

## **Section 17**

### **Geology, Soils, and Mineral Resources**

This section summarizes the City's geologic setting and describes how development associated with the *City of Modesto Urban Area General Plan (UAGP)* would affect the potential exposure of new population and employees to earthquake and earthquake-related hazards, including liquefaction. It also addresses the potential effects of implementing the development envisioned in the UAGP on the extraction of mineral resources.

#### **A. ENVIRONMENTAL SETTING**

The following information is provided in accordance with Section 15125 of the California Environmental Quality Act (CEQA) Guidelines. This environmental setting is the baseline for determining whether an impact of the UAGP is significant.

##### **1. Study Area for Direct Impacts**

The study area for direct impacts related to geology, soils and mineral resources is the UAGP planning area.

##### **2. Study Area for Cumulative Impacts**

This analysis will be based on the plan or projection approach to examining cumulative effects, as provided under Section 15130(b)(1)(B) of the State CEQA Guidelines. The pertinent plan used for this purpose is the UAGP. The study area for cumulative impacts related to geology, geologic hazards, and mineral resources is defined as Stanislaus County.

##### **3. Existing Physical Conditions in the Study Area**

###### **a. Overview**

Modesto is situated at the northern end of the San Joaquin Valley, a deep, structurally controlled trough that is bounded on the north by the Sacramento Valley, on the east by the Sierra Nevada, on the south by the San Emigdio and Tehachapi Mountains, and on the west by the Coast Ranges uplift.

The San Joaquin Valley is floored by a complexly layered sequence of sedimentary deposits that reaches an estimated thickness of 11,000 feet in the vicinity of Modesto. Under the eastern and central portions of the valley, the base of the sequence likely rests on Mesozoic crystalline rock allied to the plutons of the Sierra Nevada; to the west, basement rocks are believed to be mafic and ultramafic rocks of Jurassic age. These basement rocks are

immediately overlain by marine and continental (nonmarine) sedimentary rocks of Cretaceous and Tertiary age consisting mainly of sandstone, sand, siltstone, and shale, which in turn are overlain by Quaternary (Pleistocene and Holocene) alluvial and fluvial deposits of sand, gravel, silt, and clay (Norris and Webb 1990; Bartow 1991).

Modesto is situated primarily on alluvial fan deposits of Pleistocene age, but limited areas in the southeastern portion of Modesto are within the active floodplains of the Tuolumne River and Dry Creek and are underlain by younger (Holocene) alluvium. To the west of the City, the central portion of the Coast Ranges uplift is predominantly formed by exposed Franciscan Complex rocks of Jurassic through early Tertiary age. The range front to the west consists of a narrow belt of marine and nonmarine sedimentary rocks of post-Franciscan Tertiary age. To the east of Modesto, the exposed ridges and slopes of the Sierra Nevada are composed primarily of Mesozoic and plutonic rocks, flanked along the valley margin by deeply dissected exposures of marine and nonmarine sedimentary rocks of Tertiary age (Bartow 1991).

## **b. Soils**

Soils in the Modesto area range from hardpan soils on older alluvial fans and terraces to deep, highly fertile soils on younger alluvial fans (U.S. Department of Agriculture 1964).

Four soil associations are mapped as occurring in the project area: the San Joaquin–Madera association, the Hanford-Tujunga association, the Modesto-Chualar association, and the Dinuba-Hanford association. Soils of the San Joaquin–Madera Association consist of hardpan soils on moderately old fans and terraces. These soils are typically well-drained sandy loams, loams, and clay loams with very slow permeability, slight erosion hazard, and very slow to slow runoff (U.S. Department of Agriculture 1964). Soils of the older Pleistocene fans and terraces are typically above the area’s active drainages and are not subject to flooding or active alluvial deposition.

Soils of the Hanford-Tujunga association occur on young alluvial fans and in actively flooded bottomlands in the vicinity of the Stanislaus and Tuolumne Rivers. These soils consist of well-drained sandy loams and fine sandy loams and are characterized by moderately rapid to very rapid permeability, slight erosion hazard, and very slow runoff (U.S. Dept. of Agriculture 1964).

