

## 4.4 Geology and Soils

### 4.4.1 Overview

This section describes the regulatory setting applicable to geology and soil resources and hazards and the potential effects of the alternatives relating to exposure of people or structures to seismic risks and other geology- and soil-related effects in the study area. As described in Section 3.4, Geology and Soils, the study area for geology and soils is considered to include the Covered Lands and the surrounding fault system that could affect the Covered Lands. The cumulative effects analysis area for geology and soils considers the same area. A description of the cumulative effects analysis area is provided in Section 4.4.7, Cumulative Effects, along with a discussion of potential cumulative effects of the alternatives. Potential effects of the alternatives on mineral extraction are discussed in Section 4.7, Community Resources. Potential effects on paleontological resources are discussed in Section 4.5, Cultural Resources.

#### 4.4.1.1 Regulatory Setting

The following state and local laws and policies would apply to all development in the study area and are designed to protect people against seismic risks.

##### **Alquist-Priolo Earthquake Fault Zoning Act**

The Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) requires a California state geologist to identify areas in the state that are at risk from surface fault rupture. The primary purpose of the act is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. Under the act, the state establishes regulatory zones (Earthquake Fault Zones or Alquist-Priolo Zones) around the surface traces of active faults and issues appropriate maps of these zones. The maps are distributed to all affected cities, counties, and state agencies for their use in planning and controlling construction. Local agencies must regulate most development projects within the zones. Before a project can be permitted, a geologic investigation is required to demonstrate that proposed buildings would not be constructed across active faults. If an active fault is found, a structure for human occupancy cannot be placed over the trace of the fault and must be set back from the fault (generally 50 feet).

##### **California State Seismic Hazards Mapping Act**

The California State Seismic Hazards Mapping Act addresses hazards other than surface fault rupture, including liquefaction and seismically induced landslides. Through the act, the state establishes city, county, and state agency responsibilities for identifying and mapping seismic hazard zones and mitigating seismic hazards to protect public health and safety. It requires the California Department of Conservation, Division of Mines and Geology, to map seismic hazards and establishes specific criteria for project approval that apply in seismic hazard zones, including the requirement for a geological technical report. The California Department of Conservation has not mapped seismic hazards or established specific criteria for the study area.

##### **California Building Code**

The California Code of Regulations, Title 24 (California Building Code [CBC]) applies to all applications for residential building permits. The CBC has incorporated the Uniform Building Code (first enacted in 1927 and updated approximately every 3 years). The current CBC became effective

in 2007. (Portions of the code have been updated, including the Plumbing Code in 2007 and 2010, and the Electrical Code in 2010) (California Building Standards Commission 2011). Local agencies must ensure that development in their jurisdictions comply with guidelines contained in the CBC.

Specific minimum seismic safety and structural design requirements are set forth in Chapter 16 of the CBC. The CBC identifies seismic factors that must be considered in structural design. Chapter 18 of the CBC regulates the excavation of foundations and retaining walls, and Appendix A33 regulates grading activities, including drainage and erosion control and construction on unstable soils such as expansive soils and liquefaction areas.

## **Kern County Laws, Policies, Ordinances, Regulations, and Standards**

Kern County has established several policies and requirements related to seismic failures, including development policies and implementation measures related to the avoidance of earthquake faults and fault zones, geologic hazards, and required geological and soils engineering investigations in the Land Use, Open Space, Conservation, and Safety Elements of the Kern County General Plan, in Kern County's Hillside Development Ordinance, and in the County Code of Building Regulations, as summarized below.

**Seismically Induce Surface Rupture, Ground Shaking, and Ground Failure (Section 4.3 of the Kern County General Plan).** This section includes policies and implementation measures to address seismic risks when constructing development. Structures are to be placed away from active faults, geologic and soil studies should be conducted prior to citing structures, and proper precautions should be implemented to reduce seismic hazards wherever possible.

**Landslides, Subsidence, Seich, and Liquefaction (Section 4.5 of the Kern County General Plan).** This section includes policies and implementation measures to address other geologic hazards. Liquefaction potential should be determined and proper mitigation should be developed. Risks from other geological and soil risks should be reduced through application of mitigation measures in the California Environmental Quality Act (CEQA) process.

**Hillside Development Ordinance (Chapter 19.88 of Kern County Code of Ordinances).** This ordinance requires various standards related to, for example, density, grading, drainage, and driveway and road design, to minimize risks associated with hillside development. With respect to development that would occur under the Proposed TU MSHCP, Condor Only HCP, or Kern County General Plan Buildout Alternatives within the TMV Specific Plan Area, the TMV Specific Plan includes a site-specific grading ordinance as part of the zoning change, which replaces Kern County's Hillside Development Ordinance within the TMV Specific Plan Area. Rather than regulating development on a lot-by-lot basis as occurs under the Hillside Development Ordinance, the TMV Specific Plan permits development in areas of the project site that can accommodate development given considerations related to slope, natural resources, and other constraints. The grading standards require appropriate setbacks, grading that respects natural contours on the project site, protection of significant resources and aesthetic features, imposition of best management practices (BMPs) to avoid erosion, incorporation of features to avoid unnatural appearances, adherence to existing road alignments, and other measures to minimize the effect of grading on hillsides.

