

## **4.11 Geologic Hazards/Soils/Mineral Resources**

Geologic hazards have the potential to affect future development within the Plan Area. This section discusses potential significant impacts relating to seismic and other geologic hazards, including erosion, landslides, and soil conditions. This section relies upon information in the Seismic Safety and Safety Element of the County of Santa Barbara Comprehensive Plan and summarizes information from the County's Environmental Scoping Document for the Gaviota Coast Plan (County of Santa Barbara 2013d). Hazards relating to possible soil and groundwater contamination are discussed in Section 4.12, Hazards/Risk of Upset.

### **4.11.1 Setting**

#### **4.11.1.1 Topography**

Topography within and around the Plan Area is varied and includes a backdrop of rugged mountainous areas, rolling hills, and lowland coastal areas. The Plan Area is bordered on the south by coastal bluffs of the Pacific coastline and on the north by the western slopes of the Santa Ynez Mountains. There is a relatively narrow strip of gentle topography between the ocean bluffs and the steep rocky outcrops of the Santa Ynez Mountains. Many creeks flow south from the steep slopes of the Santa Ynez Mountains, cutting deep canyons that meet the coastline. West of the Gaviota Pass, the Santa Ynez Mountains descend to meet the coast at the westernmost portions of the Plan Area at Point Conception and Jalama Beach County Park.

#### **4.11.1.2 Geologic Formations**

The County is underlain mainly by marine sedimentary rocks of late Mesozoic and Cenozoic ages. The rock formations exposed in the County are largely of marine sedimentary origin. The sedimentary rocks are diverse, but are dominated by great thicknesses of sandstone and shale with lesser amounts of conglomerate, alluvial fan deposits, and dune sand.

One of the County's most troublesome rock units is the Rincon mudstone, which is exposed in a band of the Santa Ynez Mountains, in the northern foothills of the Plan Area. This rock readily breaks down into an unstable, heavy, clay soil, which expands when wet and develops deep cracks when dry. It slumps naturally and frequently where slopes occur. Where the terrain is flat, structures have been damaged by the constant expansion and shrinkage of the soil; where slopes occur; these effects are augmented by the tendency for soil creep, slumps, and landslides to develop. Areas susceptible to creep because of the presence of expansive soils can also be related to certain geologic formations. The Rincon and Monterey formations form a black thick clay soil profile (adobe) which is subject to creep. Other formations that produce cohesive soils subject to creep are the Sisquoc, and, to some degree, siltstone members in the Vaqueros and Sespe.

As identified in the Gaviota Coast Feasibility Study (National Park Service 2003), the igneous rocks in the Point Sal region contain ophiolites that are considered an “Area of Special Geologic Interest” by the County. Ophiolite formations are of particular importance as they reveal portions of the earth’s crust when it began forming from the earth’s interior melt at an estimated 100 million years ago and contain excellent research value. However, Point Sal lies slightly northwest outside of the Plan Area boundaries near the north end of Vandenberg Air Force Base.

The geologic formations exposed in the Plan Area are summarized in Table 4.11-1.

<b>Table 4.11-1: Geologic Formations In the Plan Area</b>	
<b>Age</b>	<b>Name</b>
Holocene	Beach Sand Deposits
Holocene	Dune Sand Deposits
Holocene	Valley and Floodplain Deposits
Holocene	Landslide Debris
Pleistocene	Stream Terrace and Alluvial Fan Deposits
Miocene	Sisquoc Shale
Miocene	Monterey Shale
Miocene	Rincon Shale
Miocene	Vaqueros Sandstone
Oligocene	Sespe Formation
Oligocene	Alegria Formation
Oligocene	Gaviota Formation
Eocene	Coldwater Sandstone
Eocene	Sacate Formation
Eocene	Cozy Dell Shale
Eocene	Matilija Sandstone
Eocene	Anita Shale
Eocene	Sierra Blanca Limestone
Upper Cretaceous	Jalama Formation
Holocene	Beach Sand Deposits
Holocene	Dune Sand Deposits
Holocene	Valley and Floodplain Deposits

SOURCE: Thomas W. Dibblee, Geologic Maps of the following USGS Quadrangles: Lompoc Hills and Point Conception (1988); Santa Rosa Hills and Sacate (1988); Solvang and Gaviota (1988); Santa Ynez and Tajiguas (1988); Dos Pueblos (1987); Lake Cachuma (1987)

### **4.11.1.3 Seismic Hazards**

#### **Earthquake Faults**

Earthquakes typically pose four key risks: ground rupture, ground acceleration, liquefaction, and earthquake-induced tsunamis. Earthquakes can also result in secondary hazards, including landslides, flooding, and sinkholes from broken water mains and fires from broken electrical and gas infrastructure (County of Santa Barbara 2013a). The entire Plan Area has a problem rating of high according to Safety Element and Seismic Safety Element maps. Faults within the Plan Area include the inactive Refugio Fault, Erburu Fault, Dos Pueblos Fault, Las Varas Fault, Eagle Fault, and Carneros Fault. These faults are all inactive east-west trending faults. In the western portion of the Plan Area, the active Pacifico Fault crosses the area, paralleling Jalama Creek. The active Santa Ynez Fault also traverses the area near Las Cruces and its south branch heads south into the western portion of the Plan Area and extends out to sea. There are also several regional faults considered active or potentially active, including San Andreas, Santa Ynez, Rinconada, Naciminto, Big Pine, Pine Mountain, White Wolf, and Garlock faults.

