Chapter 8
Geology, Soils, Mineral Resources, and Paleontological Resources

8.1 Affected Environment

This section describes the regulatory and environmental setting for geology, seismicity, soils, mineral resources, and paleontological resources.

8.1.1 Regulatory Setting

Federal

International Building Code

The design and construction of engineered facilities in California must comply with the requirements of the International Building Code (IBC) (International Code Council 2011) and the adoptions to that code adopted by the State of California (see *California Building Standards Code* below).

U.S. Geological Survey Landslide Hazard Program

To fulfill the requirements of Public Law 106-113, the U.S. Geological Survey created the National Landslide Hazards Program to reduce long-term losses from landslide hazards by improving understanding of the causes of ground failure and suggesting mitigation strategies. The Federal Emergency Management Agency is the responsible agency for the long-term management of natural hazards."

Clean Water Act Section 402 (National Pollutant Discharge Elimination System Program)

The Clean Water Act (CWA) is discussed in detail in Chapter 9, *Hydrology, Water Resources, and Water Quality*. However, because CWA Section 402 is directly relevant to grading activities, additional information is provided herein.

CWA Section 402 mandates that certain types of construction activity comply with the requirements of EPA's NPDES program. EPA has delegated to the State Water Board the authority for the NPDES program in California, where it is implemented by the state's nine Regional Water Boards. Construction activity disturbing 1 acre or more must obtain coverage under the state's General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order 2010-0014-DWQ). EPA has delegated responsibility for CWA implementation to the State Water Board (See *Construction Activities Storm Water Construction General Permit [2010-0014-DWQ Permit]*).

State

Alquist-Priolo Earthquake Fault Zoning Act

California's Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) (Public Resources Code [PRC] Section 2621 et seq.), originally enacted in 1972 as the Alquist-Priolo Special Studies Zones Act and renamed in 1994, is intended to reduce risks to life and property from surface fault rupture during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[1] across the traces of active faults and strictly regulates construction in the corridors along active faults (earthquake fault zones). It also defines criteria for identifying active faults, giving legal weight to terms such as *active*, and establishes a process for reviewing building proposals in and adjacent to 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 Holocene time (defined for purposes of the 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 (Bryant and Hart 2007).

Seismic Hazards Mapping Act

Like the Alquist-Priolo Act, the Seismic Hazards Mapping Act of 1990 (PRC Sections 2690–2699.6) is intended to reduce damage resulting from earthquakes. While the Alquist-Priolo Act addresses surface fault rupture, the Seismic Hazards Mapping Act addresses other earthquake-related hazards, including strong ground shaking, liquefaction, and seismically induced landslides. Its provisions are similar in concept to those of the Alquist-Priolo Act—the state is charged with identifying and mapping areas at risk of strong ground shaking, liquefaction, landslides, and other corollary hazards; and cities and counties are required to regulate development within mapped seismic hazard zones.

Under the Seismic Hazards Mapping Act, permit review is the primary mechanism for local regulation of development. Specifically, cities and counties are prohibited from issuing development permits for sites within seismic hazard zones until appropriate site-specific geologic and/or geotechnical investigations have been carried out and measures to reduce potential damage have been incorporated into the development plans. Geotechnical investigations conducted within Seismic Hazard Zones must incorporate standards specified by California Geological Survey Special Publication 117a, *Guidelines for Evaluating and Mitigating Seismic Hazards* (California Geological Survey 2008).

[1] With reference to the Alquist-Priolo Act, a *structure for human occupancy* is defined as one "used or intended for supporting or sheltering any use or occupancy, which is expected to have a human occupancy rate of more than 2,000 person-hours per year" (California Code of Regulations, Title 14, Div. 2, Section 3601[e]).

Construction Activities Storm Water Construction General Permit (2010-0014-DWQ Permit)

Dischargers whose projects disturb 1 or more acres of soil, or whose projects disturb less than 1 acre but are part of a larger common plan of development that in total disturbs 1 or more acres, are required to obtain coverage under the General Permit Order 2010-0014-DWQ. Construction activity subject to this permit includes clearing, grading, and disturbances to the ground such as stockpiling or excavation, but does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility.

Coverage under the General Permit is obtained by submitting permit registration documents to the State Water Board that include a risk level assessment and a site-specific stormwater pollution prevention plan (SWPPP) identifying an effective combination of erosion control, sediment control, and non-stormwater BMPs. The General Permit requires that the SWPPP define a program of regular inspections of the BMPs and, in some cases, sampling of water quality parameters. The Central Valley Water Board administers the NPDES stormwater permit program in Butte County.

Municipal Separate Storm Sewer System Program

EPA defines a municipal separate storm sewer system (MS4) as any conveyance or system of conveyances (roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, human-made channels, and storm drains) owned or operated by a state, city, town, country, or other public body having jurisdiction over stormwater, that is designed or used for collecting or conveying stormwater. As part of the NPDES program, EPA initiated a program requiring that entities having MS4s apply to their local Regional Water Board for stormwater discharge permits. The program proceeded through two phases. Under Phase I, the program initiated permit requirements for designated municipalities with populations of 100,000 or more to obtain NPDES permit coverage for their stormwater discharges. Phase II expanded the program to municipalities with populations less than 100,000 as well as small MS4s outside the urbanized areas that are designated by the permitting authority to obtain NPDES permit coverage for their stormwater discharges.

Generally, Phase I MS4s are covered by individual permits and Phase II MS4s are covered by a general permit. Each regulated MS4 is required to develop and implement an SWMP to reduce the contamination of stormwater runoff and prohibit illicit discharges.

In the Plan Area, only the City of Chico is covered by an MS4 permit.

2010 California Building Standards Code

The state's minimum standards for structural design and construction are given in the California Building Standards Code (CBSC) (24 CCR). The CBSC is based on the IBC, which is used widely throughout United States (generally adopted on a state-by-state or district-by-district basis), and has been modified for California conditions with numerous, more detailed or more stringent regulations. The CBSC requires that "classification of the soil at each building site will be determined when required by the building official" and that "the classification will be based on observation and any necessary test of the materials disclosed by borings or excavations." In addition, the CBSC states that "the soil classification and design-bearing capacity will be shown on the (building) plans, unless the foundation conforms to specified requirements." The CBSC provides standards for various aspects of construction, including (i.e., not limited to) excavation, grading, and earthwork construction; fills and embankments; expansive soils; foundation investigations; and liquefaction

potential and soil strength loss. In accordance with California law, certain aspects of the project would be required to comply with all provisions of the CBSC.

The California Building Code requires extensive geotechnical analysis and engineering for grading, foundations, retaining walls, and other structures, including criteria for seismic design.

Caltrans Standards

In addition to the CBSC, California Department of Transportation (Caltrans) highway and bridge facilities are subject to numerous standards, such as the *Caltrans Guidelines for Structures Foundations Report*, *Caltrans Seismic Design Criteria*, *Caltrans Highway Design Manual*, *Caltrans Bridge Design Specifications*, and *Caltrans Standard Specifications*. These standards were developed to ensure that Caltrans facilities are constructed and maintained to safety standards.

The Caltrans Office of Earthquake Engineering is responsible for assessing the seismic hazard for Caltrans projects, which are designed using the *Caltrans Seismic Design Criteria*. These design criteria provide the minimum seismic requirements for California highway bridges.

California Surface Mining and Reclamation Act of 1975

The principal legislation addressing mineral resources in California is the Surface Mining and Reclamation Act of 1975 (SMARA) (PRC Sections 2710–2719), which was enacted in response to land use conflicts between urban growth and essential mineral production. The stated purpose of SMARA is to provide a comprehensive surface mining and reclamation policy that will encourage the production and conservation of mineral resources while ensuring that adverse environmental effects of mining are prevented or minimized; that mined lands are reclaimed and residual hazards to public health and safety are eliminated; and that consideration is given to recreation, watershed, wildlife, aesthetic, and other related values. SMARA governs the use and conservation of a wide variety of mineral resources, although some resources and activities are exempt from its provisions, including excavation and grading conducted for farming, construction, or recovery from flooding or other natural disaster.

SMARA provides for the evaluation of an area's mineral resources using a system of Mineral Resource Zone (MRZ) classifications that reflect the known or inferred presence and significance of a given mineral resource. The MRZ classifications are based on available geologic information, including geologic mapping and other information on surface exposures, drilling records, and mine data, and on socioeconomic factors such as market conditions and urban development patterns. 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.

Although the State of California is responsible for identifying areas containing mineral resources, the county or city is responsible for SMARA implementation and enforcement by providing annual mining inspection reports and coordinating with the California Geological Survey.

Mining activities that disturb more than 1 acre or 1,000 cubic yards of material require a SMARA permit from the lead agency, which is the county, city, or board that is responsible for ensuring that adverse environmental effects of mining are prevented or minimized. The lead agency establishes its own local regulations and requires a mining applicant to obtain a surface mining permit, submit a reclamation plan, and provide financial assurances, pursuant to SMARA.

Certain mining activities do not require a permit, such as excavation related to farming, grading related to restoring the site of a natural disaster, and grading related to construction.

Caltrans Requirements for Paleontological Resources

Caltrans requires that a Paleontological Identification Report (PIR) be prepared to determine whether a project may affect paleontological resources. If the PIR indicates that the project could affect paleontological resources, a Paleontological Evaluation Report (PER) is prepared by qualified personnel concurrently with preparation of the environmental document. The PER includes a brief outline of the Paleontological Mitigation Plan (PMP) if one will be needed.

Local

Geologic and Seismic Hazards

The Butte County Code of Ordinances and the Cities of Oroville and Chico in their municipal codes incorporated the 2010 CBSC, Title 24. The City of Gridley has adopted the 2007 CBSC. The City of Biggs has adopted the 1991 Uniform Building Code.

The Butte County General Plan 2030 (Butte County 2012) includes the following goals and policies related to geologic and seismic hazards.

