4.5 GEOLOGIC HAZARDS

4.5.1 Setting

a. Geologic Conditions and Topography. San Luis Obispo County occupies a central position in the southern coast range complex. The county's landscape is defined by five mountain ranges that form five principal drainages aligned on a predominately northwest to southeast axis. The ranges include the Santa Lucia, Temblor, Caliente, La Panza and San Luis Mountains. The higher peaks, many of which exceed 3,000 feet, are located in the Santa Lucia and Caliente ranges. The Santa Lucia range, which is characterized by precipitous formation, forms a gentle curve from the north to the south end of the county. In the north, it presents a barrier between the wet coastal belt and the dry interior of the county. In the south, the range is joined by the La Panza, Caliente, and San Luis ranges to provide a wide, complex mountain region that traverses the interior of the county. The coastal plains and valleys of the county may be divided at Point Buchon into a northern and southern section by the interposition of the San Luis Range. The average elevation of peaks in the San Luis Range is approximately 1,600 feet. The northern coastal plain consists primarily of a relatively narrow bench that connects to the Santa Lucia Range. In the vicinity of the Chorro and Los Osos Valleys, the northern coastal sector makes its deepest inland penetration. The southern sector primarily consists of the Arroyo Grande Valley, an upland area of ancient dunes referred to as the Nipomo Mesa, and a portion of the Santa Maria River valley. The south coastal area is also characterized by an extensive dune area of recent origin along the coast.

Due to the prevalence of rolling or mountainous terrain, approximately 60 percent of the county is comprised of slopes of 30 percent or more. Approximately 23 percent of the county is comprised of 9 to 30 percent slopes, and approximately 17 percent of the county is comprised of slopes less than 9 percent. The project area, in comparison, is located in close proximity to existing communities which have historically been established in relatively level to moderately sloping areas of the county. Approximately 18 percent of the project area is comprised of slopes of 30 percent or more; approximately 59 percent of the project area is comprised of 9 to 30 percent slopes; and approximately 18 percent of the project area is comprised of slopes of less than 9 percent.

The County identifies areas of potential geologic concerns as Geologic Study Areas (GSA). The GSA combining designation is applied to areas where geologic and soil conditions could present new development with potential hazards to life and property. According to the Land Use Ordinance and Coastal Zone Land Use Ordinances (22.14.070 and 23.07.080, respectively), these standards are applied where the following conditions exist:

1. *Seismic Hazard*. Areas of seismic (earthquake) hazards are identified through application of an Earthquake Fault Zone. Earthquake Fault Zones are established by the state geologist as required by Sections 2621 et seq. of the Public Resources Code (the Alquist-Priolo Earthquake Fault Zones Act), and are identified in the Land Use Element (Part II). The Los Osos Alquist-Priolo fault zone is located within the project area.

2. *Landslide Hazards*. Areas within urban and village reserve lines, identified by the Safety Element as being subject to moderately high to high landslide risk, and rural areas subject to high landslide risk. Eight separate GSAs due to landslide hazards are located within the project area (refer to Table 4.5-1).

3. *Liquefaction Hazard*. Areas within urban and village reserve lines, identified by the Safety Element as being subject to moderate to high soil liquefaction. Additionally, following the 2003 San Simeon Earthquake, the County has become aware of other areas with potential liquefaction hazard, such as in the Oceano Beach area. Though these areas are not identified in the Safety Element, areas of known geologic hazard are treated similarly to areas in identified GSA.

4. *Erosion and Stability Hazard – Coastal Bluffs*. Areas along the coast with coastal bluffs are cliffs greater than ten feet in vertical relief that are identified in the Coastal Erosion Atlas, prepared by the California State Department of Navigation and Ocean Development (1977), in accordance with Hazards Policy No. 7 of the Local Coastal Program (Ord. 2742 § 11, 1995; Ord. 2344 § 1 (Exh. A) (part), 1998). The coastal project area in the North Coast region of the county is located within this GSA.

Table 4.5-1 outlines the location and reasons for GSAs within each County planning area. Seismic hazards, slope stability and landslides, and soil-related hazards are described in greater detail below.