#### **Seismic Ground Shaking**

The County Multi-jurisdictional Hazard Mitigation Plan (MJHMP; County of Santa Barbara et al. 2011) illustrates relative risk to ground shaking throughout the County. The Plan Area is located in an area of moderate-intensity ground shaking risk. Earthquake shaking hazards were calculated by projecting earthquake rates based on earthquake history and fault slip rates, the same data as used for calculating earthquake probabilities.

#### **Liquefaction Potential**

Liquefaction is the loss of soil bearing strength during a strong earthquake. Liquefaction typically occurs in a zone with seismic activity, where soils lack cohesion, groundwater is encountered within 50 feet of the surface, and soil relative densities are less than about 70 percent. If all four criteria are met, a seismic event could result in a rapid pore-water pressure increase from earthquake-generated ground accelerations, thereby resulting in soil liquefaction. Liquefaction can result in slope and/or foundation failure.

The National Earthquake Hazards Reduction Program rates soils from hard to soft, and gives the soils ratings from Type A through Type E, with the hardest soils being Type A and the softest soils rated at Type E. Liquefaction risk is considered high if there were soft soils (Types D or E) present within an active fault zone. The majority of the soils in the County are Types A–C, with some areas having Type D. There has been no Type E soils identified (MJHMP). Near-surface groundwater in the form of perched water or a static high water table may result in soils that are susceptible to liquefaction. A high water table exists in lowland areas along the South Coast, and perched water is found in several locations throughout the County. The County Safety and Seismic Safety Element Liquefaction map identifies areas within the Plan Area with low liquefaction potential including some of the coastal areas, and some limited

areas of moderate liquefaction potential in lower Refugio and Tajiguas canyons and in areas of high potential for shallow groundwater.

## **Landslides**

Landslides and coastal erosion can be defined as rock, earth, or debris displacing down an incline. Types of landslides and coastal erosion include rock falls, rockslides, deep slope failures, shallow debris flows, and mud flows. Landslides typically occur where unstable or weak soil or rock, and topographical conditions, such as steep slopes, are present. Heavy rain or over irrigation may trigger landslides, as water adds extra weight that the soil cannot bear. Earthquakes also can affect soil stability, causing landslides. Landslides are influenced by human activity, such as mining and the construction of buildings, railroads, and highways. The most common cause of a landslide is an increase in the downslope gravitational stress applied to slope materials, also known as oversteepening. Oversteepening can be caused by natural processes or by man-made activities. Undercutting of a valley wall by stream erosion or of a sea cliff by wave erosion are ways in which oversteepening may occur naturally.

Landslides and landslide-prone sedimentary formations are present throughout the coastal plain of western Santa Barbara County. Landslides also occur in the granitic mountains of East Santa Barbara County, although they are less prevalent. Many of these landslides are thought to have occurred under much wetter climatic conditions than at present. The County's MJHMP identifies landslide susceptibility and incidence as "moderate" for the Plan Area. The Seismic Safety and Safety Element of the Comprehensive Plan lists the areas in the County where there exists fairly severe land sliding and associated geologic formations, and includes a map of areas with low, moderate, and high potential for landslides. Within the Plan Area, these include:

- Foothills of the South Coast—from Santa Barbara west to Gaviota Pass (Rincon and Monterey Formations), and
- Sea cliffs along the coast from Santa Barbara to Gaviota, particularly those with out-of-slope dips (Rincon and Monterey Formations).

Known landslide deposits are also mapped on geologic maps in the Seismic Safety and Safety Element of the Comprehensive Plan.

### **4.11.1.4 Soils**

#### **Soil Types**

There are several types of soil in the Plan Area, but all can be categorized into six primary groups known as soil associations. These include the Los Osos-Gaviota-Maymen association, Nacimiento-Linne-Capitan association, Santa Lucia-Lopez-Crow Hill association, Maymen Rock outcrop association, Milpitas-Positas-Conception association, and the Concepcion-Botella association (U.S. Department of Agriculture 1981). Some of the soils in the Plan Area form a mild to moderate constraint on development. Such soils are prone to flooding, landslides, or to

expansion and contraction. These are present in the rural foothills, where land is constrained by slope, erosive soil types, and unstable geology. At the base of the watershed system, the coastal bluffs are also prone to unstable geology and erosive soil types. Soils in portions of the Plan Area have a potential to slide when wet, particularly when located on steeper slopes.

Particularly good examples of creep and shallow slumps in the Rincon and Monterey Formations can be seen in the grass-covered foothills along the South Coast and on the north side of Highway 1 west of Highway 101.