Soils of the Modesto-Chualar association are restricted to the outer margins of the Stanislaus River fan and the inter-fan areas between the Stanislaus and Tuolumne Rivers. These soils are generally moderately well-drained sandy to clay loams with very slow to slow permeability, slight erosion hazard, and very slow runoff (U.S. Dept. of Agriculture 1964).

The Dinuba-Hanford association comprises moderately deep to deep soils on fans of the Stanislaus and Tuolumne Rivers. These soils are generally imperfectly drained, moderately deep to deep sandy loams that exhibit a moderate permeability, slight erosion hazard, and very slow runoff (U.S. Dept. of Agriculture 1964).

### **c. Mineral Resources**

Historic mineral production in Stanislaus County has included construction materials (sand and gravel), industrial minerals (diatomite, clay, mineral pigments, magnesite, quartz, and dimension stone), and metallic minerals (chromite, placer gold, manganese, mercury, platinum, and silver) (California Department of Conservation, Division of Mines and Geology 1993). However, the only mineral commodities that are mined actively in Stanislaus County are sand and gravel.

No areas classified as Mineral Resource Zones (MRZ-2a or MRZ-2b) under the Surface Mining and Reclamation Act—that is, areas where significant mineral deposits have been determined to exist—occur within the planning area. (These classifications are described further in the *State Policies* section below.) Modesto is entirely within an area zoned MRZ-3a for sand and gravel (California Department of Conservation, Division of Mines and Geology 1993). This designation indicates areas containing known mineral occurrences of undetermined significance. As recently as 1998, there were five active sand and gravel operations and one specialty sand mining operation in Modesto (California Department of Conservation, Division of Mines and Geology 1999). However, no mining activity occurs in Modesto, and data from the U.S. Geological Survey regarding mineral production in California indicate that no new mines or expansions of existing mines were approved in Modesto between 1999 and 2006 (Kohler 2005, 2006; U.S. Geological Survey 1999, 2000, 2001, 2002, 2003, 2004).

### **d. Landslides and Erosion**

Historically, landslides in Stanislaus County have occurred primarily in the Diablo Range in the western portion of the county, where steep slopes and unstable geologic conditions have presented a substantial limitation to development (Stanislaus County 1987). By contrast, the regional slope in the vicinity of Modesto is on the order of 0.001 vertical foot of change per foot of horizontal distance (0.1% slope). Local slopes may approach 8% in areas where former sand dunes are located. Because the planning area is generally level, it is not subject to landslides.

As discussed above, the soils in the planning area typically have a slight erosion potential, and the overall erosion hazard in Modesto is considered low. However, wind or rain may cause erosion when soils are exposed during construction activities and when fields are left fallow. Erosion also may occur along streams or rivers during storm events, resulting in locally significant bank failures if the banks are not stabilized. Streambank erosion is restricted to areas immediately adjacent to the Stanislaus River, Tuolumne River, and Dry Creek and typically is not considered a significant problem in Modesto because of control of discharge in the upper reaches of the rivers, stabilization of banks, and restrictions on construction in their vicinity (Rivera pers. comm.).

### **e. Expansive Soils**

Expansive soils are those that contain a substantial proportion of clay minerals that swell under wet conditions and shrink under dry conditions. Expansion and contraction as a result

of wetting and drying has the potential to damage improperly designed or constructed facilities, including foundations, freestanding structures, pavement, and concrete slabs.

Information on the engineering properties of soils in Modesto is not readily available, but where soils are clay-rich, there may be some potential for expansive soils. Concerns related to development on expansive soils typically can be addressed through appropriate design. As discussed in the *Significant Direct Impacts* section below, impacts related to the location of new development on expansive soils within the planning area would be assessed through the City's development review process, and mitigated through conformance with the most recent California Building Code (Title 24 California Code of Regulations [CCR]) standards and requirements for site-specific geotechnical studies.