**Kern County Code of Building Regulations (Title 17 of Kern County Code of Ordinances).** The Code of Building Regulations adopts many provisions of the CBC, but makes some modifications due to consideration of local climatic, geological or topographic conditions. This code includes grading provisions, that require consideration of geologic risks.

#### **4.4.1.2 Methods**

The analysis of the effects and magnitude of direct, indirect, and cumulative effects were considered in terms of whether each alternative would expose people or structures to substantial seismic risks or expose people or structures to other substantial risks related to soils and geology risks such as landslides, erosion, lateral spreading, subsidence, or collapse. In general, potential effects related to soils and geology were assumed to be associated with ground disturbance activities.

### **4.4.2 No Action Alternative**

#### **4.4.2.1 Exposure to Seismic Risks**

##### **Commercial and Residential Development Activities**

No Commercial or Residential Development Activities would occur under the No Action Alternative; therefore, this alternative would not expose people or structures to seismic risks.

##### **Existing Ranch Uses**

There are some existing structures in the study area associated with Existing Ranch Uses; however, the use of most of these structures is, and would continue to be, limited. Most ancillary ranch structures are not occupied (although employees are housed in some buildings) and back-country cabins are visitor facilities used for occasional lodging. The existing ranch headquarters and ancillary ranch structures are located near Interstate 5 (I-5). These structures have been built in accordance with applicable seismic regulations. These few structures are spread out over the study area and are not concentrated on fault lines.

Existing Ranch Uses could result in the limited construction of new structures, such as ancillary ranch structures and back-country cabins, that could increase the exposure of people and structures to seismic risk. New construction for human occupancy associated with Existing Ranch Uses would be required to comply with state and local requirements to reduce seismic hazards, such as applicable building codes and design standards intended to reduce risks from seismic activity. The majority of the Covered Lands would be permanently preserved in open space (106,317 acres), and the remaining Covered Lands would continue to be limited to Existing Ranch Uses with no Commercial and Residential Development, which would further limit the potential exposure to seismic risk. Therefore, the No Action Alternative would result in minor risk of harm or injury from exposure to seismic risks, similar to existing conditions.

#### **4.4.2.2 Exposure to Other Soils and Geology Risks**

##### **Commercial and Residential Development Activities**

Commercial and Residential Development Activities are not proposed under the No Action Alternative; therefore, this alternative would not expose people or structures to other soils or geology risks, such as landslides, erosion, lateral spreading, subsidence, or collapse associated with these activities.

## Existing Ranch Uses

Under the No Action Alternative, Existing Ranch Uses would continue similar to existing conditions, subject to the use restrictions and BMPs required per the Ranchwide Agreement (as currently set forth in the Interim RWMP) to maintain existing conservation values. Specifically, the Interim RWMP includes provisions to minimize erosion and soil compaction associated with the effects of grazing through seasonal livestock rotation; placing mineral supplements distant from water resources to prevent soil compaction, erosion, and contamination from congregating livestock; and placing water sources throughout the area to disperse livestock. The Ranchwide Agreement requires that all subsequent RWMPs must similarly reflect BMPs that protect the conservation values of the land and that such restrictions are carried through in the conservation easements required by the Ranchwide Agreement.

As noted above, there are some existing structures in the study area associated with Existing Ranch Uses that could result in the exposure of people to other soils and geology risks, such as landslides, lateral spreading, subsidence, or collapse; however, the use of most of these structures is limited. Most ancillary ranch structures are not occupied, and back-country cabins are visitor facilities used for occasional lodging. The existing ranch headquarters and associated housing are located near I-5. These structures have been located to minimize potential risk associated with unstable soils.

Existing Ranch Uses could result in the limited construction of new structures, such as ancillary ranch structures and back-country cabins. The placement of new structures in areas prone to other soil and geology risks could result in increased exposure of people and structures to harm or damage associated with these risks. Some Existing Ranch Uses, such as farming, construction and maintenance activities, and ranching, could result in increased erosion and contribute to the loss of topsoil, although these activities would be carried out in a manner consistent with the Ranchwide Agreement, which includes provisions to minimize the potential for erosion and soil compaction, as described above. In addition, Existing Ranch Uses would be required to comply with Federal, state, and local requirements to reduce risks associated with other soils and geology risks. For example, activities associated with Existing Ranch Uses that would require substantial ground disturbance would trigger the need for a local grading or building permit and possibly a National Pollutant Discharge Elimination System (NPDES) Permit. It is anticipated that prior to issuance of the required permits, the local jurisdiction would require demonstration that risks associated with geology and soils would be avoided or minimized, likely through incorporation of BMPs designed to protect those resources.

The majority of the Covered Lands would be permanently preserved in open space (106,317 acres), and the remaining Covered Lands would continue to be limited to Existing Ranch Uses (no Commercial and Residential Development), which would further limit the potential exposure to these risks. Therefore, although the No Action Alternative would result in some increased risk of exposing people and structures to other soils and geology risks, the potential effects would be minor and similar to existing conditions.

## 4.4.3 Proposed TU MSHCP Alternative

### 4.4.3.1 Exposure to Seismic Risks

#### Commercial and Residential Development Activities

Commercial and Residential Development Activities under the Proposed TU MSHCP Alternative would result in the disturbance of approximately 5,533 acres. These activities would include the construction of 3,632 dwelling units and 1,804,390 square feet of commercial development. In addition, the population would increase by 11,441 individuals under this alternative.