## **Erosion**

Slope erosion is problematic throughout the County, notably along coastal bluffs. In the Plan Area, coastal bluff erosion has damaged trails and threatens to damage the rail corridor. It is estimated that a retreat of the coastal bluffs of approximately six inches per year is likely for this portion of the South Coast from Rincon Point to Point Conception, although this has not been documented (County of Santa Barbara 2011b ). Recreational trail use and agricultural land uses, including grazing can contribute to erosion, particularly through unauthorized trails use and agricultural activity that is not sensitive to the protection of soil stability. Erosion rates may be exacerbated by the effects of long-term sea level rise. Erosion may also occur as slope wash, which is the erosion of slopes by surface water runoff. Most soils in the County are susceptible to erosion to some degree but the following geologic formations are considered most subject to erosion: Fonglomerate, Terrace, and Older Alluvium deposits, Casitas, Santa Barbara, Pico, Paso Robles, Careaga, and Orcutt Formations. Recent and old sand dunes not anchored by vegetation are subject to wind erosion and considerable movement. Section 4.7, Flooding and Water Resources, discusses the potential for coastal erosion associated with sea level rise.

## **Compressible and Expansive Soils**

Portions of the Plan Area are underlain by artificial fill, colluvium/topsoil, and alluvium. These soils are typically loose, dry, contain rubble, and are unsuitable for support of settlement-sensitive structures. These types of compressible soils on slopes are subject to downslope movement (creep, sliding, or shallow debris flows). For future projects underlain by compressible soils, removal and replacement by compacted fill would be required. The Seismic Safety and Safety Element includes maps of areas of low and moderate risk due to compressible-collapsible soils in the County and Plan Area. Expansive soils contain clay minerals that swell when the moisture content increases and shrink when moisture decreases. The most extreme cases of structural distress due to expansive soils occurred in a belt along the south coastal foothills where geologic formations outcrop that are either highly expansive themselves or generate highly expansive topsoils.

### **4.11.1.5 Radon Gas**

Another potential hazard to all uses within the Plan Area is the release of radon gas. Radon gas is associated with Rincon Formation soils. The Rincon Formation underlies a significant portion of the Plan Area. The hazard associated with Radon Gas is the potential for high indoor radon levels. The California Department of Conservation (DOC), Division of Mines and Geology has mapped Santa Barbara County to identify areas with high, moderate and low potential for indoor radon levels to occur above four picocuries per liter. The U.S. Environmental Protection Agency (U.S. EPA) recommends four picocuries per liter as the action level for radon reduction. According to the Department of Conservation mapping, a majority of the coastal zone in the eastern portion of the Plan Area has a high potential for indoor radon levels to occur above four picocuries per liter, with some areas having a moderate potential for indoor radon levels to occur above four picocuries per liter. In the western portion of the Plan Area, the coastal zone near Gaviota State Park is mapped as having a high potential and then further west, there is high and moderate potential for radon gas in the foothills (DOC 1995).

### **4.11.1.6 Special Problem Areas**

Pursuant to the County Code of Regulations, Chapter 10, Section 10-11.2, "Special problem areas" are "areas of the County designated by resolution of the Board of Supervisors as having existing or anticipated special and unique problems pertaining to flooding, drainage, soils, geology, access, sewage disposal, water supply, location, or elevation which impact the health, safety and welfare of the public." There are no Special Problem Areas within the Plan Area.

### **4.11.1.7 Mineral Resources**

The Conservation Element (adopted 1979 and amended 2010) addresses mineral resources and identifies the location and state of mineral resource extraction in the County as detailed below. On the South Coast west of Goleta, there are six resource sites for yellow sand including Arroyo de Los Zorrilas Sand, Arroyo-Quemado Sand, Canada de la Huerta Sand, Doty Sand, Ellwood Ranch, and Las Varas Canyon Sand. Other sand and gravel deposits are likely widespread in the river channels in the County, however they are not being exploited and data is on their quality is not available. Mineral production in the County has declined over the past decade and it is unlikely that this trend will reverse itself because known reserves are being depleted and new deposits have not been located. Furthermore, increasing environmental regulations and standards have made it difficult for older operations to continue operations in an economically viable way.

The Land Use Element also includes a Mineral Resources Area that depicts areas of known deposits of metallic and non-metallic resources and mineral fuel. Extraction is permitted in these areas with the required permits and environmental safeguards. The Plan proposes to remove the mapped overlay within the Plan Area since information used to map the adopted overlay is out of date and more accurate information exists regarding mineral resource areas.

Oil and gas production is considered to be a mineral resource. The Gaviota Coast has a long history of oil and gas production. All four onshore oil and gas production fields have been or soon will be, abandoned and their surface areas restored. ~~No~~ While no other onshore recoverable oil and gas reserves have been discovered within the Gaviota Coast at this time, new oil and gas reserves may be discovered and the known reserves could be redeveloped at some point in the future with conventional or new production techniques, as  ~~. However,~~ newer production techniques could render these oil and gas resources commercially viable for recovery.

## **4.11.2 Regulatory Framework**

### **4.11.2.1 State**

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

The Alquist–Priolo Earthquake Fault Zoning Act (1972) was established to mitigate the hazard of surface faulting to structures for human occupancy. Pursuant to the act, the state geologist has established regulatory zones (known as earthquake fault zones) around surface traces of active faults. These zones serve as an official notification of the probability of ground rupture during future earthquakes. Where such zones are designated, no building may be constructed on the line of the fault, and before any construction is allowed, a geologic study must be conducted to determine the locations of all active fault lines in the zone. The act also provides that a city or county may establish more restrictive policies, if desired. The Plan Area is not within a state-designated Alquist–Priolo Zone.