## **f. Seismic Hazards**

### **(1) Key Terms and Concepts**

Earthquake activity is associated with several types of seismic hazards. The State of California divides these into primary seismic hazards (surface fault rupture and ground shaking) and secondary seismic hazards (liquefaction and other types of seismically induced ground failure, along with seismically induced landslides). Key terms are defined below.

*Surface fault rupture* refers to rupture, breakage, or disruption at the ground surface that occurs as a result of movement (slip) along an active fault.

*Ground shaking* results from the release of energy during an earthquake. Ground shaking is most intense at the earthquake epicenter; in general, ground shaking decreases with increasing distance from the epicenter. The nature of subsurface materials also influences the strength and duration of ground shaking in an earthquake.

The intensity of ground shaking in an earthquake can be described in terms of the Modified Mercalli Intensity Scale, which assigns a range of intensity values based on the observed effects of ground shaking on people, buildings, and the natural environment. The scale's intensities are denoted by Roman numerals ranging from I (shaking that is essentially imperceptible) to XII (total damage).

The "size" of an earthquake also can be described in terms of its *magnitude*. Commonly used scales for earthquake magnitude include Richter magnitude and moment magnitude. The Richter magnitude scale is based on the degree of ground motion experienced as a result of the first seismic waves to affect an area. The moment magnitude scale relies on an event's seismic moment, a measure of earthquake strength as a function of the extent (area) of fault rupture, the average displacement or slip on the ruptured surface, and the rigidity of the rock materials ruptured.

*Liquefaction* is a phenomenon in which unconsolidated materials (soil or sediment) lose cohesion and behave as a liquid, typically as a result of earthquake shaking. Liquefaction typically occurs in sandy materials that are saturated with groundwater and is restricted to the upper 50 feet below ground surface. Liquefaction poses a

hazard to structures (hence to life and safety) because liquefied materials lose their strength and may become unable to support structures built on them. This can result in severe structural damage, particularly in poorly designed or constructed structures.

## **(2) Primary Seismic Hazards—Surface Fault Rupture and Groundshaking**

No faults in the Modesto area are recognized as active by the State of California and zoned pursuant to the Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act, defined further under *State Policies* below) (Hart and Bryant 1997), nor is the Modesto area traversed by any faults recognized by the Uniform Building Code (UBC) as active (International Conference of Building Officials 1997).

The only active fault reported in Stanislaus County is the Tesla-Ortogonalita fault, which is located approximately 20 miles west of Modesto. Based on geomorphic evidence and results of trench studies, the Ortogonalita fault is believed to experience right-lateral strike-slip motion and is likely capable of generating earthquakes with a Richter scale magnitude of 6.5 to 6.75. The recurrence interval for large magnitude events on the Ortogonalita is inferred to be 2,000–5,000 years on the fault as a whole and 10,000–25,000 years on individual fault segments (Anderson et al. 1982) (see Table V-17-1). The UBC (International Conference of Building Officials 1997) characterizes the Ortogonalita fault as a Type B seismic source. The UBC evaluates the risk associated with active faults based on their potential to generate large earthquakes (measured as the moment magnitude for the largest earthquake anticipated on the fault) and their degree of seismic activity (measured as average annual slip rate). Under this system, a Type A seismic source is a fault that is capable of producing large-magnitude events (> M 7.0) and is highly active (has a high average annual slip rate). A Type B seismic source is associated with smaller maximum events and/or is less active but still constitutes a substantial seismic threat (International Conference of Building Officials 1997). It is not known to experience fault creep.

Other active faults in the surrounding region include: the Greenville fault, located approximately 35 miles northwest of Modesto; the Calaveras and Concord faults, approximately 50 miles west of Modesto; the Hayward fault, about 60 miles to the west; and, the San Andreas fault, approximately 75 miles west.

Based on information furnished by the Department of Mines and Geology (now the California Geological Survey) and the Office of Emergency Services, earthquakes typical of surrounding-area faults are capable of producing ground shaking to an intensity of VI or VII on the Modified Mercalli Intensity Scale (Stanislaus County 1987). Based on this scale, slight structural damage would occur as a result of an intensity-VI earthquake. Damage from an intensity-VII earthquake would be negligible in buildings of good construction and design, slight to moderate in well-built ordinary structures, and considerable in poorly built or badly designed structures (U.S. Geological Survey 2007; Wood and Neuman 1931).

