their epicenters, which have potential to be located within or near (within 15-18 miles of) the planning area.

Future land uses consistent with the Draft General Plan would expose additional people and structures to hazards related to seismic ground shaking. However, Draft General Plan policies and programs include a variety of actions aimed at protecting people and structures from ground shaking. Policy PS-1.1 requires enforcement of state seismic and structural regulations (i.e., California Seismic Hazards Mapping Act, California Building Standards Code, Hemet Municipal Code). Program PS-P-3 requires state-licensed surveys of soils and geologic conditions for critical and emergency facilities, and projects located within a state-designated seismic hazard zone. Furthermore, Program PS-P-2 directs the City to develop hazard mitigation approaches for areas with identified seismic hazards, including structural assessment and mitigation for potentially hazardous buildings.

Adherence to and implementation of Draft General Plan policies and programs requires implementation of existing state and local laws and regulations concerning seismic ground shaking. Furthermore, implementation of Program PS-P-2 would require structural assessment and mitigation for potentially hazardous buildings. Therefore, program-level impacts related to seismic ground shaking would be **less than significant**. No mitigation measures are required.

IMPACT 4.6-3 Soil Liquefaction and Ground Failure. *Adoption and implementation of the Draft General Plan would result in future land uses in areas prone to soil liquefaction and ground failure. However, implementation of Draft General Plan policies and programs require compliance with existing state and local regulations, which would reduce the potential for substantial adverse effects due to exposure to soil liquefaction. This impact would be less than significant.*

When liquefaction occurs, soil materials experience a substantial loss of shear strength and behave like a viscous liquid. Liquefaction can cause structural distress or failure due to excessive settlement, a loss of bearing capacity in the foundation soils, and the potential buoyancy effects on buried structures, such as pipelines or vaults. Exhibit 4.6-1 illustrates the location of liquefaction hazards within the Hemet planning area; most of the planning area is moderately susceptible to liquefaction, with areas of high- and very high- susceptibility near the eastern end of Diamond Valley Lake, along the San Jacinto River, and in West Hemet.

Future land uses consistent with the Draft General Plan would expose additional people and structures to hazards related to liquefaction and ground failure. However, Draft General Plan policies and programs include a variety of actions aimed at protecting people and structures from soil liquefaction and ground failure. Policy PS-1.1 requires enforcement of state and local seismic and structural regulations (i.e., California Seismic Hazards Mapping Act, California Building Standards Code, Hemet Municipal Code). Program PS-P-3 requires state-licensed surveys of soils and geologic conditions for critical and emergency facilities, and projects located within a state-designated seismic hazard zone. Furthermore, Program PS-P-2 directs the City to develop hazard mitigation approaches for areas with identified seismic hazards, including structural assessment and mitigation for potentially hazardous buildings.

Adherence to and implementation of Draft General Plan policies and programs requires implementation of existing state, and local laws and regulations concerning soil liquefaction and ground failure. Furthermore, implementation of Program PS-P-2 would require structural assessment and mitigation for potentially hazardous buildings. Therefore, program-level impacts related to liquefaction and ground failure would be **less than significant**. No mitigation measures are required.

IMPACT 4.6-4 Earthquake-induced Landslides. *Adoption and implementation of the Draft General Plan would result in future land uses in areas susceptible to earthquake-induced landslides. However, implementation of Draft General Plan policies and programs require compliance with existing state and local regulations, which would reduce the potential for substantial adverse effects due to exposure to earthquake-induced landslides. This impact would be less than significant.*

The areas considered most susceptible to earthquake-induced landslide are located on moderately to steeply inclined slopes and on or adjacent to existing landslide deposits, especially if the underlying materials consist of loose soil or weak, fractured bedrock. Such areas generally include hilly areas in West Hemet, Park Hill, and the southeastern portion of the planning area.