Goal HS-6: Reduce risks from earthquakes.

Policy HS-P6.1: Appropriate detailed seismic investigations shall be completed for all public and private development projects in accordance with the Alquist-Priolo Earthquake Fault Zoning Act.[2]*

Policy HS-P6.2: Geotechnical investigations shall be completed prior to approval of schools, hospitals, fire stations and sheriff stations, as a means to ensure that these critical facilities are constructed in a way that mitigates site-specific seismic hazards.

- **Action HS-A6.1:** Continue to require applicants to seismically retrofit existing homes where required under existing building codes.

Goal HS-7: Reduce risks from steep slopes and landslides.

Policy HS-P7.1: Site-specific geotechnical investigations shall be required to assess landslide potential for private development and public facilities projects in areas rated "Moderate to High" and "High" in Figure HS-4 or the most current available mapping.*

[2] Policies marked with an "*" are mandatory and are required by the County to mitigate environmental impacts under CEQA.

Goal HS-8: Reduce risks from erosion.

Policy HS-P8.1: Site-specific geotechnical investigations shall be required to assess erosion potential for private development projects and public facilities in areas rated "Very High" in Figure HS-5 or the most current available mapping.*

Goal HS-9: Reduce risks from expansive soils.

Policy HS-P9.1: Site-specific geotechnical investigations shall be required to assess risks from expansive soils for private development projects and public facilities in areas rated "High" in Figure HS-6 or the most current available mapping.*

Goal HS-10: Avoid subsidence from groundwater withdrawal.

Policy HS-P10.1: Continue to work with water providers and regulatory agencies to ensure that groundwater withdrawals do not lead to subsidence problems.

Policy HS-P10.2: Existing programs to monitor potential subsidence activity shall be supported.

The City of Biggs General Plan (City of Biggs 1998) includes the following goal and policies related to geologic and seismic hazards.

Goal 6.5: Minimize the threat of personal injury and property damage due to seismic and geologic hazards.

Policy 6.5.A: Consider the potential for expansive soils and earthquake related hazards when reviewing applications for developments.

Policy 6.5.B: A soils report, prepared by a licensed soils engineer, shall be required for all residential subdivisions and development projects. Soils reports shall evaluate shrink/swell and liquefaction potential of sites and recommend measures to minimize unstable soil hazards.

Policy 6.5.C: Applications for projects which extract groundwater, oil, or gas shall include a report evaluating the potential for resulting subsidence. Reports shall discuss appropriate mitigation measures to reduce the potential for subsidence.

Policy 6.5.D: The City encourages owners of buildings which are subject to seismic hazards to pursue structural improvements to remedy seismic related hazards.

Program 6.5.E: The City shall pursue funding options to assist property owners with costs related to seismic safety structural improvements.

The Chico 2011 General Plan (City of Chico 2011) includes the following goal and policy related to geologic and seismic hazards.

Goal S-3: Protect lives and property from seismic and geologic hazards.

Policy S-3.1 (Potential Structural Damage): Prevent damage to new structures caused by seismic, geologic, or soil conditions.

- **Action S-3.1.1 (California Building Code):** Require all new buildings in the City to be built under the seismic requirements of the California Building Code.
- **Action S-3.1.2 (Potential Soil Hazards):** In areas with highly expansive soils, require appropriate studies and structural precautions through project review.

The City of Gridley General Plan (City of Gridley 2010) includes the following goal, policies, and strategies related to geologic and seismic hazards.

Safety Goal 1: To reduce risks to people and property from geologic hazards and soils conditions.

Safety Policy 1.1: New development shall implement state and local building code requirements, including those related to structural requirements and seismic safety criteria in order to reduce risks associated with seismic events and unstable and expansive soils.

Safety Policy 1.2: New developments that could be adversely affected by geological and/or soil conditions shall include project features that minimize these risks.

Safety Policy 1.3: The City will not allow new water well sites to be located in areas where subsidence could occur as a result of water well operation, or where the potential for subsidence could increase as a result of operation of a water well.

Safety Implementation Strategy 1.1: The City will continue to enforce the most recent statewide building code requirements.

Safety Implementation Strategy 1.2: The City will require geotechnical evaluation and recommendations before development or construction of buildings meant for public occupancy in geologic hazard areas may proceed. Such evaluations will be required to focus on potential hazards related to liquefaction, erosion, subsidence, seismic activity, and other relevant geologic hazards and soil conditions for development. New development would be required to incorporate project features that avoid or minimize the identified hazards to the satisfaction of the City.

The City of Oroville 2030 General Plan (City of Oroville 2009) includes the following goal and policies related to geologic and seismic hazards.

Goal SAF-1: Reduce the risk of injury, loss of life and property damage from earthquakes, landslides and other geologic hazards.

P1.1: Group and locate new residential development in such a way as to avoid areas of geologic hazard, including steep slopes and areas of unstable soils.

P1.2: Require all new developments to be subjected to a geotechnical study prior to development approval and to mitigate any identified hazards to a level of insignificance. If mitigation is not possible, do not approve the development.

P1.3: Encourage retrofitting of structures, particularly older buildings, to withstand earthquake shaking and landslides, consistent with state Building Codes and Historic Building Codes.

P1.4: Ensure that new development incorporates design and engineering that minimizes the risk of damage from seismic events and landsliding, consistent with state Building Codes and Historic Building Codes.

Soils

Many counties and cities have grading and erosion control ordinances. These ordinances are intended to control erosion and sedimentation caused by construction activities. As part of the permit, a project applicant usually must submit a grading and erosion control plan, project vicinity and site maps, and other supplemental information. Standard conditions in the grading permit include an extensive list of BMPs similar to those contained in a SWPPP.

The purpose of the grading portion of the Butte County Grading and Mining Ordinance is "the control of erosion and siltation, the enhancement of slope stability, the protection of said resources and the prevention of related environmental damage by establishing standards and requiring permits for grading." In general, a permit is required for any earthmoving activities involving 50 cubic yards or more of material. Depending on the project, the County may require environmental review, engineering plans and specifications, a soils engineering report, and/or an erosion and sediment control plan.

The County General Plan 2030 (Butte County 2012) includes the following goal, policies, and objectives related to soils.

Goal AG-1: Maintain, promote and enhance Butte County's agriculture uses and resources, a major source of food, employment and income in Butte County.

Policy AG-P1.1: The County supports State and federal legislation designed to conserve soil and protect agricultural land.

Policy AG-P1.2: The County supports agricultural education and research at Butte County educational institutions.

Policy AG-P1.3: Continue to work with landowners in establishing new and maintaining existing Williamson Act contracts.

Objective D2N-O6.2: Protection of soil resources.

a. To eliminate potential for soil erosion or degradation of its agricultural productivity.

Policy D2N-P6.5: Require standard erosion-control measures and construction practices to minimize soil erosion.

Policy D2N-P6.6: Protect agricultural lands which currently produce, or have the potential to produce, from encroaching urban uses.

The grading requirements for the City of Chico are described in Chapter 16, Sections 22 to 32, "Grading Regulations." The purpose of the regulations is to "safeguard life, property and the environment from the hazards and effects of grading work performed within the city." Projects requiring excavation must comply with the provisions of Chapter 16. If any provisions conflict with state or federal law, the law that provides the greatest protection to life, property, and the environment will govern.

The City of Oroville requirements for grading and excavation are described in Chapter 9B, *Grading, Excavation and Sediment Control*, of its Municipal Code. The purpose includes establishing standards and specifications to prevent erosion, degradation of soil, and hazards to life and property. Projects requiring excavation (e.g., projects involving more than 20 cubic yards of material and disturbing an area of more than 200 square feet) must comply with the provisions of Chapter 9B. Public agencies and public utility companies, which have their own environmental compliance documents, are not required to obtain a grading permit for excavation that is for the purpose of installing or maintaining underground utility facilities.

The Cities of Biggs and Gridley also require grading permits and approval of grading plans by a city building inspector. The inspector may require a submission of a geotechnical report prepared by a civil engineer or other approved professional, depending on the project.

Minerals

The purpose of the mining portion of the Butte County Grading and Mining Ordinance is to comply with the requirements of SMARA, encourage production and conservation of mineral resources in balance with other beneficial uses, and prevent or minimize damage to the environment. Applicants must file a permit application with the County, submit mining and reclamation plans, and provide financial assurances. The application then undergoes a review and public hearing process before a determination is made by the Butte County Planning Commission.

The County General Plan 2030 (Butte County 2012) contains the following goals, policies, actions, and objectives related to mineral resources.

Goal COS-12: Protect economically viable mineral resources and related industries while avoiding land use conflicts and environmental impacts from mining activities.

Policy COS-P12.1: Sufficient aggregate resources to meet the County's fair share of future regional needs shall be conserved.

Policy COS-P12.2: Mineral resources identified by the State to be of regional or statewide significance for mineral resource extraction shall be conserved.*

Policy COS-P12.3: Permitted uses on lands containing and adjacent to important mineral resources shall be restricted to those compatible with mineral extraction, except in cases where such uses offer public benefits that outweigh those of resource extraction.

Policy COS-P12.4: Prior to approval of any new or expanded mining operation, the applicant shall demonstrate that the operation will not create significant nuisances, hazards or adverse environmental effects.

Policy COS-P12.5: New mineral haul routes shall avoid landslides, highly erodible soils, residential areas and schools, when feasible.

Policy COS-P12.6: Discretionary development projects in the vicinity of permitted mining extraction sites or along existing haul routes shall record a notice of the right to mine against the property for which a discretionary permit is sought. The notice shall advise owners and subsequent interests in ownership that the existing mining operation has a permitted right to continued mining operations.

Policy COS-P12.7: Mined property shall be left in a condition suitable for reuse in conformance with the General Plan land use designations and in accordance with the California Surface Mining and Reclamation Act (SMARA).