**Table V-17-1.** Maximum Credible Earthquake and UBC Seismic Source Type for Principal Active Faults in the Region Surrounding Planning Area

Fault	Magnitude of Maximum Credible Earthquake	UBC Seismic Source Type
Ortogonalita	6.5–6.75 <sup>b</sup> , 6.9 <sup>a</sup>	B <sup>a</sup>
San Andreas	7.0–7.9 <sup>a</sup>	A <sup>a</sup>
Hayward	Entire fault: 7.1 <sup>a</sup> Southern segment: 6.5 <sup>a</sup>	A <sup>a</sup> B <sup>a</sup>
Calaveras (southern)	6.2 <sup>a</sup>	B <sup>a</sup>
Greenville	6.9 <sup>a</sup>	B <sup>a</sup>
Concord–Green Valley	6.9 <sup>a</sup>	B <sup>a</sup>

<sup>a</sup> Source: International Conference of Building Officials 1997.

<sup>b</sup> Source: Anderson et al. 1982.

### **(3) Secondary Seismic Hazards—Liquefaction and Ground Failure**

The potential for liquefaction to occur in the Modesto area has not yet been evaluated by the State of California under the Seismic Hazards Mapping Act (California Geological Survey 2007). However, much of the substrate in the planning area consists of young, unconsolidated alluvial and fluvial (river) deposits, and groundwater data from wells in Modesto show the depth to groundwater as ranging from approximately 11.7 to 62.5 feet, based on measurements taken in November 2006 (California Department of Water Resources 2007b). Such soil and groundwater conditions may present a liquefaction hazard in portions of the planning area.

## **4. Existing Policies Applying to the Study Area**

Below is a comprehensive list of major federal, state, and local regulations and policies or summaries of policies that apply to the study areas. This list summarizes the full range of applicable policies that a project within the study areas would need to comply with, including policies beyond the jurisdiction of the City. This list of laws, regulations, and programs also serves to describe the circumstances assumed for the master environmental impact report (Master EIR) analysis of impacts related to geology, soils, and geologic hazards.

A discrete reference number, following the initials of the resource topic, is assigned to each policy or policy summary listed to facilitate its identification elsewhere in this Master EIR or, where appropriate, its incorporation as a mitigation measure into subsequent projects analyzed under this Master EIR (e.g., Geology, Soils, and Mineral Resources policies are designated as GSM-X, where X is the discrete number).

## **a Federal Policies**

The Federal Emergency Management Agency (FEMA) provides emergency relief to victims of natural disasters such as earthquakes and landslides. However, FEMA has not established federal regulations that relate to geologic hazard abatement or limit geologic hazard liabilities.

## **b State Policies**

California's Alquist-Priolo Act (Public Resources Code [PRC] Section 2621 et seq.) is intended to reduce the risk to life and property from surface fault rupture during earthquakes. The Alquist-Priolo Act prohibits the location of most types of structures intended for human occupancy across the traces of active faults and strictly regulates construction in the corridors along active faults (earthquake fault zones). Under the Alquist-Priolo Act, faults are zoned, and construction along or across them is strictly regulated if they are "sufficiently active" and "well defined." A fault is considered sufficiently active if one or more of its segments or strands shows evidence of surface displacement during the Holocene time (defined for purposes of the Alquist-Priolo Act as referring to approximately the last 11,000 years). A fault is considered well defined if its trace can be identified clearly by a trained geologist at the ground surface or in the shallow subsurface, using standard professional techniques, criteria, and judgment (Hart and Bryant 1997).

The Seismic Hazards Mapping Act of 1990 directs the state to identify and map areas subject to earthquake hazards such as liquefaction, earthquake-induced landslides, and amplified ground shaking. Pursuant to this act, cities and counties are prohibited from issuing development permits for sites within seismic hazard zones until appropriate site-specific geologic or geotechnical investigations have been carried out and measures to reduce potential damage have been incorporated into the development plans. Seismic hazard mapping has been prioritized to address coastal urban areas first, so no maps are currently available for Modesto's planning area.