Future land uses consistent with the Draft General Plan could expose additional people and structures to hazards related to landslides. However, Draft General Plan policies and programs include a variety of actions aimed at protecting people and structures from landslides. Policy PS-1.1 would require enforcement of state and local seismic and structural regulations (i.e., California Seismic Hazards Mapping Act, California Building Standards Code, Hemet Municipal Code), and Policy PS-1.3 would require the City to impose adequate mitigation for potential impacts from erosion, slope instability, or other hazardous slope conditions for development occurring

on slope and hillside areas. Program PS-P-3 would require state-licensed surveys of soils and geologic conditions for critical and emergency facilities, and projects located within a state-designated seismic hazard zone or areas with more than 15 percent slope. Program PS-P-4 would require geotechnical and geologic investigations and an evaluation of site stability for developments located on steep terrain. This evaluation must include any possible impact on adjacent properties, and must be completed before final project design is approved. Program PS-P-2 directs the City to develop adequate mitigation of potential impacts from slope instability or hazardous slope conditions, developing hazard mitigation approaches for areas with identified seismic hazards, including structural assessment and mitigation for potentially hazardous buildings.

Adherence to and implementation of Draft General Plan policies and programs would require compliance with state and local regulations, state-licensed surveys of soil and geologic conditions in areas subject to landslide hazards, and mitigation for any potential hazards. Therefore, program-level impacts related to landsliding and slope failure would be **less than significant**. No mitigation measures are required.

IMPACT 4.6-5 Erosion Hazards. *Adoption and implementation of the Draft General Plan would result in future land uses in areas susceptible to erosion. However, implementation of the Draft General Plan policies and programs and require compliance with existing state and local regulations, which would reduce the potential for substantial adverse effects due to erosion or soil loss. This impact would be less than significant.*

Increased soil erosion can occur as a result of ground disturbance, including construction activity and loss of vegetative cover. Erosive soils can damage roads, bridges, buildings, and other structures and result in degradation of water quality and damage to sensitive biological habitats (water quality impacts of soil erosion are discussed in Section 4.9, "Hydrology and Water Quality"). Soil loss can be caused by sheet or rill erosion in areas where 50–75% of the surface has been exposed.

Erosion is a large-scale impact caused by human activity and disturbance of surface soil, wind, and water. Erosion cannot be eliminated altogether, although existing regulations such as the CBC (which includes erosion control measures and best management practices) and NPDES permit requirements can reduce the potential impacts of erosion.

Ground disturbance associated with future land uses permitted under the Draft General Plan could cause erosion or soil loss. However, Draft General Plan policies and programs include a variety of actions aimed at avoiding or minimizing the effects of erosion. Policy PS-1.1 would require enforcement of state and local seismic and structural regulations (i.e., California Building Standards Code, Hemet Municipal Code, and NPDES Permit Requirements), and Policy PS-1.3 would require the City to impose adequate mitigation for potential impacts from erosion, slope instability, or other hazardous slope conditions for development occurring on slope and hillside areas. Program PS-P-3 would require state-licensed surveys of soils and geologic conditions for critical and emergency facilities, and projects located within a state-designated seismic hazard zone or areas with more than 15 percent slope. Program PS-P-4 would require geotechnical and geologic investigations and an evaluation of site stability for developments located on steep terrain. This evaluation must include possible impacts on adjacent properties, and must be completed before final project design is approved. Program PS-P-2 directs the City to develop adequate mitigation of potential impacts from slope instability or hazardous slope conditions, including structural assessment and mitigation for potentially hazardous buildings.

Adherence to and implementation of Draft General Plan policies and programs would require compliance with state and local regulations, state-licensed surveys of soil and geologic conditions, and mitigation for any potential erosion hazards. Therefore, program-level impacts related to erosion would be **less than significant**. No mitigation measures are required.

IMPACT 4.6-6 Soil Hazards. *Adoption and implementation of the Draft General Plan would result in future land uses in areas susceptible to soil hazards, including landsliding, debris flows, expansive soils, and collapsible soils. However, implementation of Draft General Plan policies and programs require compliance with existing state and local regulations which would reduce the potential for substantial adverse effects due to exposure to soil hazards. This impact would be less than significant.*

In addition to earthquake-induced landslides, slope instability or landsliding can occur under static (non-earthquake) conditions due to moisture influx, erosion or loss of toe support, and other factors. The potential for landslides, debris flows, and shallow mudslides is a potential geologic hazard in the hilly portions of the planning area, including areas in West Hemet, Park Hill, and the southeastern portion of the planning area. Mudslides and debris flows also pose a hazard to properties at the base of undeveloped or unimproved slopes.