Implementation of the conservation measures included in the TU MSHCP (as presented in Tables 2-3 and 2-4 in Chapter 2, Proposed TU MSHCP and Alternatives), would help to reduce the potential effects of exposure to seismic risk by requiring low-density development. However, Commercial and Residential Development Activities would still result in increased exposure of people or structures to harm or injury from seismic risks. Seismic risks arise from groundshaking events and risks to people are caused by exposure to unsafe structures in earthquake-prone areas that could result in major injury, or loss of life. Some low-density development would be located in the vicinity of the Garlock Fault zone. Other proposed development would be further away from the fault zone. Seismic activity along the San Andreas Fault system, where the nearest location of that system is approximately 2 miles southwest of the study area, or the Pleito Thrust Fault, approximately 3 miles north of the study area, could affect people and structures in the study area. There could be moderate to large earthquakes and horizontal ground accelerations that could result in structural damage, major injury, or loss of life. Secondary fault ruptures outside of the fault zones could also damage structures, as could groundshaking and other secondary seismic effects.

As noted in Section 4.4.3.3, Mitigation Measures, all Commercial and Residential Development Activities would be subject to project-specific approvals from state agencies and local jurisdictions as indicated in Section 4.4.3.3, Mitigation Measures. For example, in accordance with the Alquist-Priolo Act, local agencies would not allow habitable structures such as homes and commercial buildings in areas designated as active fault lines and buildings would need to be constructed in accordance with building code requirements. It is anticipated that the local jurisdiction would require provisions that would reduce the exposure of people and structures to seismic risks during project-level approval. For example, Kern County's approval of the TMV Project requires preparation of geotechnical studies prior to development; buffer zones of 50 feet around fault zones and a minimum setback of 300 feet around all critical facilities, such as fire stations; and design measures to minimize risks to new critical utilities that cross active fault traces (Appendix J, MM 4.6-1 through 4.6-4 and MM 4.6-6) (Kern County 2009). In addition, under the Proposed TU MSHCP Alternative, Commercial and Residential Development Activities would occur as an integrated, planned project. This would allow for more effective implementation of minimization and avoidance measures and would substantially reduce the potential for exposure of structures or humans to seismic risks.

In consideration of the above avoidance, minimization, and mitigation measures, it is anticipated that the potential for increased exposure to seismic risk under the Proposed TU MSHCP Alternative would be minor. This risk would be somewhat higher than the No Action Alternative, however, given the increased development footprint.

## Plan-Wide Activities

Plan-Wide Activities under the Proposed TU MSHCP Alternative would be similar to Existing Ranch Uses under the No Action Alternative with the exception that permanent ground disturbance would be limited to 200 acres. As noted above, there are some existing structures in the study area associated with Plan-Wide Activities; however, the use of most of these structures is limited. Most ancillary ranch structures are not occupied and back-country cabins are visitor facilities used for occasional lodging. The existing ranch headquarters and ancillary ranch structures are located near I-5 and were constructed in accordance with local approvals and codes. Plan-Wide Activities could result in the limited construction of new structures (e.g., ancillary ranch structures) that could increase the exposure of people and structures to seismic risk. New construction for human occupancy associated with Plan-Wide Activities would be required to comply with state and local requirements to reduce seismic hazards, such as applicable building codes and design standards intended to reduce risks from seismic activity. Permanent ground-disturbing activities would be limited to 200 acres, which would further limit the exposure to seismic risk. Therefore, the Proposed TU MSHCP Alternative would result in a minor risk of harm or injury from exposure to seismic risks, similar to the No Action Alternative.

### 4.4.3.2 Exposure to Other Soils and Geology Risks

#### Commercial and Residential Development Activities

Commercial and Residential Development Activities under the Proposed TU MSHCP Alternative would result in the disturbance of approximately 5,533 acres, requiring grading and cut and fill or approximately 75 million cubic yards. These activities would include the construction of 3,632 dwelling units and 1,804,390 square feet of commercial development. In addition, the population would increase by 11,441 individuals under this alternative.

Implementation of conservation measures included in the TU MSHCP (as presented in Tables 2-3 and 2-4 in Chapter 2, Proposed TU MSHCP and Alternatives), would help to reduce exposure to other soils and geology risks, including landslides, erosion, lateral spreading, subsidence, and collapse, by allowing only low-density development, incorporating design features to avoid and minimize urban runoff, and implementing erosion control measures. However, Commercial and Residential Development Activities could result in increased exposure of people or structures to harm or injury from other soils and geology risks as a result of placing structures on unstable soils, or by destabilizing soils through grading and earthmoving. Compressible or collapsible soils exist in areas with a higher groundwater table, such as around Castac Lake, and therefore may be more prone to lateral spreading in places. Landslides can occur in steep ridged areas throughout the TMV Planning Area and can be exacerbated by erosion or grading.