The Surface Mining and Reclamation Act of 1975 (SMARA) was enacted in response to land use conflicts between urban growth and essential mineral production. It requires the California Geological Survey (formerly the California Division of Mines and Geology) to classify California lands into MRZs. The MRZ classifications are defined as follows.

- MRZ-1: areas where adequate information indicates that no significant mineral deposits are present or where it is judged that little likelihood exists for their presence.
- MRZ-2: areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists.
- MRZ-3: areas containing mineral deposits, the significance of which cannot be evaluated from available data.
- MRZ-4: areas where available information is inadequate for assignment into any other MRZ.

Based on the MRZ zoning system, SMARA creates a framework for local government to consider the impacts of new development on the availability of mineral resources. Government Code Section 65560 requires a general plan’s open space element to protect “major mineral deposits.”

The California Building Code (24 CCR) is adopted and regularly updated by the California Building Standards Commission. The 2016 edition took effect on January 1, 2017. The Commission is established under the California Building Standards Law (Health and Safety Code Sections 18901–18949.6) to adopt and publish a standardized set of building codes. These building codes serve as the comprehensive standards for the design and construction of buildings in California and include (among other things) provisions for seismic safety, foundation stability, and energy conservation.

The California Building Code is based on the UBC, a model code adopted by the International Conference of Building Officials (International Conference of Building Officials 1997). The UBC classifies seismic risk zones ranging from 0 to 4, with building standards increasing in stringency accordingly. The California Building Code includes additional requirements beyond the UBC because of the state’s history of seismic activity. The California Building Code provides that a geologic engineering report is required of all construction except for one-story wood frame or light steel frame buildings of 4,000 square feet or smaller that are located outside seismic hazard zones.

Hospitals and other medical facilities with surgery or emergency treatment areas that are needed for emergency purposes must upgrade to state seismic safety standards under the Alfred E. Alquist Hospital Facilities Seismic Safety Act of 1983. Enforcement of this program is the responsibility of the Office of Statewide Health Planning and Development. (Health and Safety Code Section 129675 et seq.)

School facilities are required to meet special seismic safety standards under the “Field Act” and are not subject to local building standards. Enforcement of this program is the responsibility of the California Department of General Services, Division of the State Architect.

### **c. Local Policies**

The City has adopted the California Building Code, as have Stanislaus County (the County) and numerous other cities within the county. Portions of the California Building Code and UBC that have been adopted by the City and that are particularly relevant to geology and geologic hazards include California Building Code Chapter 16, Division IV (Structural Design Requirements—Earthquake Design), and Chapter 33 (Site Work, Demolition, and Grading), in addition to Appendix Chapter 33 (Excavation and Grading).

Stanislaus County, including Modesto, is within the UBC Seismic Zone 3; accordingly, any future development in the planning area is required to comply with all UBC Seismic Zone 3 design standards.

The City’s Grading and Erosion Control Ordinance (Section 5-10.301 et seq., Modesto Municipal Code) requires a grading and erosion control permit before any grading may occur



that involves 350 cubic yards of soil or clears more than 0.5 acre of land. The City can condition issuance of a permit to ensure that grading doesn't result in erosion or a release of soil off the site. Erosion is controlled further through the City's "Erosion and Sediment Control Standards for Construction Activities" adopted as part of the City's National Pollutant Discharge Elimination System (NPDES) permit from the Regional Water Quality Control Board (RWQCB). This establishes best management practices (BMPs) to avoid erosion. The following sections describe policies specific to the City.

#### **d. City of Modesto Policies**

The UAGP provides the following policies related to geology, geologic hazards, and mineral resources.