- **Action COS-A12.1:** Apply zoning regulations permitting extraction and processing as a conditional use on any lands classified by the State Mining and Geology Board as Mineral Resource Zone 2 (MRZ-2) or Scientific Zone (SZ).

Goal D2N-6: Utilize and develop natural resources so as to protect those resources and eliminate exposure of persons and property to environmental hazards.

Objective D2N-O6.1: Management of mineral resources.

a. Efficiently utilize mineral resources and ensure their continued supply.

Policy D2N-P6.1: Encourage proper development and management of sand and gravel.

Policy D2N-P6.2: Ensure that all commercial development of sand and gravel deposits is compatible with nearby land uses.

Policy D2N-P6.3: Ensure that extraction operations of sand and gravel adhere to all environmental quality regulations of the County and State.

Policy D2N-P6.4: Locate commercial, industrial, open space and agricultural uses adjacent to prime mineral resource areas to avoid conflicts between mineral production activities and present or planned residential and institutional land uses.

The City of Biggs General Plan (City of Biggs 1998) contains the following policies related to mineral resources.

Policy 5.1.D: No mineral, gas or other natural resource extraction shall occur within the City limits of Biggs without prior review and approval of the activity by the City.

Policy 5.1.E: Ensure that any mineral extraction activities within the Biggs planning area to conform with the State Mining and Reclamation Act (SMARA) requirements, including financial assurances and reclamation plans.

The Chico 2030 General Plan (City of Chico 2011) does not have goals or policies related to mineral resources.

The City of Gridley General Plan states that there are no significant mineral resources in the Gridley area and therefore does not address the topic (City of Gridley 2010:1).

The City of Oroville 2030 General Plan (City of Oroville 2009) includes the following goal and policies related to mineral resources.

Goal OPS-7: Protect economically viable mineral resources and related industries in Oroville, while avoiding land use conflicts and environmental impacts from mining activities.

P7.1: Manage mineral resource extraction to ensure that this activity results in the fewest possible environmental impacts. Require preparation and assured implementation of a rehabilitation plan for mineral extraction sites as a condition of mining approval. The mineral resource extraction plan should address the protection and restoration of biotic resources.

P7.2: New or expanded mining operations within the City of Oroville and its SOI shall adhere to the following guidelines:

- Demonstrate no significant adverse impacts from the mining operations on adjoining areas and uses, including, but not limited to, those associated with noise, dust and vibration.
- Demonstrate no substantial increase in hazards to neighboring uses, water quality, air quality, agricultural resources or biological resources.
- Demonstrate that the proposed plan complies with existing applicable County and State waste management standards.
- Incorporate sufficient buffering between mining operations and adjacent non-mining uses to minimize noise in accordance with guidelines described in the Noise Ordinance.
- Incorporate landscaping buffers and other measures to minimize visual impacts to the extent possible.

P7.3: If the State Division of Mines and Geology determines that the Planning Area contains significant aggregate resources, conserve sufficient aggregate resources to meet the Planning Area's fair share of future regional needs.

P7.4: Apply zoning regulations permitting extraction as a conditional use on any lands that may be designated as Significant Construction Aggregate Resource Areas.

P7.5: Restrict permitted uses on lands containing important mineral resources to those compatible with mineral extraction, except in cases where such uses offer public benefits that outweigh those of resource extraction.

P7.6: Reclaim former mining sites to a condition which is readily adaptable for alternative land uses, consistent with the Land Use Map and other applicable policies, in accordance with the California Surface Mining and Reclamation Act (SMARA).

Paleontological Resources

Butte County General Plan

The County General Plan 2030 (Butte County 2012) contains the following goals and policies related to paleontological resources.

Goal COS-15: Ensure that new development does not adversely impact cultural resources.

COS-P15.2: Any archaeological or paleontological resources on a development project site shall be either preserved in their sites or adequately documented as a condition of removal. When a

development project has sufficient flexibility, avoidance and preservation of the resource shall be the primary mitigation measure.

Biggs General Plan

The City of Biggs does not have regulations related to paleontological resources.

Chico

The City of Chico (2011) General Plan contains the following action to protect paleontological resources.

Action CRHP-1.1.6 (Best Management Practices): Update the City's Best Management Practices Manual to include environmental review protocol, communication with appropriate agencies, and standard conditions of approval for discretionary projects that protect cultural and paleontological resources.

Gridley

The City of Gridley (2010) General Plan contains the following goals, policies, and implementation strategy to protect paleontological resources.

Conservation Goal 4: To minimize negative impacts to prehistoric and historic resources.

Conservation Policy 4.1: Archaeological and paleontological resources shall be protected permanently from urban development, wherever possible.

Conservation Policy 4.2: New developments shall analyze potential impacts, and shall be designed to avoid adverse impacts to any known archaeological and paleontological resources, wherever possible.

Conservation Implementation Strategy 4.2: The City will require a paleontological resources impact assessment for projects proposed within the Modesto Formation, where a CEQA environmental document is required and where substantial excavation is anticipated. The Modesto Formation is an area that is sensitive for paleontological resources and underlies many parts of the central valley. Impacts to paleontological resources would be evaluated on a site-specific basis, pursuant to the State CEQA Guidelines. Where such impacts are found to be potentially significant, the City will require feasible mitigation measures to reduce impacts, such as construction worker personnel education, consultation with a qualified paleontologist should resources be encountered, and recovery and curation of specimens, as appropriate. Infill projects that do not involve substantial excavation would be exempt from this requirement.

Oroville

Goal OPS-14: Preserve Oroville's cultural resources, including archaeological, historic and paleontological resources, for their aesthetic, scientific, educational and cultural values.

P14.5: Consult with qualified paleontologists to identify and protect Oroville's significant paleontological resources.

P14.7: If cultural resources, including archaeological or paleontological resources, are uncovered during grading or other on-site excavation activities, construction shall stop until appropriate mitigation is implemented.

8.1.2 Environmental Setting

Regional Geology

The Plan Area spans two geomorphic provinces: the Great Valley geomorphic province and the Sierra Nevada geomorphic province. A geologic map of the Plan Area is provided in Figure 8-1.

The valley and foothills of the western portion of the Plan Area are located in the northern central portion of the Sacramento Valley, which forms the northern portion of California's Great Valley geomorphic province (Norris and Webb 1990:412). The Great Valley, also called the Central Valley, is a nearly level alluvial plain that lies between the Sierra Nevada on the east and the Coast Ranges on the west. Its south end is defined by the Tehachapi Mountains north of Los Angeles, and its north end is defined by the Klamath Mountains. Subdivided into the Sacramento Valley to the north and the San Joaquin Valley to the south, the valley has an average width of about 50 miles and is about 400 miles long overall (Norris and Webb 1990:412; Bartow 1991:2).

The Great Valley is floored by a thick sequence of sedimentary deposits that range in age from Jurassic through Quaternary. 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 Franciscan metasediments and/or mélange similar to exposures in the Coast Ranges. Mesozoic sedimentary rocks now in the subsurface record marine deposition. They are overlain by Tertiary strata reflecting marine, estuarine, and terrestrial conditions, which are in turn overlain by Quaternary fluvial and alluvial strata recording uplift and erosion of the Sierra Nevada and Coast Ranges to approximately their present shape (Norris and Webb 1990:417–425; Bartow 1991:2). In the Plan Area, the valley is characterized by alluvial and basin units of Holocene, Pleistocene, and Pliocene age (Saucedo and Wagner 1992).

Plan Area Geology

The eastern portion of the Plan Area is located in the foothills of the Sierra Nevada geomorphic province, a linear, tilted fault block almost 400 miles long that extends from northern Butte County to the Mohave Desert. Its western slope is gentle (approximately 2°), in stark contrast to its steep eastern slope. This western slope is deeply incised by rivers and disappears beneath the sediments of the Great Valley. Massive granites make up the upper Sierra, which has been shaped by glaciation, such as is seen in Yosemite Valley. Lower in the Sierra is the northwest-trending Mother Lode, which is made up of metamorphic rock containing gold-bearing veins. The Sierra Nevada disappears to the north beneath the Cenozoic volcanic rock of the Cascade Range (California Geological Survey 2002:2). The northeastern portion of the Plan Area is dominated by the Tuscan Formation, a lahar (i.e., volcanic mudflow) deposit of Pliocene to Pleistocene age. The southeastern portion of the Plan Area is dominated by older volcanic units, such as the Mesozoic quartz diorite and Jurassic volcanic rocks (Saucedo and Wagner 1992).

Further information on the geology of the Plan Area and a description of its geologic units can be found in the draft ecological baseline report prepared for the project (Butte Association of Governments 2007:3.3-8 to 3.3-11).

Seismicity

The Plan Area is located in a region of California characterized by moderate seismic activity, as described below.

Primary Seismic Hazards

The State of California considers two aspects of earthquake events primary seismic hazards: surface fault rupture (disruption at the ground surface as a result of fault activity) and seismic ground shaking.

Surface Fault Rupture

The portion of the southeastern part of the Plan Area is located in an Alquist-Priolo Earthquake Fault Zone (Bryant and Hart 2007; Jennings and Bryant 2010; California Geological Survey 2010). The Cleveland fault is an active fault just south of Lake Oroville and is part of the Foothills Fault System (northern reach section). This fault has been active within the past 150 years, with a 5.7 earthquake in 1975 (U.S. Geological Survey and California Geological Survey 2010; Jennings and Bryant 2010). No other active faults are located in the Plan Area and no other portion of the Plan Area is located in an Alquist-Priolo Earthquake Fault Zone (Jennings and Bryant 2010; Bryant and Hart 2007). The risk of surface fault rupture in the Plan Area is therefore considered high in the area around the Cleveland fault and low in the rest of the Plan Area. The next nearest fault is the Dunnigan Hills fault, approximately 31 miles southwest of the Plan Area (Figure 8-2).