As indicated in Section 4.4.3.3, Mitigation Measures, Commercial and Residential Development Activities would be subject to project-specific approvals from state agencies and local jurisdictions. It is anticipated that the local approval process would include provisions that would reduce exposure of people and structures to other soils and geology risks, and minimize potential effects on soils from erosion through restricted building locations and requiring compliance with grading erosion controls and earthquake building codes. For example, Kern County's approval of the TMV Project requires grading and construction approaches to minimize risks associated with compressible and collapsible soils, landslides and debris flows; and preparation of a stormwater management plan and site-specific erosion controls (Appendix J, MM 4.6-19 through 4.6-21 and MM 4.6-25) (Kern County 2009). In addition, under the Proposed TU MSHCP Alternative, Commercial and Residential Development Activities would occur as an integrated, planned project. This would allow for more effective implementation of minimization and avoidance measures and would

substantially reduce the potential for exposure of structures or humans to other soils and geology risks, such as landslides, erosion, lateral spreading, subsidence, or collapse.

In consideration of the above avoidance, minimization, and mitigation measures, it is anticipated that the potential for increased exposure to other soils and geology risks under the Proposed TU MSHCP Alternative would be minor. These risks would be somewhat higher than the No Action Alternative, however, given the increased development footprint.

### **Plan-Wide Activities**

Plan-Wide Activities would be similar to Existing Ranch Uses under the No Action Alternative, with the exception that permanent ground disturbance would be limited to 200 acres. Similar to Existing Ranch Uses under the No Action Alternative, Plan-Wide Activities would be subject to use restrictions and BMPs required per the Ranchwide Agreement (as currently set forth in the Interim RWMP) to maintain the existing conservation values, including provisions to minimize erosion and soil compaction associated with the effects of grazing through seasonal livestock rotation; placing mineral supplements distant from water resources to prevent soil compaction, erosion, and contamination from congregating livestock; and placing water sources throughout the area to disperse livestock.

As noted above, there are some existing structures in the study area associated with Plan-Wide Activities that could result in the exposure of people to other soils and geology risks; however, the use of most of these structures would continue to be limited. Most ancillary ranch structures are not occupied and back-country cabins are visitor facilities used for occasional lodging. The existing ranch headquarters are located near I-5 and were constructed in accordance with local approvals and codes.

Plan-Wide Activities could result in the limited construction of new structures, such as ancillary ranch structures. The placement of new structures in areas prone to other soil and geology risks could result in increased exposure of people and structures to harm or damage associated with these risks. Some Plan-Wide Activities, such as farming, construction and maintenance activities, and ranching, could result in increased erosion and contribute to the loss of topsoil. These activities would continue to be carried out in a manner consistent with the Ranchwide Agreement, which includes provisions to minimize the potential for erosion and soil compaction, as described above. Additionally, conservation measures included in the TU MSHCP (Tables 2-3 and 2-4 in Chapter 2, Proposed TU MSHCP and Alternatives) would further reduce other soil and geology risks by, for example, requiring erosion controls during ground disturbance, and BMPs, which would help mitigate against increased risk from exposure to other soils and geology risks. As indicated in Section 4.4.3.3, Mitigation Measures, all new construction for human occupancy associated with Plan-Wide Activities would be required to comply with Federal, state, and local requirements to reduce risks associated with other soils and geology risks. Under the Proposed TU MSHCP Alternative, an additional area of the Covered Lands would be preserved in open space compared to the No Action Alternative (approximately 23,001 additional acres) and permanent ground disturbance would be limited to 200 acres, which would further limit the potential exposure to risk. Therefore, although the Proposed TU MSHCP Alternative would result in some increased exposure of people and structures to other soils and geology risks, the potential effects would be minor and less than under the No Action Alternative where additional development would not be limited to 200 acres.

#### **4.4.3.3 Mitigation Measures**

As described above, BMPs and use restrictions required pursuant to the Ranchwide Agreement (as currently set forth in the Interim RWMP), would reduce the potential for increased exposure of people and structures to geology and soils risks under the Proposed TU MSHCP Alternative. The

Proposed TU MSHCP Alternative would also include species-specific conservation measures (Tables 2-3 and 2-4 in Chapter 2, Proposed TU MSHCP and Alternatives), such as requirements to minimize ground disturbance activities in areas susceptible to erosion, which would further reduce some geology and soil-related effects. If the Service issues an incidental take permit (ITP) to TRC for incidental take of the 27 species covered under the TU MSHCP, these measures would be enforceable under the Endangered Species Act (ESA) through the ITP and applicable conservation easements. In addition, the following mitigation measures would reduce soils and geology effects that may be associated under this alternative.

- **Comply with Applicable Federal, State, and Local Laws and Regulations Related to Geology and Soils.** All development will comply with applicable state and local laws and policies to minimize seismic risks, including the Alquist-Priolo Act, the CBC, and applicable Kern County laws and policies. In addition, all ground disturbing activities will comply with applicable Federal, state, and local laws and policies requiring implementation of erosion-control BMPs, which include at a minimum, the standards set for by the NPDES Permit and associated preparation of a stormwater pollution prevention plan (SWPPP) with erosion-related BMPs.

## 4.4.4 Condor Only HCP Alternative

### 4.4.4.1 Exposure to Seismic Risks

#### Commercial and Residential Development Activities

The potential for exposure of humans and structures to seismic risks associated with Commercial and Residential Development Activities under the Condor Only HCP Alternative would be the same as described for the Proposed TU MSHCP Alternative.