- GSM-1:** Continue to use building codes as the primary tool for reducing seismic risk in structures. The current version of the California Building Code, as adopted by the City of Modesto, is intended to ensure that buildings resist major earthquakes of the intensity or severity of the strongest experience in California, without collapse, but with some structural as well as nonstructural damage. In most structures, it is expected that structural damage could be limited to repairable damage, even in a major earthquake. (UAGP Policy VII.K[a])
- GSM-2:** Require all new buildings in the City to be built to the seismic requirements of the current adopted California Building Code. (UAGP Policy VII.K[b])
- GSM-3:** Continue to explore measures to induce building owners to upgrade and retrofit structures to render them seismically safe. (UAGP Policy VII.K[c])
- GSM-4:** Enforce provisions of the Alquist-Priolo Earthquake Fault Zoning Act. (UAGP Policy VII.K[d])
- GSM-5:** Any construction that occurs as a result of the General Plan must conform to the current California Building Code regulations, which address seismic safety of new structures and slope requirements. As appropriate, require a geotechnical analysis prior to tentative map approval in order to ascertain site-specific subsurface information necessary to estimate foundation conditions. These geotechnical studies should reference and make use of the most recent regional geologic maps available from the California Department of Conservation Division of Mines and Geology. (UAGP Policy VII.N[a])
- GSM-6:** Discourage development on lands that are subject to landslides. (UAGP Policy VII.N[b])
- GSM-7:** New public roads in areas subject to landslides should be designed to minimize landslide risks. (UAGP Policy VII.N[c])
- GSM-8:** All building permits should be reviewed to ensure compliance with the current adopted edition of the California Fire Code, California Building Code, California Mechanical Code, California Electrical Code, California Plumbing Code, Title 19, Title 24, and the City of Modesto Municipal Code. (UAGP Policy VII.N[d])
- GSM-9:** Include "best management practices" in the erosion control program, as appropriate, given the specific circumstances of the site and/or project. Table 9-2 in the Master Environmental Impact Report presents examples of best management practices. (UAGP Policy VII.N.[f])

- GSM-10:** Design sediment control basins to capture eroded sediments and contain them on the project sites shall be designed consistent with the criteria outlined in Table 9-3 in the Master Environmental Impact Report. (UAGP Policy VII.N[g])
- GSM-11:** Promote public awareness of the following local routes for the public’s use in evacuating the City in the event of an emergency.
1. State Highways 99, 132, 219, and 108
  2. Briggsmore Avenue
  3. Claus Road
  4. Standiford/Sylvan Avenue
  5. Scenic Drive
  6. Pelandale Avenue
  7. Ninth Street
  8. Paradise Road
  9. Carpenter Road (UAGP Policy VII.N[h])
- GSM-12:** City plans and policies shall not interfere with any emergency evacuation and response plans. This would include the continued maintenance of adequate police and fire services, and identified emergency evacuation routes (UAGP Figure VII-3). (UAGP Policy VII.N[i])
- GSM-13:** Ensure the provision of adequate and accessible evacuation routes. (UAGP Policy VII.N[j])

## **5. Policies That Avoid Impacts**

The following City policies are in effect and have been determined to reduce, avoid, or mitigate environmental impacts within the existing city limits and within the Planned Urbanizing Area. The policy reference numbers are listed, and the full text of these policies is found in Section A-4, *Existing Policies Applying to the Study Areas*.

### **a. City of Modesto Policies**

The UAGP provides the following policies related to geology, geologic hazards, and mineral resources: Baseline Developed Area and Planned Urbanizing Area: GSM-1 through GSM-13. In addition, the City will comply with requirements of its Grading and Erosion Control Ordinance and the adopted “Erosion and Sediment Control Standards for Construction Activities.”

## **B. CONSIDERATION AND DISCUSSION OF SIGNIFICANT IMPACTS**

The following information is provided in accordance with State CEQA Guidelines Section 15126.2.

## **1. Thresholds of Significance**

CEQA requires that agencies analyze effects on the environment of seismic and landslide hazards; a model checklist to guide analysis is provided in Appendix G of the State CEQA Guidelines. Impacts could be significant if a project would:

- a. expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  1. 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);
  2. strong seismic ground shaking;
  3. seismic-related ground failure, including liquefaction; or,
  4. landslides (including seismically induced landslides);
- b. be located on expansive soil;
- c. result in substantial loss of topsoil resources; or,
- d. result in the loss of availability of known mineral resources that would be of value to the region and the state.