#### **California Building and Residential Codes**

The California Building Code is based largely on the International Building Code. The California Building Code contains specific provisions for structures located in seismic zones. Slope instability and erosion problems are also primarily regulated through the California Building Code, along with the County's Grading and Building Codes (described below). The California Building Code requires special foundation engineering and investigation of soils for proposed development sites located in geologic hazard areas. The California Building Code also contains design and construction regulations pertaining to seismic safety for buildings. These regulations cover issues such as ground motions, soil classifications, redundancy, drift, and deformation compatibility.

The California Building Code, along with the California Residential Code (CRC), contains seismic safety standards outlining design and construction requirements. Development projects must show compliance with the California Building Code and/or CRC through the development review process. Building plans must be submitted and reviewed for compliance with these codes prior to issuance of necessary construction and building permits by the County.

The California Department of Health also requires radon testing and mitigation plans for new construction (California Health and Safety Code Section 105430). Any radon assessment and mitigation plan shall include appropriate measures designed to detect, avoid, or dissipate dangerous levels of radon gas at potential building sites or during construction of new residential buildings in areas affected by radon.

### **Seismic Hazards Mapping Act (SHMA)**

The SHMA was passed by the state in 1990. The purpose of SHMA is to minimize loss of life and property through the identification, evaluation, and mitigation of seismic hazards. The act includes seismic safety standards for non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides. The County enforces the SHMA and directed the DOC, California Geological Survey to identify and map areas prone to liquefaction, earthquake-induced landslides, and amplified ground shaking.

### **Surface Mining and Reclamation Act of 1975 (SMARA)**

The primary State law concerning conservation and development of mineral resources is the Surface Mining and Reclamation Act of 1975, or SMARA. The SMARA states that the extraction of minerals is essential to the continued economic well-being of the State and to the needs of society, and that reclamation of mined lands is necessary to prevent or minimize adverse effects on the environment and to protect the public health and safety.

### **Clean Water Act Permits**

The State Water Resources Control Board (SWRCB) is responsible for implementing the provisions of the Clean Water Act, including the NPDES Municipal General Permit. The County is subject to this permit, which is renewed every five years and regulates discharges through the storm sewer system within a defined "urbanized area", determined by either the latest census or as designated by the SWRCB. The Municipal General Permit establishes certain urban unincorporated areas in which the County is responsible for discharges from storm drains. The Plan Area, however, is entirely outside of the NPDES permit area, as described in Section 4.7, Flooding and Water Resources. However, the County applies portions of the NPDES Municipal General Permit to areas outside the NPDES permit area, such as prohibitions on pollutant discharges, and post-construction development standards.

In addition to the Municipal General Permit, the NPDES General Permit for Construction Sites requires development of a Storm Water Pollution Prevention Plan and submittal of a Notice of Intent directly to the Regional Water Quality Control Board for construction activities disturbing greater than 1.0 acre. NPDES permits are discussed in greater detail in Section 4.7, Flooding and Water Resources.



## **4.11.2.2 County of Santa Barbara**

### **Multi-jurisdictional Hazard Mitigation Plan**

The County's MJHMP (September 2011) is "a tool for all stakeholders to increase public awareness of local hazards and risks, while at the same time providing information about options and resources available to reduce those risks." The emphasis of the MJHMP is on the assessment and avoidance of identified risks, implementing loss reduction measures for existing exposures, and ensuring that critical services and facilities survive a disaster. Hazard mitigation strategies and measures avoid losses by: limiting new exposures in identified hazard areas; altering the hazard by eliminating or reducing the frequency of occurrence; averting the hazard by redirecting the impact by means of a structure; or adapting to the hazard by modifying structures or standards. The 2011 MJHMP addresses hazards including flooding and coastal storm surge, wildfire, agricultural pests, earthquakes, landslides and coastal erosion, dam failure, and tsunamis.

### **Comprehensive Plan**

The Comprehensive Plan includes a Seismic Safety and Safety Element (adopted 1979 and amended 2010). It is intended to guide land use planning by providing pertinent data regarding geologic, soil, seismic, fire, and flood hazards and includes a comprehensive study of geologic conditions within the County. It also contains goals, policies, and implementation measures adopted by the County, which demonstrate compliance with geologic and seismic protection requirements outlined in state law. The Conservation element (adopted 1978 and amended 2010) addresses mineral resources and identifies locations of known mineral resources in the County.

The County Comprehensive Plan Land Use Element contains Hillside and Watershed Protection Policies that intend to help protect and minimize impacts from new development. The County provides guidelines for the implementation of policy coordination. CLUP policies 3-15, 3-16, 3-17, and 3-19 include regulations on waste discharge, grading, sediment basins, and landscaping practices that intend to minimize future development impacts within the Plan Area. Details of the Hillside and Watershed Protection Policies are also discussed in Chapter 4.7: Flooding.