#### Plan-Wide Activities

The potential for exposure of humans and structures to seismic risks associated with Plan-Wide Activities under the Condor Only HCP Alternative would be same as described for the Proposed TU MSHCP Alternative.

### 4.4.4.2 Exposure to Other Soils and Geology Risks

#### Commercial and Residential Development Activities

The potential for exposure of humans and structures to other soil and geology risks associated with Commercial and Residential Development Activities under this alternative would be the same as described for the Proposed TU MSHCP Alternative.

#### Plan-Wide Activities

The potential for exposure of humans and structures to other soil and geology risks associated with Plan-Wide Activities under the Condor Only HCP Alternative would be the same as described for the Proposed TU MSHCP Alternative.

### 4.4.4.3 Mitigation Measures

As described above, the BMPs and use restrictions required pursuant to the Ranchwide Agreement (as currently set forth in the Interim RWMP) would reduce the potential for increased exposure of people and structures to geology and soils risks under the Condor Only HCP Alternative. However, only the species-specific conservation measures for California condor (Table 2-3 in Chapter 2,

Proposed TU MSHCP and Alternatives) would be implemented under this alternative. In addition, the mitigation measures listed in Section 4.4.3.3, Mitigation Measures, for the Proposed TU MSHCP Alternative would also be implemented under the Condor Only HCP Alternative.

## 4.4.5 CCH Avoidance MSHCP Alternative

### 4.4.5.1 Exposure to Seismic Risks

#### Commercial and Residential Development Activities

The potential effects from exposure to seismic risk under the CCH Avoidance MSHCP Alternative would be similar to those described for the Proposed TU MSHCP. The extent of the exposure overall would be slightly less than under the Proposed TU MSHCP Alternatives because the extent of proposed Commercial and Residential Development Activities would be slightly less.

There are some notable differences in where the Commercial and Residential Development Activities would be concentrated under the CCH Avoidance MSHCP Alternative compared to the Proposed TU MSHCP Alternative. Less Commercial and Residential Development Activities would occur in the immediate vicinity of the Garlock Fault compared to the Proposed TU MSHCP Alternative, but more development would be located closer to the San Andreas Fault (approximately 2 miles southwest of the study area) and the Pleito Thrust Fault (approximately 3 miles north of the study area).

Similar to the Proposed TU MSHCP Alternative, with implementation of mitigation presented in Section 4.4.5.3, Mitigation Measures, it is anticipated that the potential for increased exposure to seismic risks under the CCH Avoidance MSHCP Alternative would be minor. These risks would be somewhat higher than the No Action Alternative, however, given the increased development footprint.

#### Plan-Wide Activities

The potential effects from exposure to seismic risk under the CCH Avoidance MSHCP Alternative from Plan-Wide Activities would be the same as under the Proposed TU MSHCP Alternative.

### 4.4.5.2 Exposure to Other Soils and Geology Risks

#### Commercial and Residential Development Activities

Commercial and Residential Development Activities under the CCH Avoidance MSHCP Alternative would result in the disturbance of approximately 4,496 acres, requiring grading and cut-and-fill of approximately 90 million cubic yards. These activities would include the construction of 3,161 dwelling units and 1,804,390 square feet of commercial development. The population would increase by 9,957 individuals under this alternative.

Implementation of the conservation measures presented in Tables 2-3 and 2-4 in Chapter 2, Proposed TU MSHCP and Alternatives, would reduce exposure to other soils and geology risks under the CCH Avoidance MSHCP Alternative by incorporating design features to avoid and minimize urban runoff, and implementing erosion control measures. However, Commercial and Residential Development Activities could result in increased exposure of people or structures to harm or injury from other soils and geology risks by placing structures on unstable soils, or by destabilizing soils through grading and earthmoving. Compressible or collapsible soils exist in areas with a higher groundwater table, such as around Castac Lake, and therefore may be more prone to lateral

spreading in places. Landslides can occur in steep ridged areas throughout the TMV Planning Area and can be exacerbated by erosion or grading.

Commercial and Residential Development Activities would be more concentrated along the southern edge of the Covered Lands along the I-5 corridor and around Castac Lake, where compressible and collapsible soils may be present. Because more extensive grading would be required, it would be more difficult to avoid these areas under the CCH Avoidance MSHCP Alternative.

As indicated in Section 4.4.5.3, Mitigation Measures, all Commercial and Residential Development Activities would be subject to project-specific approvals from state agencies and local jurisdictions. For example, in accordance with the Alquist-Priolo Act, local agencies would not allow habitable structures, such as homes and commercial buildings, in areas designated as active fault lines and buildings would need to be constructed in accordance with building code requirements. It is anticipated that the local approval process would include provisions that would reduce exposure of people and structures to other soils and geology risks, and minimize potential effects on soils from erosion. For example, Kern County's approval of the TMV Project requires grading and construction approaches to minimize risks associated with compressible and collapsible soils, landslides and debris flows; and preparation of a stormwater management plan and site-specific erosion controls (Appendix J, MM 4.6-19 through 4.6-21 and MM 4.6-25) (Kern County 2009). Similar requirements are anticipated to be imposed for this alternative. In addition, under the CCH Avoidance MSHCP Alternative, Commercial and Residential Development Activities would occur as an integrated, planned project. This would allow for more effective implementation of minimization and avoidance measures and would substantially reduce the potential for exposure of structures or humans to other soils and geology risks.