## **2. Significant Direct Impacts**

The general level of risk related to seismic activity, soil conditions, and the loss of mineral resource availability is similar throughout the Modesto area, and approaches to avoid and mitigate impacts related to these conditions are also very similar regardless of the location within the city.

Therefore, significant direct impacts are not discussed specifically in terms of the City's Baseline Developed Area, Downtown Area, or Planned Urbanizing Area, but rather are evaluated based on the entire UAGP planning area.

### **a. Impacts Related to Seismic Hazards**

No faults known to be active or zoned as active by the State of California under the Alquist-Priolo Act are within the Modesto planning area. Consequently, the risk of surface fault rupture in Modesto is considered low, and related impacts currently are identified as less-than-significant. Nonetheless, policies GSM-1 through GSM-6 and GSM-9 commit the City to enforcing building standards and carrying out its enforcement responsibilities under the Alquist-Priolo Act. With this commitment in place, risks to new development and redevelopment under the updated UAGP as a result of surface fault rupture are also expected to be less than significant, even if active faulting is identified within the UAGP at some future time. No mitigation would be required.

The planning area very likely will be subject to ground shaking as a result of earthquake activity on faults in the region, and there is some potential for significant impacts related to structural damage and concomitant hazards to safety and life. However, City policies GSM-1

through GSM-6 require all new structures to be designed and constructed to meet or exceed relevant building code requirements. Additional code compliance requirements specific to critical facilities (e.g., hospitals and schools) are established under state law and are administered by the state. Finally, where appropriate, the City will require the preparation of site-specific geotechnical investigations as a condition of subdivision approval and will hold the project proponent responsible for implementing the recommendations of the geotechnical investigation (policy GSM-6). Although there would be some residual risk, in any seismically active area, residual impacts are considered less than significant with these policies in place. No additional mitigation would be required.

Because topography in the planning area is not hilly, the risk of seismically induced landsliding is considered low. However, the planning area may be at some risk related to liquefaction and other types of seismically induced ground failure. Much of the substrate in the planning area consists of young, unconsolidated alluvial and fluvial (river) deposits. In addition, depth to groundwater in the planning area ranges from approximately 11.7 feet to 62.5 feet, based on measurements taken in November 2006 (California Department of Water Resources 2007b). Therefore, conditions exist in the planning area that could result in seismic-related ground failure such as liquefaction, lateral spreading (lurching), and differential settlement, any of which could result in structural damage, potentially exposing people to a substantial risk of injury or death. However, the City has committed, through policy GSM-5, to require a site-specific geotechnical investigation for larger residential and remodel projects located in parts of the City potentially prone to liquefaction. With these provisions in place, impacts related to liquefaction hazard would be reduced, consistent with the prevailing standard of care in the state, and any residual impact would be considered less than significant. No mitigation is required.

#### **b. Impacts Related to Expansive Soils**

Information about the engineering properties of soils in Modesto is not readily available, but where soils are clay-rich, there may be some potential for expansive soils. Impacts related to the location of new development on expansive soils within the Modesto planning area would be assessed through the City's development review process and mitigated through policy GSM-1, which requires conformance with the most recent UBC standards; and policy GSM-6, which requires the preparation of site-specific geotechnical studies for new subdivisions. With these policies and their outcomes in place, impacts related to expansive soils would be reduced substantially, and any residual impact would be considered less than significant.

#### **c. Impacts Related to Topsoil Loss**

Earthwork activities associated with the development of the Modesto planning area could result in a loss of topsoil resources during site grading. Potential loss of topsoil resources would be minimized through policies GSM-9 and GSM-10. Conformance to these policies, which call for implementation of industry-standard best practices relative to erosion control and sediment containment, would minimize the potential for loss of topsoil due to grading and other earthwork activities, reducing related impacts to a less than significant level. No mitigation would be required.