### **Coastal Land Use Plan**

The California Coastal Act requires that the risks to new development from geologic hazards be minimized. Moreover, it specifies that new development must be located and built neither to "create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs" (Coastal Act Section 30253(b)). The CLUP contains policies addressing geologic hazards for land within the coastal zone.

## **Subdivision Ordinance**

Section 21-7(d) (4) and (5) of Ordinance 2199 (County Code Chapter 21) gives the County the authority to require preliminary soil reports in conjunction with subdivision applications. In addition, the Planning and Development Department may require a geological report of the land involved, including an analysis of the proposed grading plan made by an engineering geologist acceptable to the Director of Planning and Development. As a general rule, soil investigations are required for all subdivisions. Geologic reports are generally required when the property contains or is near an active or potentially active fault or is classified as Category III, IV, or V (moderate, moderate severe, and severe).

## **Grading Code**

Grading is regulated by County Code Chapter 14—Grading, Erosion and Sediment Control, which complies with Title 24 of the California Code of Regulations. One of the most important functions of the Grading and Building Codes is to require a detailed geologic and soil investigation of the specific site under consideration. A qualified private consultant usually conducts the study that is then reviewed by the County. The site investigation is essential for all structures of any consequence and frequently is necessary even for a single-family residence or similar structure if located in an area with possible soil or geologic problems. The County Public Works and Planning and Development departments have the authority to require geologic and soil engineering reports.

Section 14-9 of the County Code details when an agricultural erosion control permit or a pollution, sediment, and erosion control permit is required. Agricultural grading is often exempt from these requirements, with several exceptions (such as grading on slopes with a natural gradient over thirty percent, where earthwork exceeds 50 cubic yards in volume, etc.). A sediment and erosion control permit is required for most non-agricultural land disturbance, with some exceptions. In order to obtain these permits, project plans typically must show the location and details of relevant best management practices (BMPs); runoff control; drainage devices; sedimentation basin and other measures of erosion control—including revegetation of new slopes and other denuded areas; and a brief description of the revegetation practices to be used, including types of seeds and their application rates

Chapter 9A of the County Code contains the Brush Removal Ordinance, which covers a portion of the County, including the Plan Area. The purpose of these regulations is to regulate the removal of native brush, shrubs, trees and roots thereof within the Plan Area in order to prevent erosion damage, flood hazards and soil loss to lands in that area. Portions of the Plan Area consist largely of steep terrain where brush was often removed in areas adjacent to urban areas, and the rapid runoff from torrential winter rainfalls is very likely to do substantial damage to the lands from which such vegetation is removed and other lands downstream. The ordinance states that no person shall remove, destroy, or cause the removal or destruction of natural vegetation without first obtaining written approval from the building and safety division of the department of planning and development.

The Mountainous Area land use designation is applied in the County to steep watershed areas that are unsuitable for intensive development. These areas consist of (1) slopes in excess of 40 percent; or (2) valleys surrounded by slopes exceeding 40 percent; or (3) isolated tableland surrounded by slopes exceeding 40 percent; or (4) areas with outstanding resource values, such as environmentally sensitive habitats and/or watersheds. The intent of this designation is to allow reasonable but limited development because of extreme fire hazards, minimum services, or environmental constraints.

## **Building Code**

The design of structures to resist earthquake forces is a critical factor in their ability to withstand severe earthquakes without structural failure or collapse. Although seismic shock waves can act in any direction, design concern is usually focused on lateral (horizontal) forces because buildings are inherently much weaker with respect to horizontal forces than they are to vertical forces. The County uses the California Code of Regulations, Title 24, Part 2 of the California Building Code to regulate building design and construction in unincorporated areas of the County (County of Santa Barbara 2011b).

### **4.11.3 Impact Analysis**

#### **4.11.3.1 Thresholds of Significance**

The following impact analysis is based upon secondary source information, including mapping of geologic formations within the Plan Area and the geologic inventory and study included in the Seismic Safety Element of the Comprehensive Plan. The analysis is programmatic in nature and identifies general impacts and mitigation associated with future development in accordance with buildout of the Plan.

#### **CEQA Guidelines**

According to CEQA Guidelines Appendix G, implementation of the Plan would have significant environmental impacts on geology and soils, or mineral resources, if it would:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - i.) rupture of a known earthquake fault as delineated on the most recent Alquist–Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault,
  - ii.) strong seismic ground shaking,
  - iii.) seismic-related ground failure, including liquefaction, or
  - iv.) landslides

- Result in substantial soil erosion or the loss of topsoil;
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse; and/or
- 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
- Result in a 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.

Appendix G includes a question applicable at the project-level when waste disposal systems are proposed in conjunction with actual development. Therefore, it is not discussed further in this programmatic analysis.

### **County Environmental Thresholds**

The County Environmental Thresholds and Guidelines Manual (2008) states that impacts are potentially significant with regard to geology if the proposed development activity, including all proposed mitigation measures, could result in substantially increased erosion, landslides, soil creep, mudslides, and unstable slopes (Appendix G(q), CEQA Guidelines).