Strong Ground Shaking

Unlike surface rupture, ground shaking is not confined to the trace of a fault, but rather propagates into the surrounding areas during an earthquake. The intensity of ground shaking typically diminishes with distance from the fault, but ground shaking may be locally amplified and/or prolonged by some types of substrate materials.

The ground-shaking hazard in the Plan Area is relatively low for California. Based on a probabilistic seismic hazard map that depicts the peak horizontal ground acceleration values exceeded at a 10% probability in 50 years (California Geological Survey 2003; Cao et al. 2003), the probabilistic peak horizontal ground acceleration values for the Plan Area are 0.1 to 0.2g (where g equals the acceleration speed of gravity). As a point of comparison, probabilistic peak horizontal ground acceleration values for the San Francisco Bay Area range from 0.4g to more than 0.8g.

Secondary Seismic Hazards

Secondary seismic hazards refers to seismically induced landsliding, liquefaction, and related types of ground failure. As discussed in Section 8.1.1, *Regulatory Setting*, the State of California maps areas that are subject to secondary seismic hazards pursuant to the Seismic Hazards Mapping Act of 1990. The State of California has not yet published seismic hazards mapping in Butte County under the Seismic Hazards Mapping Program (California Geological Survey 2009). These hazards are addressed briefly below based on available information.

Landslide and Other Slope Stability Hazards

Slope stability hazards in the Plan Area vary according to the steepness of the slope. Therefore, as shown in the County General Plan 2030, the nearly level valley floor that makes up the western two-

thirds of the Plan Area has a low risk for landsliding. In the foothills, the risk increases to low/moderate to moderate. Landslides are uncommon in the county and mainly occur in the mountainous eastern portion of the county outside the Plan Area, where slopes are steeper than 15% (Butte County 2012:280 and 281).

Liquefaction

Liquefaction is the process in which soils and sediments lose shear strength and fail during seismic ground shaking. The vibration caused by an earthquake can increase pore pressure in saturated materials. If the pore pressure is raised to be equivalent to the load pressure, this causes a temporary loss of shear strength, allowing the material to flow as a fluid. This temporary condition can result in severe settlement of foundations and slope failure. The susceptibility of an area to liquefaction is determined largely by the depth to groundwater and the properties (e.g., texture and density) of the soil and sediment within and above the groundwater. The sediments most susceptible to liquefaction are saturated, unconsolidated sand and silt soils with low plasticity within 50 feet of the ground surface (California Geological Survey 2008: 35 and 36).

The potential for liquefaction in the Plan Area varies by location. According to the County General Plan 2030, much of the western and southwestern portions of the Plan Area has a moderate to high susceptibility to liquefaction (Butte County 2012:279).

Land Subsidence

Subsidence is the sinking of a large area of ground surface in which the material is displaced vertically downward, with little or no horizontal movement. Many areas in the Central Valley have experienced subsidence, most notably the San Joaquin Valley and San Joaquin–Sacramento River Delta (Faunt 2009:99). Subsidence occurs in three ways: as a result of groundwater overdraft or oil and gas withdrawal, compaction and oxidation of peat soils, and hydrocompaction (U.S. Geological Survey 2000:1–2). Land subsidence as a result of groundwater overdraft is discussed below. Land subsidence as a result of compaction and oxidation of peat soils and hydrocompaction are not significant concerns in the northern Sacramento Valley and are not discussed.

Groundwater overdraft occurs when groundwater extraction results in compression of a clay bed within an aquifer to such an extent that it no longer expands to its original thickness after groundwater recharge. Clay beds often compress when wells pump groundwater and expand after pumping stops. Clay beds contain individual clay particles and small pores that fill with groundwater in saturated conditions. Groundwater maintains the pore space, expands the clay particles, and helps the bed maintain its thickness. A clay bed will yield a certain volume of groundwater (i.e., safe yield) without losing its storage capacity. If safe yield is not exceeded, the clay bed will compress and expand as the soil pores alternately fill with water and drain. This can lead to elastic land subsidence at the ground surface where elevation decreases when water is extracted then increases when water is recharged. If the safe yield of a clay bed is exceeded, however, its pores collapse and the surrounding clay particles settle in their place. When the clay particles settle, the clay bed is effectively thinned, resulting in permanent land subsidence at the ground surface.

The severity of subsidence depends on several factors, such as those listed below.

- Groundwater level decline that has already occurred.
- Thickness of the aquifer unit.
- Thickness and compressibility of the aquifer's silt-clay layers.

- Length of time groundwater level decline has occurred.
- Frequency and size of water withdrawals.
- Geology of the groundwater basin (Butte County 2007:17–74).

The types of damage that may occur as a result of subsidence include "gradient changes in roads, streams, canals, drains, sewers, and dikes. Many such systems are constructed with slight gradients and may be significantly damaged by even small elevation changes. Other damaging effects include damage to water wells resulting from sediment compaction and increased likelihood of flooding of low-lying areas." (Butte County 2007:17–75.)

Land subsidence is a potential hazard for the portions of the Plan Area located in the Sacramento Valley. Areas of potentially significant subsidence are shown in Figure 17-7 of the *Butte County General Plan Settings and Trends Report* (Butte County 2007: 17-76). The areas with the greatest potential for subsidence are those with heavy groundwater pumping and those in gas-producing areas. The areas with the greatest groundwater withdrawal occur about 2 miles north and south of Chico and in a 1-mile radius around Gridley. The amount of subsidence that could take place in the Plan Area depends primarily on the amount of groundwater withdrawal (Butte County 2007: 17-75).

Soils

Soil Types

Most soils in the Plan Area are classified as thermic because they have a warm mean annual soil temperature.

In the low-lying western portion of the Plan Area, the predominant soils are the thermic soils in flood basins and the thermic soils on alluvial fans in the Sacramento Valley. These soils generally formed in a low-energy floodplain or flood basin environment. In the eastern portion of the Plan Area, the predominant soils are the thermic soils on Lovejoy Basalt and Ione sediments on Sierra Nevada foothills, thermic soils on low fan terraces formed from Sierra Nevada alluvium in the Sacramento Valley, thermic soils on strath terraces on volcanic Cascade foothills, and thermic soils on volcanic Cascade foothills. The soils formed in sediments derived from the Cascade foothills in the northeastern portion of the Plan Area, and the Sierra foothills in the southeastern portion of the Plan Area. Further information on the soils of the Plan Area can be found in the draft ecological baseline report prepared for the project (Butte Association of Governments 2007:3.3-12 to 3.3-17).

Expansive Soils

An issue of concern in the Plan Area is the shrink-swell potential of several soils (Butte County 2012:294, 297). Soils with a moderate to high shrink-swell potential, also known as expansive soils, expand and contract with changes in moisture content and therefore do not provide a suitable substrate for construction without modification. In the Plan Area, expansive soils tend to occur in level areas in the valley, particularly in the western and southwestern portions of the Plan Area around Chico, Oroville, Biggs, and Gridley (Butte County 2012:294, 297).

Other Hazards

Several other geologic and seismic hazards (volcanic activity, tsunami, seiche, and mudflow) that could be experienced in the larger region are unlikely to affect the Plan Area. These hazards are not likely to affect the proposed project and therefore are not discussed in this EIS/EIR.

Mineral Resources

The focus of this section is on aggregate resources, which are the primary mineral resource of economic importance in the Plan Area. Aggregate resources are important because they are necessary for most construction, cannot be replaced with other products, and are most economical when used close to the area where they are mined because of the high cost of transportation (California Geological Survey 2007:2).

The predominant mineral resources in the Plan Area are sand and gravel. Current mining activities take place primarily in a gravel belt that runs north–south through the center of the county. The sand and gravel are used, together with Portland cement or asphalt, for construction and road building. Historically, extensive sand and gravel mining also occurred along the Feather River, but most of those operations have since ceased (Butte County 2012:243).

The State Geologist has not yet mapped mineral resources in Butte County, but several companies have petitioned to have properties mapped under SMARA. The Plan Area has three areas designated as mineral resources of statewide or regional importance (MRZ 2) and active aggregate mines. The Martin Marietta Materials Table Mountain Quarry is a basalt mine near Oroville, and the M&T Chico Ranch is a previously proposed but nonoperational mine (Butte County 2012:245). The Power House Aggregate Project site was classified as MRZ 2 in December 2010. This site, 7 miles south of Oroville between the east side of the Feather River and SR 70, was classified as MRZ 2 for Portland cement concrete-grade aggregate and contains resources in excess of the threshold value of $17,157,910 (2010 dollars) required for classification as MRZ-2 (State Mining and Geology Board 2010).

According to the County General Plan 2030, there are 20 active mines in Butte County (Butte County 2007:4.6–14). Most of these mines occur in the valley in a swath along SR 99.

Gold mining was historically important in the Plan Area and still takes place in some locations, often in conjunction with aggregate operations (Butte County 2007:11-3).

There are no active mines or known minable mineral deposits in the incorporated cities of the Plan Area. In addition, land use conflicts make the start-up of new mining operations in urban areas generally unlikely.

Paleontological Resources

A number of geologic units with the potential to contain paleontological resources occur in the Plan Area. These units are the Modesto and Riverbank Formations of Pleistocene age, the Laguna Formation of Pliocene age, and the Ione Formation of Eocene age.

Paleontological sensitivity is a qualitative assessment based on the paleontological potential of the stratigraphic units present, the local geology and geomorphology, and other factors relevant to fossil preservation and potential yield. According to the Society of Vertebrate Paleontology (SVP) (2010), standard guidelines for sensitivity are (1) the potential for a geological unit to yield abundant or

significant vertebrate fossils or to yield a few significant fossils, large or small, vertebrate, invertebrate, or paleobotanical remains; and (2) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecological, or stratigraphic data (Table 8-1).