The erosion hazard for soils in the Modesto planning area is generally considered slight. However, activities required for construction, including vegetation removal, excavation, grading, and fill placement have the potential to cause accelerated soil erosion. Standard City requirements are sufficient to avoid such erosion. (Rivera pers. comm.) Preparation of an erosion control program consistent with applicable requirements of the federal Clean Water Act and the City’s Grading and Erosion Control Ordinance and “Erosion and Sediment Control Standards for Construction Activities” are examples of the standard City requirements that would ensure any adverse impacts related to accelerated construction site erosion and associated siltation increases would be contained to a less than significant level. No mitigation would be required.

Although the Modesto area is not generally subject to landslides, localized slope failure in the planning area could occur if cut slopes and fill embankments created during new project construction are improperly designed and implemented. Potential geotechnical hazards associated with cut and fill activities would be minimized through policies GSM-1, GSM-4, GSM-7, and GSM-8, which require conformance to the most recent UBC standards and avoidance of landslide areas. Conformance to these policies and adherence to good grading and excavation practices would minimize the potential for failure of cut slopes and fill embankments, reducing related impacts to a less than significant level. No mitigation would be required.

#### **d. Impacts Related to Mineral Resources**

The Modesto planning area has been classified by the California State Geologist as MRZ-3a for sand and gravel resources. This designation indicates the presence of resources of unknown significance. In the absence of major mineral resources, the UAGP would not result in a significant loss, and no mitigation is required. Impacts would be less than significant.

### **3. Significant Cumulative Impacts**

CEQA and the State CEQA Guidelines require the disclosure of significant cumulative environmental impacts and the determination of whether a project would make a cumulatively considerable contribution to any such impacts. If the project would make such a contribution, mitigation measures intended to reduce the project’s contribution must be identified also (Section 15130 of the State CEQA Guidelines). A cumulative impact is one that results from past, present, and probable future projects. A project that has a less than significant direct effect on the environment may make a considerable contribution to a cumulative effect nonetheless. Seismic hazard exposure is the significant cumulative impact in Stanislaus County with regard to geology and mineral resources.

A number of Stanislaus County municipalities have grown substantially in recent decades, representing an increase in the number of persons living and working within the area affected by the county’s ambient seismic hazards. Stringent building standards and the regulation of construction offer a substantive means of mitigating seismic hazards, but such risks cannot be avoided entirely, and in regions of rapid urban expansion, a significant cumulative impact related to increased exposure to seismic hazards may exist nonetheless. This pattern is expected to continue

into the future. However, under existing City codes, all new structures would be required to meet or exceed UBC standards for Seismic Zone 3. As appropriate, projects also would be required to comply with the recommendations of a site-specific geotechnical report that identifies seismic constraints and develops engineering parameters at the project level. Finally, the City has committed to comply with any future enforcement responsibilities that become effective under the Alquist-Priolo Act and the Seismic Hazards Mapping Act of 1990. With these conditions in place, the increased seismic risk exposure associated with the proposed project has been identified as less than significant in the broad context and would not be expected to increase to a cumulatively considerable level.

### **C. POLICIES ADOPTED TO MINIMIZE SIGNIFICANT EFFECTS**

The following information is provided in accordance with State CEQA Guidelines Section 15126.4.

#### **1. Policies That Mitigate Direct Impacts**

No significant direct impacts that are related to Geology, Soils and Mineral Resources have been identified, based on the implementation of policies GSM-1 through GSM-13. These policies, described above, would reduce potential impacts to less than significant levels through implementation of safety measures and industry-standard best practices.

#### **2. Policies That Mitigate Cumulative Impacts**

There is no identified significant cumulative impact(s) for Geology, Soils and Mineral Resources, no new or additional mitigation is required. Implementation of policies GSM-1 through GSM-13 would reduce any project impact(s) to a less than significant level. No new or additional mitigation would be required.

### **D. MONITORING POLICIES THAT REDUCE IMPACTS**

The following information is provided in accordance with PRC Section 211081.6. The policies identified in this Master EIR have been drawn from the proposed UAGP amendment, and they are implemented by that plan. City staff provides the City Council with an annual report on UAGP implementation; therefore, no separate mitigation monitoring program is required for the UAGP Master EIR.