In addition, impacts are considered significant when people or structures would be exposed to major geologic hazards upon implementation of the project (Appendix G(r), CEQA Guidelines). Impacts related to geology have the potential to be significant if the proposed project involves any of the following characteristics:

- The project site or any part of the project is located on land having substantial geologic constraints, as determined by the Planning and Development or the Public Works Department. Areas constrained by geology include parcels located near active or potentially active faults and property underlain by rock types associated with compressible/collapsible soils or susceptible to landslides or severe erosion. Special Problem Areas designated by the Board of Supervisors have been established based on geologic constraints, flood hazards, and other physical limitations to development.

### 4.11.3.2 Impacts Determination and Mitigation Measures

#### Impacts

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##### *Impact GEO-1: Seismic Hazards*

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Plan buildout is estimated to result in development of 167 additional single-family residences and 9 agricultural employee housing units within the Plan Area over the 20-year Plan horizon. Potential highway commercial development is limited to an approximately 2-acre site located east of Highway 101 at Las Cruces. Zoning amendments are also proposed that could encourage expansion of agricultural land uses and uses accessory and supportive of agriculture such as composting, agricultural processing, farmstands, and small scale agricultural tourist activities such as camping and guest ranch/farmstay. Parks, Recreation, and Trails (PRT) Maps Amendments would support additional recreational trails within the Plan Area. An analysis of potential impacts to PRT facilities related to seismic hazards is discussed in Section 4.13.

As described under Section 4.11.1, Setting, the Plan Area contains numerous faults. Seismic hazards affecting the Plan Area may include ground rupture, ground acceleration (shaking), liquefaction, earthquake-induced tsunamis, and earthquake-induced landslides. However, because the Plan would not lead to the development of a significant amount of new housing or commercial uses due to the low density agricultural land use designations that dominate the Plan Area, the potential for seismic hazards to expose people and structures to potential substantial adverse effects, including loss, injury, or death is low.

Nonetheless, when new development occurs, risks from seismic hazards could occur if they are not properly addressed at the project level. Future development within the Plan Area would be required to adhere to the County's Grading Code, which requires the preparation of a site-specific geotechnical report. Impacts also would be avoided or reduced through engineering design that meets or exceeds adherence to the County's Building Code and the California Building Code. The Plan does not include specific policies addressing risk from fault hazards. Due to the rural nature of the Plan Area, additional policies are not warranted. Overall, impacts would be less than significant through compliance with existing regulations.

#### Mitigation

Mitigation would not be required as impacts would be less than significant.

#### Residual Impacts

Compliance with established development and engineering standards and codes, as well as conformance to the recommendations of a site-specific geotechnical report, would avoid risks in conjunction with future development related to seismic hazards. Impacts related to seismic hazards would be less than significant through compliance with the existing regulatory framework (Class III impact).

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**Impact GEO-2: Soil Erosion**

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Plan buildout is estimated to result in development of 167 additional single-family residences and 9 agricultural employee housing units within the Plan Area over the 20-year Plan horizon. Potential highway commercial development is limited to an approximately 2-acre site located east of Highway 101 at Las Cruces. Zoning amendments are also proposed that could encourage expansion of agricultural land uses and uses accessory and supportive of agriculture.

As described under Section 4.11.1, Setting, the Plan Area is susceptible to both coastal erosion along sea cliffs and erosion from runoff (slopewash). Implementation of the proposed Plan would have the potential to result in soil erosion due to expansion of agricultural operations, grading, and construction activities, especially on steeper slopes. For example, several orchards within the Plan Area may currently be located on steep slopes (i.e., greater than 30 percent), which may be contributing to erosion within the Plan Area. Erosion on drainage slopes could cause downstream sedimentation impacts. Other related impacts resulting from substantial short-term erosion or loss of topsoil include topography changes, water quality degradation, and the creation of impervious surfaces within the Plan Area. Potential impacts due to agricultural expansion activities within steep slopes would be potentially significant.

As previously detailed, numerous existing regulations are in place that is intended to minimize potential impacts from soil erosion with regard to other development aside from agricultural operations.

The County Hillside and Watershed Protection Policies aim to reduce soil erosion and protect water resources by preventing the degradation of water quality from site development and waste disposal into waterbodies during or after construction. The Hillside and Watershed Protection policies also restrict grading and have requirements for sediment basins and landscaping. These policies and guidelines apply to all new development and redevelopment projects proposed within the County.

Furthermore, as part of the development permitting process, the County requires individual projects to adhere to the County and California Building Code, Grading Code and NPDES permit requirements. Regulatory compliance would avoid or reduce erosion hazards. Prior to obtaining grading permits for future actions, County Code requires submittal, review, and approval of a site-specific geotechnical investigation. Engineering design specifications based on future project-level grading and site plans are required for all future projects implemented in accordance with the Plan.

Conformance to mandated County grading requirements would ensure that future grading and construction operations would avoid significant soil erosion impacts, including through the submittal of a Sediment and Erosion Control Plan for grading permit approval. Furthermore, any development involving clearing, grading, or excavation that causes soil disturbance of one or more acres, or any project involving less than one acre that is part of a larger development plan,

would be subject to NPDES Construction General Permit provisions. Any development regulated under the NPDES Construction General Permit is required to prepare and comply with an approved Storm Water Pollution Prevention Plan (SWPPP) that shall consider the full range of erosion control BMPs, including any additional site-specific and seasonal conditions. Project compliance with NPDES requirements would reduce the potential for substantial erosion or topsoil loss to occur in association with new development.