Even with implementation of the above avoidance, minimization, and mitigation measures, increased risk of exposure to other soils and geology risks would occur from Commercial and Residential Development Activities under the CCH Avoidance MSHCP Alternative. Because it would be difficult to avoid areas around Castac Lake, where compressible and collapsible soils may be present, and because more extensive and intensive grading would be required, there would be moderate increase in risk of exposure of people or structures to other soil and geology risks under the CCH Avoidance MSHCP Alternative. These risks would be higher than the No Action Alternative.

### **Plan-Wide Activities**

The potential effects from exposure to other soil and geology risks under the CCH Avoidance MSHCP Alternative from Plan-Wide Activities would be the same as under the Proposed TU MSHCP Alternative.

#### **4.4.5.3 Mitigation Measures**

As described above, the BMPs and use restrictions required pursuant to the Ranchwide Agreement would reduce the effects of the CCH Avoidance MSHCP Alternative related to the exposure of people and structures to seismic risks and other soils and geology hazards. Conservation measures, similar to those provided in Tables 2-3 and 2-4 in Chapter 2, Proposed TU MSHCP and Alternatives, would also reduce effects on soils and geology by incorporating design features to avoid and minimize urban runoff and erosion. In addition, the mitigation measures listed in Section 4.4.3.3, Mitigation Measures, for the Proposed TU MSHCP Alternative would also be implemented under the CCH Avoidance MSHCP Alternative.

## 4.4.6 Kern County General Plan Buildout Alternative

### 4.4.6.1 Exposure to Seismic Risks

#### Commercial and Residential Development Activities

The effects from exposure to seismic risk under the Kern County General Plan Buildout Alternative would be similar to those described for the Proposed TU MSHCP. The extent of the exposure would be slightly greater than under the Proposed TU MSHCP Alternatives because there would be more Commercial and Residential Development Activities.

There are some notable differences in where Commercial and Residential Development Activities would be concentrated under the Kern County General Plan Buildout Alternative compared to the Proposed TU MSHCP Alternative. Under the Kern County General Plan Buildout Alternative, additional development would be scattered throughout the study area, and could include development close to the Garlock and White Wolf Fault zones.

Similar to the Proposed TU MSHCP Alternative, with implementation of mitigation presented in Section 4.4.6.3, Mitigation Measures, it is anticipated that the potential for increased exposure to seismic risks under the Kern County General Plan Buildout Alternative would be minor. These risks would be somewhat higher than the No Action Alternative, however, given the increased development footprint.

#### Existing Ranch Uses

As noted above, Existing Ranch Uses could result in the limited construction of new structures, such as ancillary ranch structures and back-country cabins that could increase the exposure of people and structures to seismic risk. New construction for human occupancy associated with Existing Ranch Uses would be required to comply with state and local requirements to reduce seismic hazards. Specifically, project permits would require conformance with applicable building codes and design standards intended to reduce risks from seismic activity. In addition, the majority of the Covered Lands would be preserved in open space (119,392 acres), which would further limit the potential exposure to seismic risk. Therefore, the Kern County General Plan Buildout Alternative would result in a minor risk of harm or injury from exposure to seismic risks, similar to the No Action Alternative.

### 4.4.6.2 Exposure to Other Soils and Geology Risks

#### Commercial and Residential Development Activities

Commercial and Residential Development Activities under the Kern County General Plan Buildout Alternative would result in the disturbance of approximately 12,142 acres, requiring grading and cut and fill of approximately 222 million cubic yards. These activities would include the construction of 7,238 dwelling units and 2,144,810 square feet of commercial development. In addition, the population would increase by 22,800 individuals under this alternative.

Commercial and Residential Development Activities could result in increased exposure of people or structures to harm or injury from other soils and geology risks, such as landslides, erosion, lateral spreading, subsidence, or collapse. Risks could arise by placing structures on unstable soils, or by destabilizing soils through grading and earthmoving. Compressible or collapsible soils exist in areas with a higher groundwater table, such as around Castac Lake, and therefore may be more prone to lateral spreading in places. Landslides can occur in steep ridged areas throughout the TMV Planning Area and can be exacerbated by erosion or grading. Under the Kern County General Plan Buildout

Alternative, additional development would be scattered throughout the study area and would result in more grading and disturbance of soil compared to the other action alternatives.

As indicated in Section 4.4.6.3, Mitigation Measures, Commercial and Residential Development Activities would be subject to project-specific approvals from state agencies and local jurisdictions. For example, in accordance with the Alquist-Priolo Act, local agencies would not allow habitable structures such as homes and commercial buildings in areas designated as active fault lines and buildings would need to be constructed in accordance with building code requirements. It is anticipated that the local approval process would include provisions that would reduce exposure of people and structures to other soils and geology risks, and minimize potential effects on soils from erosion. For example, Kern County's approval of the TMV Project requires grading and construction approaches to minimize risks associated with compressible and collapsible soils, landslides and debris flows; and preparation of a stormwater management plan and site-specific erosion controls (Appendix J, MM 4.6-19 through 4.6-21 and MM 4.6-25) (Kern County 2009).