The Modesto Formation and Riverbank Formation are considered to have high sensitivity for paleontological resources, consistent with the prevailing standard of care—California's Pleistocene nonmarine strata have yielded a wealth of stratigraphically important vertebrate fossils, including the assemblages that defined both the Rancholabrean and Irvingtonian Stages of the North American Land Mammal Chronology, which is used as a reference by paleontologists and stratigraphers across the country. Because of this wealth of information, continental deposits of Pleistocene age are almost universally treated as paleontologically sensitive in California.

The University of California Museum of Paleontology (UCMP) paleontological database contains 22 records of paleontological resources from Butte County (University of California Museum of Paleontology 2013).

Table 8-1. Paleontological Sensitivity Ratings

Potential	Definition
High	Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered are considered to have a high potential for containing additional significant paleontological resources…Paleontological potential consists of both (a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, plant, or trace fossils and (b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecologic, taphonomic, biochronologic, or stratigraphic data.
Undetermined	Rock units for which little information is available concerning their paleontological content, geologic age, and depositional environment are considered to have undetermined potential. Further study is necessary to determine if these rock units have high or low potential to contain significant paleontological resources.
Low	Reports in the paleontological literature or field surveys by a qualified professional paleontologist may allow determination that some rock units have low potential for yielding significant fossils. Such rock units will be poorly represented by fossil specimens in institutional collections, or based on general scientific consensus only preserve fossils in rare circumstances and the presence of fossils is the exception not the rule.
No	Some rock units have no potential to contain significant paleontological resources, for instance high-grade metamorphic rocks (such as gneisses and schists) and plutonic igneous rocks (such as granites and diorites). Rock units with no potential require neither protection nor impact mitigation measures relative to paleontological resources.

Source: Society of Vertebrate Paleontology 2010.

8.2 Environmental Consequences

This section incorporates by reference the impact determinations presented for geology, soils, mineral resources, and paleontological resources in the Local Agencies' general plan EIRs (as described in more detail in Chapter 3, Section 3.3, *Resource Chapter Organization and NEPA/CEQA*

Requirements).[3] The significance findings and mitigation measures of each of the general plan EIRs are compiled in Appendix C. The Lead Agencies have reviewed these analyses and found them to be appropriate for the purposes of this EIS/EIR.

8.2.1 Methods for Impact Analysis

Impacts related to geology, soils, mineral resources, and paleontological resources were assessed on the basis of the proposed BRCP and review of applicable documents such as the Local Agencies' general plan EIRs.

The BRCP would not provide individual project approvals or entitlements for any private or public development or infrastructure projects. Accordingly, this EIS/EIR does not provide CEQA or NEPA coverage for individual covered activities and does not function as a *programmatic* or *umbrella* CEQA or NEPA document for regional development and infrastructure projects. The BRCP EIS/EIR evaluates only the adverse and beneficial environmental effects associated with the decisions of the Local Agencies, water and irrigation districts, and Caltrans to approve, permit, and implement the BRCP. Accordingly, the methods for analyzing direct impacts on geology, soils, mineral resources, and paleontological resources are tailored to evaluate the decisions of the Local Agencies, water and irrigation districts, and Caltrans to approve, permit, and implement the BRCP. This EIS/EIR also incorporates the impact determinations of the Local Agencies' general plan EIRs to analyze indirect impacts on geology, soils, mineral resources, and paleontological resources.

In adopting the EIRs for the local general plans, each participating jurisdiction determined the programmatic impacts on geology, soils, and mineral resources would be less than significant through the implementation of general plan policies. It is assumed that all covered activities approved by the participating local jurisdictions would be consistent with the policies of the respective general plan and would be subject to any mitigation measures identified, such that impacts would be adequately mitigated. For development-related activities, no additional mitigation measures are identified in this chapter beyond the policies identified in the general plans. Water and irrigation district activities have not been analyzed in previous CEQA documents. These activities include: rerouting of existing canals, replacement of water delivery structures, replacement of large weirs, mowing and trimming vegetation along service roads, and removing aquatic vegetation from canals. Potential impacts on geology, soils, mineral resources, and paleontological resources could occur primarily during construction or maintenance of these activities. The methodology for evaluating impacts on geologic and paleontological resources also incorporates standard best management practices (BMPs) required by Caltrans during construction of transportation projects and summarized in Appendix D. The analysis assumes that Caltrans would incorporate these BMPs where appropriate on transportation projects within the Plan Area.

8.2.2 Significance Criteria

Criteria from Appendix G of the State CEQA Guidelines and standard professional practice were used to determine whether the action alternatives would have a significant impact on geology and seismicity, soils, mineral resources, or paleontological resources. In accordance with Appendix G of

[3] These previous CEQA documents are available collectively for public review at the BCAG offices (2580 Sierra Sunrise Terrace, Suite 100 Chico, CA 95928-8441). Individual general plans and EIRs are also available at each of the respective land use agencies.

the State CEQA Guidelines, the action alternatives would be considered to have a significant effect if they would result in any of the conditions list below.

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving any of the following.
    - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault. (Refer to Division of Mines and Geology Special Publication 42).
    - Strong seismic ground shaking.
    - Seismic-related ground failure, including liquefaction.
    - 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 an onsite or offsite 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 in areas 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 the residents of the state.
- Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

8.2.3 Impacts and Mitigation Measures

Alternative 1—No Action (No Plan Implementation)

As discussed in Section 2.3.1, *Alternative 1—No Action (No Plan Implementation)*, under Alternative 1, project proponents would apply for permits on a project-by-project basis, without a coordinated and comprehensive effort to minimize and mitigate biological impacts through the BRCP. Under Alternative 1, urban development and public infrastructure projects would continue to occur pursuant to the approved general plans of the Local Agencies and BCAG's regional plans. These include residential, commercial, and industrial development as well as construction, maintenance, and use of urban infrastructure, parks, recreational facilities, public services, and similar types of urban land uses. Other activities that would occur under Alternative 1 are construction and maintenance of public infrastructure projects outside of urban areas, including public infrastructure projects in and over streams (e.g. bridge replacements). Implementation of a conservation strategy and conservation measures would not occur. No regional conservation strategy or conservation measures would be implemented; therefore, benefits to and impacts on geology, soils, mineral

resources, and paleontological resources associated with the conservation strategy and conservation measures would not occur.

Impact GEO-1: Expose people or structures to potential substantial adverse effects involving rupture of a known earthquake fault (NEPA: less than significant; CEQA: less than significant)

If a structure were constructed on the Cleveland fault, an active fault just south of Lake Oroville, substantial damage or harm to people or property could occur if the fault ruptures. However, the area around the Cleveland fault is designated for agricultural use. In addition, any facilities would be designed and constructed to meet relevant requirements of the CBSC, as required by the state, city, and county building codes, and as set forth in the Local Agencies' general plans and BCAG's regional plan(s). These building code requirements specify that detailed seismic investigations be completed for all public and private projects located within the boundaries of an Earthquake Fault Zone as shown on an Official Earthquake Fault Zone and that such projects receive appropriate permit approvals. State road projects would also need to comply with Caltrans requirements.

NEPA Determination: Alternative 1 would not result in the exposure of people or structures to potential substantial adverse effects involving rupture of a known earthquake fault because the area around the Cleveland fault is designated for agricultural use. In addition, any facilities would be required to meet building codes, and state road projects would need to meet Caltrans requirements. This impact would be less than significant. No mitigation is required.

CEQA Determination: Alternative 1 would not result in the exposure of people or structures to potential substantial adverse effects involving rupture of a known earthquake fault because the area around the Cleveland fault is designated for agricultural use. In addition, any facilities would be required to meet building codes, and state road projects would need to meet Caltrans requirements. This impact would be less than significant. No mitigation is required.

Impact GEO-2: Expose people or structures to potential substantial adverse effects involving strong seismic ground shaking (NEPA: less than significant; CEQA: less than significant)

Although the risk of strong ground shaking in the Plan Area is relatively low for California, a large earthquake on a nearby fault that could result in strong ground shaking in the Plan Area, potentially resulting in structural loss, injury, and death. However, any facilities would be designed and constructed to meet relevant requirements of the CBSC, as required by the state, city, and county building codes, and as set forth in the Local Agencies' general plans. State road projects would also need to comply with Caltrans requirements.

NEPA Determination: Alternative 1 would not expose people or structures to substantial adverse effects involving strong seismic ground shaking because facilities and state road projects constructed or operated under this alternative would be designed to meet relevant requirements of the CBSC and Caltrans requirements. This impact would be less than significant. No mitigation is required.

CEQA Determination: Alternative 1 would not expose people or structures to substantial adverse effects involving strong seismic ground shaking because facilities and state road projects constructed or operated under this alternative would be designed to meet relevant requirements of the CBSC and Caltrans requirements. This impact would be less than significant. No mitigation is required.

Impact GEO-3: Result in substantial soil erosion or the loss of topsoil (NEPA: less than significant; CEQA: less than significant)

Ground-disturbing earthwork associated with construction may increase soil erosion rates. These activities, such as excavation, trenching, grading, and compaction, would cause groundbreaking and vegetation removal. As a result, soil would be exposed to rain and wind, potentially causing accelerated erosion, thereby resulting in significant impacts. However, ground-disturbing earthwork would need to meet the relevant requirements of the state, city, and county building codes, as set forth in the Local Agencies' general plans and ordinances. Furthermore, compliance with applicable federal and local erosion-related regulations (i.e., the SWPPPs that are developed for individual projects and the requirements of the county and city stormwater quality management codes and construction activities must obtain a Storm Water Construction General Permit as required by the CWA) would ensure that construction activities do not result in significant effects. State road projects would also need to comply with Caltrans requirements and BMPs summarized in Appendix D.

NEPA Determination: Alternative 1 would result in ground-disturbing construction activities that may increase soil erosion rates. However, these activities would be controlled by federal, state, and local requirements and thus would ensure construction activities would not result in substantial soil erosion or loss of topsoil. This impact would be less than significant. No mitigation is required.