The proposed Plan includes policies, actions and development standards related to erosion. Policy AG-3.B within the proposed Plan states that grading and brush clearing for new agricultural improvements on hillsides shall not cause excessive erosion or downslope damage. Specifically, Action AG-3 initiates the County to develop a set of ordinance amendments setting enhanced standards for development on steep slopes within agriculturally zoned land. The standards call for preparation of an erosion control plan with site-specific field verifiable best management practices to ensure slope stabilization, soil conservation, and water quality control.

## Mitigation

### ***MM\_GEO-1 Addresses Steep Slope Impacts***

The Steep Slope Guidelines and Standards (Appendix E) for orchards shall be adopted as ordinance amendments into the County Land Use and Development Code (LUDC) and Article II to minimize and reduce erosion impacts associated with agricultural development and orchard expansions on steep slopes. The ordinance amendments identify preferred land clearing methods and reclamation provisions for abandoned operations. These standards address agricultural uses to prevent the degradation of steep slopes. Future agricultural and orchard expansion on steep slopes must comply with the new ordinance amendments in order to manage potential soil erosion impacts.

## Residual Impacts

The Plan does not propose major residential or commercial development plans that would cause adverse soil erosion to occur. The potential for expanded agricultural uses on steep slopes may create significant impacts in relation to soil erosion. The Plan includes Action AG-3 (develop steep slopes standards) and the Steep Slope Guidelines (Appendix E) as mitigation to reduce and minimize the potential impacts of soil erosion. The Guidelines will be codified and implemented during development review. Therefore, impacts from expanded agricultural uses on steep slopes related to soil erosion would be less than significant with mitigation (Class II impact).

### ***Impact GEO-3: Geologic Instability and Radon Gas***

Plan buildout is estimated to result in development of 167 additional single-family residences and 9 agricultural employee housing units within the Plan Area over the 20-year Plan horizon. Potential highway commercial development is limited to an approximately 2-acre site located

east of Highway 101 at Las Cruces. Zoning amendments are also proposed that could encourage expansion of agricultural land uses and uses accessory and supportive of agriculture.

As described under the existing setting above, landslide-prone sedimentary formations underlie the Plan Area; however, the County's Seismic Safety and Safety Element identifies that landslide susceptibility in a majority of the Plan Area as low. In the western portion of the Plan Area, north of Highway 101 landslide susceptibility is moderate to high. Development within landslide-prone formations would be limited; however, significant hazards could occur where structures are proposed on these formations. Portions of the Plan Area are underlain by artificial fill, colluvium/topsoil, and alluvium are compressible soils subject to downslope movement (creep, sliding, or shallow debris flows) when located on slopes. Development on compressible soils would require removal and replacement by compacted fill would be required. Naturally occurring compressible and collapsible soils in Santa Barbara County are not common, and the Rincon and Monterey Formations are considered to have a moderate to low risk of having these soil problems.

Another potential geologic hazard to all uses within the Plan Area is the release of radon gas. Radon gas is associated with Rincon Formation soils, which underlies a significant portion of the Plan Area including a majority of the coastal zone in the eastern portion of the Plan Area. In the western portion of the Plan Area, the coastal zone near Gaviota State Park is mapped as having a high potential and then further west, there is high and moderate potential for radon gas in the foothills. Grading and development within these soils could result in the release of radon gas during construction and within newly constructed structures. Future development within the Plan Area would be required to adhere to the County's Grading Code, which requires the preparation of a site-specific geotechnical report. Impacts associated with landslides or compressible and expansive soils would also be avoided or reduced through engineering design that meets or exceeds adherence to the County's Building Code and the California Building Code. Compliance with established development and engineering standards and codes, as well as conformance to the recommendations of a site-specific geotechnical report, would ensure future development is not subject to geologic instability.

However, the Plan does not include a policy that addresses radon gas issues for state-mapped elevated radon hazard zones. Thus, impacts associated with radon gas would be potentially significant.

The Plan policies and actions related to geologic stability are the same as described above, under Impact GEO-2. Plan policies and actions and County Building Code requirements would ensure development is sensitive to topography and geological characteristics of the land. However, existing policies do not address the potential impacts associated with radon gas exposure.



## Mitigation

The following development standard is proposed for addition to the Plan to provide mitigation for radon gas impacts.

### ***MM GEO-2 Addresses Impacts on Geologic Instability and Radon Gas***

~~Mitigation Measure MM GEO-2:~~ A new Development Standard LU-4\_2 shall be added to the Plan as follows (addition in underline):

- **Dev Std LU-42: Radon.** Development proposed on Rincon Formation soils or within state-mapped elevated radon hazard zones shall be avoided to the extent feasible; if infeasible, development shall be subject to an evaluation of conformance to EPA radon gas exposure standards. For any sites exposed to radon gas levels exceeding acceptable health standards, incorporation of construction techniques, which reduce the interior radon gas concentrations to acceptable levels, shall be required.