Even with implementation of mitigation, some increased exposure to soils and geology risks would occur from Commercial and Residential Development Activities. Because more extensive and dispersed grading would be required, there would be moderate increase in risk of exposure of people or structures to other soil and geology risks under the Kern County General Plan Buildout Alternative. These risks would be greater than those associated with the No Action Alternative.

### **Existing Ranch Uses**

As noted above, Existing Ranch Uses could result in the limited construction of new structures, such as ancillary ranch structures, that could increase the exposure of people and structures to other geology and soils risks. As described in Chapter 2, Proposed TU MSHCP and Alternatives, the limitations of the Ranchwide Agreement would not apply under this alternative. However, even in the absence of the Ranchwide Agreement, historic ranch practices, as currently reflected in the Interim RWMP, are anticipated to continue (although they cannot be assured), and compliance with legal requirements governing other soil and geology risks would apply.

New construction for human occupancy associated with Existing Ranch Uses would be required to comply with Federal, state, and local requirements to reduce risks associated with other soils and geology risks, as discussed above. The majority of the Covered Lands would be preserved in open space (119,392 acres), which would further limit the exposure to risk. Therefore, although the Kern County General Plan Buildout Alternative would result in some increased exposure of people and structures to other soils and geology risks, the potential effects would be minor and similar to the No Action Alternative.

### **4.4.6.3 Mitigation Measures**

As described above, the limitations of the Ranchwide Agreement would not apply under the Kern County General Plan Buildout Alternative. However, even in the absence of the Ranchwide Agreement, BMPs (as currently set forth in the Interim RWMP) are anticipated to continue (although they cannot be assured). Restrictions imposed by the TMV Project Approvals and by easement language in the Existing Conservation Easement Areas would apply under the Kern County General Plan Buildout Alternative. Comparable measures to those provided in Tables 2-3 and 2-4 would likely be implemented to avoid, mitigate, and minimize effects on special-status species (i.e., state or federally listed species, species protected as special-status species under CEQA), which could also reduce effects on geology and soil resources. In addition, the mitigation measures listed in Section 4.4.3.3, Mitigation Measures, for the Proposed TU MSHCP Alternative would also be implemented under the Kern County General Plan Buildout Alternative.

## 4.4.7 Cumulative Effects

The approach for analyzing cumulative effects on geology and soils resources is described in Section 4.0.4, Methods of Assessing Cumulative Effects, which includes a list of reasonably foreseeable projects considered in this assessment. As noted above, the cumulative effects analysis area is the same as the study area for geology and soils and includes the Covered Lands and the surrounding fault system that could affect the Covered Lands. Specific to soils and geological considerations, the potential cumulative effects are assessed in the context of the criteria discussed in Section 4.4.1.2, Methods, which includes each alternative's potential to expose people or structures to substantial seismic risks or expose people or structures to other substantial risks related to other soil and geology risks, such as landslides, erosion, lateral spreading, subsidence, or collapse.

Cumulative effects related to soils and geology are indirect or secondary effects related to the future development that would be facilitated by issuance of an ITP by the Service. Whether or not such effects would be substantial cumulatively is primarily dependent on the avoidance, minimization and mitigation measures put in place by other Federal, local, and state authorities pursuant to their project approval process.

### 4.4.7.1 Exposure to Seismic Risks

As noted in Section 3.4, Geology and Soils, the region is seismically active. As noted above and in greater detail in Section 3.7, Community Resources, some limited development currently exists within the general vicinity of the Covered Lands. Past development within the cumulative effects analysis area has also resulted in the placement of additional structures and the development of land uses that have attracted more people to the area. To a large extent, the development is relatively dispersed and does not result in a substantial risk of exposure to people or structures to risk from seismic activities.

The No Action Alternative would not include any Commercial and Residential Development Activities and would not expose a substantial number of people to increased seismic risk. Therefore, the No Action Alternative would not contribute to a cumulative effect. Existing Ranch Uses or Plan-Wide Activities associated with any of the alternatives would not result in substantial increases in exposure to seismic risks. Therefore, these activities would not combine with any of the reasonably foreseeable projects to result in cumulative effects associated with seismic risk.

As noted above, the proposed action alternatives would result in additional development and associated population growth and would have the potential to contribute to a cumulative effect. However, seismic risks would vary depending on project location and would be site-specific. Like all development under any of the proposed action alternatives, each project in the region must individually meet building code and other local requirements (such as conducting engineering surveys and placing structures away from active faults). It is anticipated that other future development would also meet these requirements. Therefore, no additive effect would occur and no cumulatively substantial effect related to seismic risks would occur.

### 4.4.7.2 Exposure to Other Soils and Geology Risks

The existing exposure of people and structures to other soils and geology risks in the cumulative effects analysis area has also been influenced by past development. The placement of additional structures and the development of land uses have attracted more people to the area and resulted in changes in topography. However, to a large extent, the development is relatively dispersed and has not occurred in areas where substantial risk of erosion, landslides, lateral spreading, subsidence, or collapse are prevalent. Therefore, within the cumulative effects analysis area, the risk of exposure to people or structures to these hazards is relatively minor.