Fine-grained native soils, bedrock, and artificial fill soils, consisting predominantly of silt and clay, may contain clay minerals that are susceptible to expansion upon addition of water and contraction under drying conditions. Certain clay minerals with high plasticity have higher potential for expansion. These materials can affect performance of foundations, slabs, and exterior property improvements. Most soil associations in the planning area have low shrink-swell potential, but expansive materials may exist in portions of the planning area. Current building code provisions are considered suitable for design at sites with expansive soils. Therefore, designs should include proper characterization of the hazard through soils investigations and follow building codes and local experience.

Collapsible soils are typically young, loose deposits that have the potential for significant abrupt volumetric change when wetted. An increase in surface water infiltration such as from heavy irrigation or prolonged rainfall or from a rise in the groundwater, combined with the weight of a structure, can initiate settlement. These materials typically affect foundations, slabs, and exterior improvements to properties. Current provisions in building codes are considered suitable for design at sites with collapsible expansive soils.

Ground subsidence is typically associated with regional changes in ground surface elevation associated with seismic warping, lowering of groundwater through pumping, and removal of oil and natural gas through pumping. Ground subsidence is occurring beneath the planning area, primarily due to groundwater withdrawal. However, these movements are distributed over large areas and, as a consequence, rarely produce damage.

Future land uses consistent with the Draft General Plan would expose additional people and structures to soil hazards, including landsliding, debris flows, expansive soils, and collapsible soils. However, policies and programs in the Draft General Plan include a variety of actions aimed at protecting people and structures from soil hazards. Policy PS-1.1 would require enforcement of state and local seismic and structural regulations (i.e., California Seismic Hazards Mapping Act, California Building Standards Code, Hemet Municipal Code, NPDES Permit Requirements), and Policy PS-1.3 would require the City to impose adequate mitigation for potential impacts from erosion, slope instability, or other hazardous slope conditions for development occurring on slope and hillside areas. Program PS-P-3 would require state-licensed surveys of soils and geologic conditions for critical and emergency facilities, and projects located within a state-designated seismic hazard zone or areas with more than 15 percent slope. Program PS-P-4 would require geotechnical and geologic investigations and an evaluation of site stability for developments located on steep terrain. This evaluation must include possible impacts on adjacent properties, and must be completed before final project design is approved. Program PS-P-2 directs the City to develop adequate mitigation of potential impacts from slope instability or hazardous slope conditions, developing hazard mitigation approaches for areas with identified seismic hazards, including structural assessment and mitigation for potentially hazardous buildings.

Adherence to and implementation of Draft General Plan policies and programs would require compliance with state and local regulations, state-licensed surveys of soil and geologic conditions, and mitigation for any potential soil hazards. Therefore, program-level impacts related to soil hazards, including landslides, debris flows, subsidence, expansive soils, and collapsible soils would be less than significant. No mitigation measures are required.

IMPACT 4.6-7 Septic Suitability of Soils. *Adoption and implementation of the Draft General Plan would generally result in the installation of public sewer collection systems. Where new individual septic systems are proposed, existing regulatory requirements for septic permits could not be met in areas with soil not suitable for septic systems. Therefore, no septic system could be installed in an area with unsuitable soils. This impact would be less than significant.*

Adoption and implementation of the Draft General Plan would generally result in urbanized future land uses, served by municipal sewer collection and treatment systems. However, some future land uses envisioned in the Draft General Plan could use septic systems for sewage disposal.

An application for a septic system in the planning area requires documentation of a percolation test, permission from the Riverside County Health Department, and a letter of permission from Eastern Municipal Water District. These requirements could not be met, and no permit could be issued, in areas where soils are not suitable for septic systems. Therefore, no septic system could be installed in an area with unsuitable soils.