CEQA Determination: Alternative 1 would result in ground-disturbing construction activities that may increase soil erosion rates. However, these activities would be controlled by federal, state, and local requirements and thus would ensure construction activities would not result in substantial soil erosion or loss of topsoil. This impact would be less than significant. No mitigation is required.

Impact GEO-4: 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 an onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse (NEPA: less than significant; CEQA: less than significant)

Although the risk of strong ground shaking in the Plan Area is relatively low for California, a large earthquake on a nearby fault could cause ground shaking that could result in liquefaction or secondary ground failure, such as lateral spreading or differential settlement, which could result in structural loss, injury, and death. However, any facilities would be designed and constructed to meet relevant requirements of the CBSC, as required by the state, city, and county building codes, and as set forth in the Local Agencies' general plans. State road projects would also need to comply with Caltrans requirements.

NEPA Determination: The risk of strong ground shaking is relatively low in the Plan Area and construction or operation of facilities or state roads would need to meet relevant CBSC requirements and Caltrans requirements. Therefore, impacts would be less than significant. No mitigation is required.

CEQA Determination: The risk of strong ground shaking is relatively low in the Plan Area and construction or operation of facilities or state roads would need to meet relevant CBSC requirements and Caltrans requirements. Therefore, the impact would be less than significant. No mitigation is required.

Impact GEO-5: Be located on expansive soil, creating substantial risks to life or property (NEPA: less than significant; CEQA: less than significant)

Expansive soils occur in much of the Plan Area and could cause damage to structures if the subsoil, drainage, and foundation are not properly engineered. However, soil sampling and treatment procedures are addressed by state and local building codes.

NEPA Determination: The Plan Area contains expansive soils; however, there is a low potential for these soils to create substantial risk to life or property because soil sampling and treatment procedures would be required by state and local building codes. Therefore, the impact is less than significant. No mitigation is required.

CEQA Determination: The Plan Area contains expansive soils; however, there is a low potential for these soils to create substantial risk to life or property because soil sampling and treatment procedures would be required by state and local building codes. Therefore, the impact is less than significant. No mitigation is required.

Impact GEO-6: Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater (NEPA: less than significant; CEQA: less than significant)

Most new development in the county would be connected to sewer lines of the municipal wastewater systems, rather than septic systems. Development in the cities would also be connected to the municipal wastewater systems. In addition, the County's Action PUB-A12.1 is to complete and implement updates to onsite wastewater policies and standards.

NEPA Determination: Development under Alternative 1 is expected to connect to the appropriate wastewater system and therefore would not use septic tanks or alternative wastewater disposal systems. Thus, impacts would be less than significant. No mitigation is required.

CEQA Determination: Development under Alternative 1 is expected to connect to the appropriate wastewater system and therefore would not use septic tanks or alternative wastewater disposal systems. Thus, impacts would be less than significant. No mitigation is required.

Impact GEO-7: Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature (NEPA: less than significant; CEQA: less than significant)

Several geologic units in the Plan Area are sensitive for paleontological resources, and fossils could be present. If fossils are present, they could be damaged during ground-disturbing activities related to construction. Substantial damage to or destruction of significant paleontological resources as defined by the SVP (Society of Vertebrate Paleontology 2010) would be a significant impact. However, compliance with the Local Agencies' general plans and compliance with Caltrans BMPs would protect paleontological resources during ground disturbing activities in potential sensitive areas.

NEPA Determination: Alternative 1 ground-disturbing activities have the potential to disturb potentially significant paleontological resources if the activities occur within geologic units that are sensitive for these resources. This potential would be reduced with compliance with Local Agencies' general plans and compliance with Caltrans BMPs. No mitigation required.

CEQA Determination: Alternative 1 ground-disturbing activities have the potential to disturb potentially significant paleontological resources if the activities occur within geologic units that are sensitive for these resources. This potential would be reduced with compliance with Local Agencies' general plans and compliance with Caltrans BMPs. No mitigation required.

Impact GEO-8: Result in the loss of availability of a known mineral resource or local of regional significance (NEPA: less than significant; CEQA: less than significant)

Mining occurs in the county, and the county has two mineral resource zones. No mining or mineral resource zones occur within any of the city limits. The general plans of the County and the Cities of Oroville, Chico, and Biggs all contain policies to protect mineral resources. The City of Gridley and the City of Biggs does not have any significant mineral resources (City of Gridley 2010; City of Biggs 2014).

NEPA Determination: Alternative 1 would not result in the loss of availability of a known mineral resource because there are either no mineral resources within certain parts of the Plan Area (i.e., Gridley) or because Local Agencies' general plan policies protect mineral resources. Impacts would be less than significant. No mitigation is required.

CEQA Determination: Alternative 1 would not result in the loss of availability of a known mineral resource because there are either no mineral resources within certain parts of the Plan Area (i.e., Gridley) or because Local Agencies' general plan policies protect mineral resources. Impacts would be less than significant. No mitigation is required.

Alternative 2—Proposed Action

Under Alternative 2, covered activities would include the existing, planned, and proposed land uses over which the Permit Applicants have land use authority; state and local transportation projects; operation of water delivery systems (e.g., WCWD canals and similar delivery systems); habitat restoration, enhancement, and management actions (conservation measures); and adaptive management and monitoring activities. Covered activities relevant to geology, soils, mineral resources, and paleontological resources are those that involve construction or those that involve earthmoving activities. Covered activities that would involve construction (including earthmoving activities) are all development activities consistent with the Local Agencies' general plans, state and local transportation projects, and water district canal installation. Conservation measures that involve earthmoving activities are certain restoration actions under the conservation strategy (CM4–CM11, CM13, CM14, and Activities to Improve Urban Stormwater Water Quality). Most covered activities would require individual permits and approvals pursuant to the Local Agencies' general plans and land use regulations or the requirements of the implementing agency (such as Caltrans and irrigation districts) and would undergo subsequent project-level CEQA and relevant NEPA review for construction and operations-related impacts; some covered activities, however, may be exempted from environmental review requirements due to project characteristics, including small projects or infill projects.

Impact GEO-1: Expose people or structures to potential substantial adverse effects involving rupture of a known earthquake fault (NEPA: less than significant; CEQA: less than significant)

The exposure of people and structures to surface fault rupture would be the same as under Alternative 1 because there would be no change in land use planning in the Earthquake Fault Zone or to building codes. In addition, Alternative 2 would not entail construction of public infrastructure

or private development in the Earthquake Fault Zone as a result of the conservation strategy, and no conservation measures would be undertaken in the Earthquake Fault Zone.

NEPA Determination: Alternative 2 would not result in the exposure of people or structures to potential substantial adverse effects involving rupture of a known earthquake fault as described for Alternative 1. In addition, the conservation strategy would not require construction of public infrastructure or private development in the Earthquake Fault Zone. This impact would be less than significant. No mitigation is required.

CEQA Determination: Alternative 2 would not result in the exposure of people or structures to potential substantial adverse effects involving rupture of a known earthquake fault as described for Alternative 1. In addition, the conservation strategy would not require construction of public infrastructure or private development in the Earthquake Fault Zone. This impact would be less than significant. No mitigation is required.

Impact GEO-2: Expose people or structures to potential substantial adverse effects involving strong seismic ground shaking (NEPA: less than significant; CEQA: less than significant)

This impact would be the same under Alternative 2 as under Alternative 1 because all projects would require individual permits and approvals pursuant to the Local Agencies' general plans, BCAG's regional plan(s), and Caltrans requirements as described in the discussion of Impact GEO-2 under Alternative 1. In addition, it is anticipated the implementation of the conservation strategy would have a very low potential to expose people or structures to substantial adverse effects regarding strong seismic ground shaking.

NEPA Determination: Alternative 2 would not result in the exposure of people or structures to potential substantial adverse effects involving strong seismic ground shaking as described for Alternative 1. In addition, the conservation strategy would have a very low potential for exposing people or structures. This impact would be less than significant. No mitigation is required.

CEQA Determination: Alternative 2 would not result in the exposure of people or structures to potential substantial adverse effects involving strong seismic ground shaking as described for Alternative 1. In addition, the conservation strategy would have a very low potential for exposing people or structures. This impact would be less than significant. No mitigation is required.

Impact GEO-3: Result in substantial soil erosion or the loss of topsoil (NEPA: less than significant; CEQA: less than significant)

This impact would be the same under Alternative 2 as under Alternative 1 because all projects would require individual permits and approvals pursuant to the Local Agencies' general plans and BCAG's regional plan(s) as described in the discussion of Impact GEO-3 under Alternative 1. In addition, BRCP AMM8 (Implement Standard Urban Stormwater Management Plans), AMM16 (Install Erosion Control Barriers), and AMM19 (Implement Wet Weather Erosion Control Plan) would be incorporated to avoid substantial erosion or the loss of topsoil during implementation of the conservation strategy and covered activities.

NEPA Determination: Like Alternative 1, Alternative 2 would not result in substantial soil erosion or loss of topsoil. In addition, implementation of AMMs during conservation measures and covered activities would further reduce soil erosion or loss of topsoil. This impact would be less than significant. No mitigation is required.

CEQA Determination: Like Alternative 1, Alternative 2 would not result in substantial soil erosion or loss of topsoil. In addition, implementation of AMMs during conservation measures and covered activities would further reduce soil erosion or loss of topsoil. This impact would be less than significant. No mitigation is required.

Impact GEO-4: 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 an onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse (NEPA: less than significant; CEQA: less than significant)

This impact would be the same under Alternative 2 as under Alternative 1 because all projects would require individual permits and approvals pursuant to the Local Agencies' general plans and BCAG's regional plan(s) as described in the discussion of Impact GEO-4 under Alternative 1. For example, construction projects (e.g., road projects, utility installation, and new canal construction) would need to comply with the requirements of the CBSC, including geotechnical investigation and site-specific design. Additionally, state road projects would also need to comply with the requirements of Caltrans and Caltrans BMPs (summarized in Appendix D). For projects and conservation measures requiring grading, a grading permit would be required from the county and/or the city for excavation involving more than 50 cubic yards of material or disturbing more than 1 acre (depending on the jurisdiction). Improper excavation or grading could result in unstable slopes. However, compliance with state and local regulations would ensure that new construction under the covered activities and conservation measures was built according to appropriate design standards for seismic and slope stability safety.