The No Action Alternative would not include any Commercial and Residential Development Activities and would expose a substantial number of people to increased soils and geology risks. Therefore, the No Action Alternative would not contribute to a cumulative effect. In addition, Existing Ranch Uses or Plan-Wide Activities associated with the alternatives would not result in substantial increases in risk of exposure to other soils and geology risks. Therefore, these activities would not combine with any of the reasonably foreseeable projects to result in a cumulative effect.

As noted above, the proposed action alternatives would result in additional development and associated population growth, and would have the potential to contribute to a cumulative effect. However, geologic formations and soils types vary depending on project location and are site-specific. Like all development under any of the proposed action alternatives, each project in the region must individually meet building code and other local requirements (such as grading and erosion control plans). It is anticipated that other future development would also meet these requirements. Therefore, no additive effect would occur and no cumulatively substantial effect related to soils or other geologic hazards would occur.

#### 4.4.8 Comparison of Alternatives

Because the exact contours, locations, and building designs of the Commercial and Residential Development Activities are not known, the following comparison of alternatives is based on the acreage of disturbance and estimates of cut-and-fill in the development area as well as the area that would be preserved as open space, as summarized in Table 4.4-1.

**Table 4.4-1. Proposed Development and Open Space under Each Alternative**

	No Action Alternative	Proposed TU MSHCP/Condor Only HCP Alternatives	CCH Avoidance MSHCP Alternative	Kern County General Plan Buildout Alternative
Ground disturbance (acres)	0	5,533	4,496	12,142
Cut and fill (cubic yards)	0	75 million	90 million	222 million
Dwelling Units	0	3,632	3,161	7,238
Commercial Development (square feet)	0	1,804,390	1,804,390	2,144,810
Population	0	11,441	9,957	22,800
Permanently preserved open space (acres) <sup>1</sup>	106,317 <sup>2</sup> (75%)	129,318 (91%)	130,339 (92%)	119,392 <sup>3</sup> (84%)

<sup>1</sup> Percentage representative of percentage of total study area (141,886 acres).

<sup>2</sup> While conservation easements would be recorded over only 106,317 acres, Existing Ranch Uses would continue over the remaining Covered Lands (with no commercial or residential development).

<sup>3</sup> The Kern County General Plan Buildout Alternative includes both permanently preserved open space (34,130 acres) and Restricted Open Space (85,262 acres).

Commercial and Residential Development Activities would not occur under the No Action Alternative. Therefore, there would be no related effects associated with soils or geology from these activities. By comparison, the remaining alternatives would all result in potential effects on soils and geology from Commercial and Residential Development Activities.

Generally speaking, the potential for adverse effects from exposure to seismic risk would increase with the extent and intensity of the development. As indicated in Table 4.4-1, the CCH Avoidance MSHCP Alternative would result in the least amount of developed area. The Proposed TU MSHCP Alternative and the Condor Only HCP Alternative would result in the next greatest amount of permanent ground disturbance, and the Kern County General Plan Buildout Alternative would result

in the greatest amount of ground disturbance. However, as indicated in the discussions above, it is anticipated that the effects from exposure to seismic risk would be minor under all the alternatives, and reduced through implementation of state and local regulations and policies.

With respect to potential risks from exposure to other soil and geology risks, the CCH Avoidance MSHCP and Kern County General Plan Buildout Alternatives would result in the greatest effects. Although there would be less Commercial and Residential Development Activities under the CCH Avoidance MSHCP Alternative, there would be more concentrated development around Castac Lake, where compressible and collapsible soils may be present. Due to the density of development and smaller area of surface disturbance under this alternative, Commercial and Residential Development Activities would be less likely to avoid areas with steeper slopes where landslides could be exacerbated by erosion. Under the Kern County General Plan Buildout Alternative, more extensive Commercial and Residential Development Activities and dispersed grading would result in greater potential for erosion. Therefore, the potential effects associated with other soil and geology risks for the CCH Avoidance MSHCP and Kern County General Plan Buildout Alternatives would be moderate. Although the Proposed TU MSHCP and Condor Only HCP Alternatives would result in increased risk compared to the No Action Alternative, the exposure to other soil and geology risks would be minor.

Existing Ranch Uses and Plan-Wide Activities under all the alternatives would result in minor to no effects on soils and geology. Effects from these activities would be generally the same across all alternatives. Under the Proposed TU MSHCP, Condor Only HCP, and CCH Avoidance MSHCP Alternatives, the extent of ground disturbance from Plan-Wide Activities would be limited to 200 acres, which functions as a limit to ground disturbance that could result in geologic risks, and would result in fewer effects compared to the No Action Alternative. The No Action, Proposed TU MSHCP, Condor Only HCP, and CCH Avoidance MSHCP Alternatives are all also subject to the use restrictions and BMPs required pursuant to the Ranchwide Agreement that protect conservation values, including protection from land use changes that would result in geologic risks. By comparison, because the Kern County General Plan Buildout Alternative would not be subject to the Ranchwide Agreement, it would result in slightly less open space preservation compared to the other proposed action alternatives, and would have a slightly greater potential for soils and geology effects. However, the potential effects of the Kern County General Plan Buildout Alternative would still be minor.