With adherence to and implementation of existing federal, state, and local laws and regulations concerning septic permitting, including Riverside County Health Department septic permit requirements, program-level impacts related to septic suitability of soils would be **less than significant**. No mitigation measures are required.

IMPACT 4.6-8 Mineral Resources. *Adoption and implementation of the Draft General Plan could result in land use changes that would affect the availability of mineral resources. However, implementation of Draft General Plan policies and programs require compliance with existing regulations and protection of mineral resources for future use. These regulations, policies, and programs would reduce the potential for substantial adverse effects related to loss of mineral resources. This impact would be less than significant.*

The portions of the planning area that have been evaluated for the presence of mineral resources by the State Geologist are designated as MRZ-3. MRZ-3 includes those areas where geologic evidence indicates that mineral deposits exist or likely exist, but the significance of these deposits has not been determined. In addition, some minerals are present which have the potential to have local significance. Historically, limestone, serpentine, and sand and gravel were mined in the Bautista Canyon, Diamond Valley, and the Salt Creek and San Jacinto riverbeds, respectively.

Future land uses consistent with the Draft General Plan could result in a loss of availability of mineral resources. Although the presence of mineral resources in MRZ-3 areas cannot be determined, these resources potentially exist in some portion of the planning area, and some areas of the planning area have not been evaluated by the State Geologist for the presence of mineral resources. Locally important resources in the Bautista Canyon, Diamond Valley, and the Salt Creek and San Jacinto riverbeds could also be affected by land uses permitted under the Draft General Plan. However, Draft General Plan policies and programs include a variety of actions aimed at protecting the future availability of mineral resources. Policy OS-4.2 would require the City to protect and conserve mineral resource deposits and ensure that they are available for future use. Program OS-P-15 would require the City to accept California Land Conservation (Williamson Act) contracts on land identified by the state as containing significant mineral deposits subject to the use and acreage limitations established by Riverside County.

Adherence to and implementation of Draft General Plan policies and programs, along with implementation of existing federal, state, and local laws and regulations concerning mineral resources (including SMARA), would reduce program-level impacts related to mineral resources to a **less-than-significant** level. No mitigation measures are required.

IMPACT 4.6-9 Paleontological Resources. *Ground disturbance associated with future land uses consistent with the Draft General Plan could result in the discovery of paleontological resources. However, implementation of Draft General Plan policies and programs would reduce the potential for substantial adverse effects related to loss these resources. This impact would be less than significant.*

The Hemet planning area includes both areas where older Pleistocene sediments are present in the subsurface, and areas where these sediments are exposed at the ground surface. Surface exposures are located in the southern portion of the planning area (generally south of Johnston Avenue), and also in the western portion of the planning area (generally west of Warren Road). Surface exposure of older Pleistocene sediments generally occurs at the lower slopes of hills or mountains. These older Pleistocene alluvial deposits have high potential to contain significant paleontological resources, and so are considered to have high paleontological sensitivity. Pleistocene sediments in the Diamond and Domenigoni Valleys yielded tens of thousands of Pleistocene age vertebrate fossils. Older Pleistocene alluvial sediments elsewhere throughout Riverside and San Bernardino Counties and the Inland Empire have been reported to yield significant fossils of plants and extinct animals.

Ground disturbance associated with future land uses consistent with the Draft General Plan could result in the discovery of paleontological resources. However, Draft General Plan policies and programs include a variety of actions aimed at protecting paleontological resources. Policy HR-2.3 would require resources found prior to or during site development be evaluated by a qualified paleontologist, and would require appropriate mitigation measures be implemented before resumption of development activities when resources are found. Program HR-P-10 would require the City to use the development review process to require appropriate paleontological surveys and document findings.

Adherence to and implementation of Draft General Plan policies and programs would reduce program-level impacts related to paleontological resources to a **less than significant** level because a qualified paleontologist would evaluate any resources found prior to or during site development, and the City would use the development review process to require appropriate surveys. No mitigation measures are required.