NEPA Determination: Alternative 2 would not result in an onsite or offsite landslide, lateral spreading, subsidence, or liquefaction or collapse as a result of being located on an unstable geologic unit as described for Alternative 1. In addition, implementation of grading permits for covered activities and conservation measures requiring grading would ensure slope stability. This impact would be less than significant. No mitigation is required.

CEQA Determination: Alternative 2 would not result in an onsite or offsite landslide, lateral spreading, subsidence, or liquefaction or collapse as a result of being located on an unstable geologic unit as described for Alternative 1. In addition, implementation of grading permits for covered activities and conservation measures requiring grading would ensure slope stability. This impact would be less than significant. No mitigation is required.

Impact GEO-5: Be located on expansive soil, creating substantial risks to life or property (NEPA: less than significant; CEQA: less than significant)

This impact would be less than significant as with Alternative 1 because, even though expansive soils occur in the Plan Area and could cause damage to structures if the subsoils, drainage, and foundation are not properly engineered, soil sampling and treatment procedures are required by state and local building codes during the construction of buildings. This would prevent substantial risks to life or property as a result of expansive soils. It is unknown exactly where conservation measures would be implemented within the Plan Area and therefore they have the potential to be located on expansive soils. However, this applies to only a few conservation measures (e.g., Activities to Improve Urban Stormwater Water Quality, CM9-11) and these structures would not be habitable (e.g., stormwater retention basins). Furthermore, any structure would be required to follow the procedures by state and local building codes. Therefore, it is anticipated the conservation

measures would not create substantial risks to life or property as a result of potentially being located on expansive soils.

NEPA Determination: The Plan Area contains expansive soils; however, under Alternative 2 there is a low potential for these soils to create substantial risk to life or property because soil sampling and treatment procedures would be required by state and local building codes. Furthermore, conservation measures would not result in habitable structures. Therefore, the impact is less than significant. No mitigation is required.

CEQA Determination: The Plan Area contains expansive soils; however, under Alternative 2 there is a low potential for these soils to create substantial risk to life or property because soil sampling and treatment procedures would be required by state and local building codes. Furthermore, conservation measures would not result in habitable structures. Therefore, the impact is less than significant. No mitigation is required.

Impact GEO-6: Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater (NEPA: less that significant; CEQA: less than significant)

This impact would be less than significant as with Alternative 1 because most new development in the county would be connected to sewer lines of the municipal wastewater systems rather than septic systems. Development in the cities would also be connected to the municipal wastewater systems. In addition, the County's Action PUB-A12.1 is to complete and implement updates to onsite wastewater policies and standards. As discussed under Impact GEO-5, any structure constructed and operated under the conservation strategy is not expected to be habitable and therefore would not need wastewater disposal.

NEPA Determination: Development under Alternative 2 is expected to connect to the appropriate wastewater system and therefore would not use septic tanks or alternative wastewater disposal systems. The conservation strategy is not expected to require wastewater disposal. Thus, impacts would be less than significant. No mitigation is required.

CEQA Determination: Development under Alternative 2 is expected to connect to the appropriate wastewater system and therefore would not use septic tanks or alternative wastewater disposal systems. The conservation strategy is not expected to require wastewater disposal. Thus, impacts would be less than significant. No mitigation is required.

Impact GEO-7: Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature (NEPA: less than significant; CEQA: less than significant)

This impact would be the same as Alternative 1 because all projects, including those undertaken to support the conservation strategy, would require individual permits and approvals pursuant to the Local Agencies' general plans and BCAG's regional plan(s). Compliance with state and local regulations would ensure protection of paleontological resources.

NEPA Determination: Alternative 2 ground-disturbing activities have the potential to disturb potentially significant paleontological resources if the activities occur within the geologic units that are sensitive for these resources. This potential would be reduced with compliance with Local Agencies' general plans and compliance with Caltrans BMPs. No mitigation is required.

CEQA Determination: Alternative 2 ground-disturbing activities have the potential to disturb potentially significant paleontological resources if the activities occur within the geologic units that are sensitive for these resources. This potential would be reduced with compliance with Local Agencies' general plans and compliance with Caltrans BMPs. No mitigation is required.

Impact GEO-8: Result in the loss of availability of a known mineral resource or local of regional significance (NEPA: less than significant; CEQA: less than significant)

This impact would be the same under Alternative 2 as under Alternative 1 because no covered activities would be located where they would conflict with active mines or lands designated as MRZ-2. Land used for conservation could occur adjacent to active mines or lands designated as MRZ-2 without negatively affecting mining.

NEPA Determination: Alternative 2 would not result in the loss of availability of a known mineral resource because there are either no mineral resources within certain parts of the Plan Area (i.e., Gridley) or because Local Agencies' general plan policies protect mineral resources. Impacts would be less than significant. No mitigation is required.

CEQA Determination: Alternative 2 would not result in the loss of availability of a known mineral resource because there are either no mineral resources within certain parts of the Plan Area (i.e., Gridley) or because Local Agencies' general plan policies protect mineral resources. Impacts would be less than significant. No mitigation is required.

Alternative 3—Reduced Development/Reduced Fill

Alternative 3 is similar to Alternative 2, except that it uses the various general plan EIRs reduced development alternatives as described in Chapter 2, *Proposed Action and Alternatives*, to create a single reduced development footprint. Covered activities under this alternative would be similar to those described in the BRCP but would be limited to the reduced development footprint for a reduced permit term of 30 years. The reduced footprint and reduced land conservation would result in fewer built structures and less ground disturbance. Covered activities relevant to geology, soils, mineral resources, and paleontological resources are those that involve construction or earthmoving activities. The categories of covered activities that would entail ground disturbance are the same as Alternative 2.

It is anticipated that under Alternative 3, fewer acres of natural communities would be conserved because reduced development would provide reduced funding for the conservation strategy. However, it is anticipated that the conservation measures would be the same because the reduction of fill would be achieved through the reduced development footprint of the Local Agencies' general plans rather than through modification of the conservation measures. Consequently, the impacts related to implementation of the conservation strategy and conservation measures would be the same as under Alternative 2.

Impact GEO-1: Expose people or structures to potential substantial adverse effects involving rupture of a known earthquake fault (NEPA: less than significant; CEQA: less than significant)

There would be fewer impacts expected under Alternative 3 when compared to Alternative 2 because under this alternative it is anticipated there may be fewer structures. Therefore, Alternative 3 would not result in the exposure of people or structures to potential substantial adverse effects involving rupture of a known earthquake fault as described for Alternative 2. In addition, the

conservation strategy would not require construction of public infrastructure or private development in the Earthquake Fault Zone.

NEPA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

CEQA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

Impact GEO-2: Expose people or structures to potential substantial adverse effects involving strong seismic ground shaking (NEPA: less than significant; CEQA: less than significant)

There would be fewer impacts expected under Alternative 3 when compared to Alternative 2 because under this alternative it is anticipated there would be fewer structures. Alternative 3 would not result in the exposure of people or structures to potential substantial adverse effects involving strong seismic ground shaking as described for Alternative 2. In addition, the conservation strategy would have a very low potential for exposing people or structures because very few structures would be built and those that are built would typically not be habitable by people.

NEPA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

CEQA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

Impact GEO-3: Result in substantial soil erosion or the loss of topsoil (NEPA: less than significant; CEQA: less than significant)

This impact would be the same as under Alternative 2 but of a slightly lesser magnitude because of the reduced development footprint. Like Alternative 2, Alternative 3 would not result in substantial soil erosion or loss of topsoil. In addition, AMMs would be incorporated during implementation of conservation measures and covered activities and further reduce soil erosion or loss of topsoil.

NEPA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

CEQA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

Impact GEO-4: 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 an onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse (NEPA: less than significant; CEQA: less than significant)

There would be fewer impacts expected under Alternative 3 when compared to Alternative 2 because under this alternative, it is anticipated there would be less development. Alternative 3 would not result in an onsite or offsite landslide, lateral spreading, subsidence, or liquefaction or collapse as a result of being located on an unstable geologic unit, as described for Alternative 2. In addition, implementation of grading permits for covered activities and conservation measures requiring grading would ensure slope stability.

NEPA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

CEQA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

Impact GEO-5: Be located on expansive soil, creating substantial risks to life or property (NEPA: less than significant; CEQA: less than significant)

There would be fewer impacts expected under Alternative 3 when compared to Alternative 2 because under this alternative, it is anticipated there would be less development. The Plan Area contains expansive soils; however, there is a low potential for these soils to create substantial risk to life or property because soil sampling and treatment procedures would be required by state and local building codes. Furthermore, conservation measures would not result in habitable structures.

NEPA Determination: The impact determination would be the same as Alternative 2; the impact is less than significant. No mitigation is required.

CEQA Determination: The impact determination would be the same as Alternative 2; the impact is less than significant. No mitigation is required.

Impact GEO-6: Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater (NEPA: less than significant; CEQA: less than significant)

There would be fewer impacts expected under Alternative 3 when compared to Alternative 2 because under this alternative it is anticipated there would be less development. Development under Alternative 3 is expected to connect to the appropriate wastewater system and therefore would not use septic tanks or alternative wastewater disposal systems. The conservation strategy is not expected to require wastewater disposal.

NEPA Determination: The impact determination would be the same as Alternative 2; the impacts would be less than significant. No mitigation is required.

CEQA Determination: The impact determination would be the same as Alternative 2; the impacts would be less than significant. No mitigation is required.