## Residual Impacts

Soil instability and radon gas impacts would be reduced to less than significant levels through implementation of MM GEO-2 that adds Dev\_Std LU-2\_4 to address radon gas hazard zones. Residual impacts associated with geologic instability and Radon gas would be less than significant with mitigation (Class II).

### ***Impact GEO-4: Mineral Resources***

Plan buildout is estimated to result in development of 167 additional single-family residences and 9 agricultural employee housing units within the Plan Area over the 20-year Plan horizon. Potential highway commercial development is limited to an approximately 2-acre site located east of Highway 101 at Las Cruces. Zoning amendments are also proposed that could encourage expansion of agricultural land uses and uses accessory and supportive of agriculture such as composting, agricultural processing, farmstands, and small scale agricultural tourist activities such as fishing, camping and guest ranch/farmstay. The existing Mineral Resources Area overlay on the Land Use Map would also be removed within the Plan Area because the information is out of date. The Mineral Resources Area overlay is a County Comprehensive Plan Land Use Element overlay that depicts an area of known deposit of metallic and non-metallic resources and mineral fuel. Extraction is permitted in these areas with the required permits and environmental safeguards. The proposed Plan would remove the mapped overlay within the Plan Area since information used to map the adopted overlay is out of date and more accurate information exists regarding mineral resource areas. The proposed Plan also does not propose any new mining operations that would significantly affect mineral resources in the Plan Area, and does not propose new onshore or offshore oil and gas development.

The California Department of Conservation's Division of Oil, Gas, and Geothermal Resources (DOGGR) has remediated 80 abandoned wells in the Santa Barbara field since 2000; the final 11 were completed between November 2008 and January 2009. Figure 4.11-1 provides a map of the onshore and offshore oil fields and wells that have been mapped by DOGGR along the Gaviota Coast. The Plan does not include specific policies addressing mineral resources, but does include a policy regarding addresses the use of oil and gas recovery techniques. Policy TEI-12 states that the use of enhanced oil and gas recovery techniques such as hydraulic fracturing and steam injection should be discouraged in the Plan Area.

Hazards relating to possible soil and groundwater contamination are discussed in Section 4.12, Hazardous Materials/Risk of Upset.

Plan adoption would not place adverse constraints in relation to mineral resources in the Plan Area. The Mineral Resources Area overlay on the County Comprehensive Plan Land Use Map would be removed within the Plan Area. Extraction has been permitted in these areas with the required permits and environmental safeguards. However, the Plan proposes to remove the mapped overlay within the Plan Area since information used to map the adopted overlay is out of date and more accurate information exists regarding mineral resource areas. The proposed Plan changes would not result in an increase or change to allowable mineral or oil and gas extraction activities. Impacts would be less than significant.

### **Mitigation**

Since the proposed Plan would result in less than significant impacts to mineral resources, no mitigation measures would be required.

### **Residual Impacts**

The Plan does not propose activities related mineral and oil and gas resource extraction or impacts to these sources in the Plan Area. The lack of proposed mineral resource activities would not increase flooding and erosion problems. Residual impacts would be less than significant (Class III impact).



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## 4.11.4 Cumulative Impacts Analysis

### Impacts

Projected population growth in the County and buildout of the Plan Area would increase the number of people potentially exposed to seismic and geologic hazards. New development would alter landforms in the Plan Area and would expose new residents and properties to seismic, erosion, and soil stability-related hazards that exist in the area. Erosion rates would be accelerated by earthwork associated with new construction and agricultural expansion during buildout of the Plan. Development of agricultural accessory uses and trail construction would incrementally contribute to these cumulative impacts. However, such impacts are site-specific and do not compound or increase in combination with projected development elsewhere in the County.

Grading and seismic issues would be addressed on a case-by-case basis to mitigate impacts resulting from individual projects. Potential impacts associated with future development would be addressed through project-level analysis and the application of remedial measures identified in site-specific geotechnical investigations (when applicable). Cumulative development projects would be subject to seismic standards contained in the Uniform Building Code, the California Building Code, and mitigative policies within the County Comprehensive Plan and General Plans of neighboring jurisdictions. Adherence to policies and development standards contained in the Plan, as well as seismic standards contained in the Uniform Building Code, the California Building Code, and County Building Codes and Ordinances would assure that potential impacts would be less than significant. Therefore, future development implemented in accordance with the Plan would not result in a cumulatively considerable impact.

### Mitigation

Mitigation Measures MM GEO-1 and MM GEO-2 would also apply to cumulative impacts that would be less than significant with mitigation. In addition, the proposed Plan contains policies and development standards intended to protect people and property from geologic hazards. Implementation of Comprehensive Plan and Plan policies, compliance with established development and engineering standards and codes, as well as conformance to Plan policies and development standards, would reduce impacts to below a level of significance.

No additional mitigation is required to address the less than significant cumulative impacts of Plan buildout.

### Residual Impacts

Cumulative impacts resulting from Plan buildout would be less than significant; as a result, residual impacts would be less than significant (Class III impact).

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