Impact GEO-7: Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature (NEPA: less than significant; CEQA: less than significant)

There would be fewer impacts expected under Alternative 3 when compared to Alternative 2 because less ground disturbing activities are expected. Alternative 3 ground-disturbing activities have the potential to disturb potentially significant paleontological resources if the activities occur within the geologic units that are sensitive for these resources. This potential would be reduced with compliance with Local Agencies' general plans and compliance with Caltrans BMPs.

NEPA Determination: The impact determination would be the same as Alternative 2; impacts would be less than significant. No mitigation required.

CEQA Determination: The impact determination would be the same as Alternative 2; impacts would be less than significant. No mitigation required.

Impact GEO-8: Result in the loss of availability of a known mineral resource or local of regional significance (NEPA: less than significant; CEQA: less than significant)

There would be fewer impacts expected under Alternative 3 when compared to Alternative 2 because development would be concentrated and there is expected to be less development overall. Alternative 3 would not result in the loss of availability of a known mineral resource because there are either no mineral resources within certain parts of the Plan Area (i.e., Gridley) or because Local Agencies' general plan policies protect mineral resources.

NEPA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

CEQA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

Alternative 4—Greater Conservation

Alternative 4 would be similar to Alternative 2 except that under Alternative 4, the conservation strategy would include the conservation of an additional 9,850 acres of grassland and 35,310 acres of riceland. Alternative 4 would include the same conservation measures as Alternative 2, and all other acreage protection targets for natural communities/land types would be the same as described under Alternative 2.

Covered activities relevant to geology, soils, mineral resources, and paleontological resources are those that involve construction or earthmoving activities. The categories of covered activities that would entail ground disturbance are the same under Alternative 4 as under Alternative 2. Therefore, the impact mechanisms under Alternative 4 would be the same as those under Alternative 2.

Impact GEO-1: Expose people or structures to potential substantial adverse effects involving rupture of a known earthquake fault (NEPA: less than significant; CEQA: less than significant)

This impact would be the same as under Alternative 2. Alternative 4 would not result in the exposure of people or structures to potential substantial adverse effects involving rupture of a known earthquake fault because the area around the Cleveland fault is designated for agricultural use. In addition, the conservation strategy would not require construction of public infrastructure or private development in the Earthquake Fault Zone.

NEPA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

CEQA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

Impact GEO-2: Expose people or structures to potential substantial adverse effects involving strong seismic ground shaking (NEPA: less than significant; CEQA: less than significant)

This impact would be the same as under Alternative 2 because all projects would require individual permits and approvals pursuant to the Local Agencies' general plans, BCAG's regional plan(s), and Caltrans requirements. In addition, it is anticipated the implementation of the conservation strategy would have a very low potential to expose people or structures to substantial adverse effects regarding strong seismic ground shaking.

NEPA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

CEQA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

Impact GEO-3: Result in substantial soil erosion or the loss of topsoil (NEPA: less than significant; CEQA: less than significant)

This impact would be the same as under Alternative 2. Alternative 4 would not result in substantial soil erosion or loss of topsoil because all projects would require individual permits and approvals pursuant to the Local Agencies' general plans and BCAG's regional plan(s). In addition, implementation of AMMs during conservation measures and covered activities would further reduce soil erosion or loss of topsoil.

NEPA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

CEQA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

Impact GEO-4: 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 an onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse (NEPA: less than significant; CEQA: less than significant)

This impact would be the same as under Alternative 2. Alternative 4 would not result in an onsite or offsite landslide, lateral spreading, subsidence, or liquefaction or collapse as a result of being located on an unstable geologic unit. In addition, implementation of grading permits for covered activities and conservation measures requiring grading would ensure slope stability.

NEPA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

CEQA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

Impact GEO-5: Be located on expansive soil, creating substantial risks to life or property (NEPA: less than significant; CEQA: less than significant)

The impact would be the same as under Alternative 2. The Plan Area contains expansive soils; however, under this alternative there is a low potential for these soils to create substantial risk to life or property because soil sampling and treatment procedures would be required by state and local building codes. Furthermore, conservation measures would not result in habitable structures.

NEPA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

CEQA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

Impact GEO-6: Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater (NEPA: less than significant; CEQA: less than significant)

This impact would be the same as under Alternative 2. Any development under this alternative is expected to connect to the appropriate wastewater system and therefore would not use septic tanks or alternative wastewater disposal systems. The conservation strategy is not expected to require wastewater disposal.

NEPA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

CEQA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

Impact GEO-7: Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature (NEPA: less than significant; CEQA: less than significant)

This impact would be the same as under Alternative 2 because all projects, including those undertaken to support the conservation strategy, would require individual permits and approvals pursuant to the Local Agencies' general plans and BCAG's regional plan(s). Compliance with state and local regulations would ensure protection of paleontological resources.

NEPA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

CEQA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

Impact GEO-8: Result in the loss of availability of a known mineral resource or local of regional significance (NEPA: less than significant; CEQA: less than significant)

This impact would be the same as under Alternative 2 because Alternative 4 would not result in the loss of availability of a known mineral resource because there are either no mineral resources within certain parts of the Plan Area (i.e., Gridley) or because Local Agencies' general plan policies protect mineral resources.

NEPA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

CEQA Determination: The impact determination would be the same as Alternative 2; the impact would be less than significant. No mitigation is required.

8.2.4 Cumulative Analysis

Methods and Approach

The cumulative analysis for geologic and paleontological resources is a qualitative evaluation using the past, present, and reasonably foreseeable future projects listed in Chapter 3, Section 3.3.2, under *Cumulative Impacts*. This cumulative effects analysis for geology, soils, mineral resources, and paleontological resources considers the effects of implementing the action alternatives in

combination with other past, present, and reasonably foreseeable projects or programs. The analysis focuses on projects in the Plan Area—in particular those that could create a cumulatively significant geologic or seismic risk to people or structures, those that could result in the loss of availability of a known mineral resource, and those that could result in the damage or loss of paleontological resources. Such projects are those under the jurisdiction of the Local Agencies and BCAG. This analysis also considers whether the covered activities not analyzed in previous environmental documents would result in cumulatively considerable incremental contribution that, when combined with the past, present, and reasonably foreseeable future projects, would result in a cumulatively significant impact.

Cumulative Impacts

Past, present, and reasonably foreseeable future projects are identified in Chapter 3, Section 3.3.2, under *Cumulative Impacts*. While such projects result in placing structures or people within potentially seismically sensitive areas, these projects complied with all applicable building code and federal, state, and local requirements. This has generally not resulted in cumulatively significant effects related to geology and soils within the Plan Area. Such projects have resulted in ground disturbance in the Plan Area, including areas sensitive for paleontological resources. It is anticipated that past projects have resulted in the loss or damage of paleontological resources; whereas present and future projects that require ground disturbance must comply with state and local regulations that require stop work if potential resources are found and that require collection and categorization of the resources. Therefore, this has generally not resulted in cumulatively significant effects on paleontological resources within the Plan Area.

Alternative 1—No Project (No Plan Implementation)

All Local Agencies determined in the general plan EIRs that implementation of their general plans would result in less than cumulatively considerable impacts on geology and soils given state and local policies and requirements to reduce geologic and soil hazards. All Local Agencies except the City of Gridley determined that implementation of its general plans would result in less than cumulatively considerable impacts on paleontological resources given their current policies and measures to protect these resources. It is anticipated that facilities constructed and operated as a result of Caltrans activities or water district activities would not result in cumulatively considerable impacts on geological or paleontological resources because such facilities would be required to comply with existing regulations as described in the impact analysis above. However, the City of Gridley determined that implementation of its general plan would result in cumulatively considerable and significant impacts on paleontological resources because given the past extent of urban development and the expected scope and range of activities undertaken that could result in the loss of sites unique to the paleoenvironmental context of the area. Therefore, the No Action Alternative would contribute to cumulative impacts on paleontological resources as determined in the Gridley general plan EIR.

Alternative 2—Proposed Action

Construction in a seismically active region puts people and structures at risk from a range of earthquake-related effects—mainly seismic ground shaking. Additionally, ground disturbing activities as a result of covered activities could result in increases in soil erosion or loss of topsoil. However, as discussed above, various mechanisms are in place to reduce seismic-related risk, including project-specific geotechnical investigation and seismic design standards promulgated by

the county and city building codes, as well as by Caltrans (Appendix D). Additionally, state and local requirements such as the preparation and implementation of SWPPPs and Storm Water Construction General Permits would serve to control and reduce potential soil erosion and loss of topsoil during project-specific ground disturbing activities. The covered activities would not contribute considerably to the existing cumulative impact related to seismic hazards, soil erosion, or loss of topsoil. This impact is less than significant. No mitigation is required.

If the covered activities were to create a land use conflict that prevents mineral extraction (specifically aggregate resources), the Plan could contribute to a cumulatively significant impact. However, the Local Agencies' general plans all have policies in place to protect mineral resources, and the covered activities would not occur on land used or zoned for mining and implementation of the covered activities would not conflict with mining. Accordingly, the covered activities would not contribute considerably to the existing cumulative impact related to mineral resources. This impact is less than significant. No mitigation is required.

If the covered activities were to result in the damage or loss of paleontological resources, the Plan could result in a cumulatively significant impact. However, implementation of the policies in the Local Agencies' general plans to protect paleontological resources would reduce this impact, with the exception of the City of Gridley. As described above for Alternative 1, Gridley determined implementation of the general plan would result in cumulatively considerable impacts on paleontological resources.

Alternative 3—Reduced Development/Reduced Fill and Alternative 4—Greater Conservation

Although the extent of the ground disturbing activities, development activities, and establishment and management of conservation areas varies among these two alternatives, the mechanism and implications are the same as under Alternative 2. Neither Alternative 3 nor Alternative 4 would result in a cumulatively considerable contribution to cumulative impacts on geologic or mineral resources. However, as a result of the City of Gridley's general plan EIR determination, Alternative 3 and 4 would result in a cumulatively considerable impact on paleontological resources.

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