Table 4.5-1: Planning Area GSA Designations

Planning Area	GSA	Reason	General Location	In Project Area?
Adeladia	Yes	Landslide	Santa Lucia Range, Foothill, and Hillside areas (AG, RL)	Yes
Estero	Yes	Landslide	Hillsides east of Cayucos and Morro Bay (AG, RL, OS)	Yes
Huasna-Lopez	Yes	Landslide	Portions of Santa Lucia Range and Hillsides Areas (AG, RL)	Yes
Los Padres	Yes	Landslide	Hi Mountain Lookout Road (OS), Stanley Mountain (OS)	No
Nacimiento	Yes	Landslide	Santa Lucia Range and Foothill Areas-Western portion of planning areas (AG, RL, OS)	No
North Coast	Yes	Landslide Bluff Erosion Seismic	Monterey Co. Line to Rancho San Geronimo-Inland (AG) Underdeveloped lots in Cambria w/ slopes >20% (RL, RSF, AG, RS) Coastline (AG, Rec, RL, RSF, OS) San Simeon Fault Zone - San Simeon Point - San Carporforo Creek (RL, AG)	Yes
Salinas River	Yes	Landslides	Southwestern corner of planning area and outlying areas (AG, OS, RL), Western corner of Atascadero City Limits (RR)	Yes
San Luis Bay Coastal	Yes	Bluff Erosion	Point Buchon to Avila Beach (AG, PF), Pirates Cove (RL, OS, RS)	Yes
San Luis Bay Inland	Yes	Landslides	Irish Hills, Indian Knob, Pismo Beach Hillside, Price Canyon, Portions of Squire Canyon and Montana de Oro (AG, RL Rec, PR)	Yes
San Luis Obispo	Yes	Landslide Seismic	North, East, and West Rural Areas (AG, RL, Rec, RR), Southwestern Corner Los Ranchos/Edna VR. Eastern corner SLO URL (RS)	Yes
Shandon-Carrizo	Yes	Landslide Seismic	Temblor Range, Red Hills, Hubbard Hill-Freeborn Mtn., Caliente Mtn. (RL) San Andreas Fault Zone (RL, Eastern California Valley VRL)	No
South County Inland	Yes	Landslide	Temettate Ridge (AG)	Yes

AG - Agriculture; RL – Rural Lands; OS – Open Space; RSF – Residential Single Family; RS – Residential Suburban; Rec – Recreation; RR – Residential Rural; PF – Public Facilities; VRL – Village Reserve Line; URL – Urban Reserve Line.

Source: *County of San Luis Obispo Area Plans*

Figure 4.5-1 identifies the GSAs that are located within the project area. In the Inland portion of the county, the project area only intersects identified GSAs around the Atascadero, San Luis Obispo, and Arroyo Grande URLs (refer to Figure 4.5-2).

b. Seismic Hazards. Areas with seismic (earthquake) hazards are identified by earthquake fault zones as established by the Alquist-Priolo Earthquake Fault Zone Act of 1972. The California Geologic Survey (CGS, formerly Division of Mines and Geology) classifies faults as active, potentially active, or inactive according to standards developed for implementation of the Alquist-Priolo Earthquake Fault Zone Act. A fault that has exhibited surface displacement within the Holocene Epoch (the last 11,000 years) is defined as active. A fault that has exhibited surface displacement during the Quaternary time (i.e., within the past 1.6 million years) but which cannot be proven to have moved or not moved during the Holocene time is defined as potentially active. Table 4.5-2 shows a list of the California Geologic Survey mapped faults and their respective maximum probable earthquake.

Portions of the Coast Range of California lie within the county. This range is considered a geologically complex and seismically active region that is subject to seismic hazards, which are discussed in more detail below. Active, potentially active, and inactive faults are located throughout the county (refer to Table 4.5-2).

Within the county, the Coast Range is further divided into four distinct seismotectonic domains including the Santa Maria-San Luis Range, Salinan Domain, Coastal Franciscan and the Western San Joaquin Valley.

- *Santa Maria-San Luis Range Domain*. Comprising the southwestern area of the county, this range covers several planning areas, including San Luis Bay (Inland and Coastal), South County (Inland and Coastal), southwestern portions of the Estero, and the western portions of San Luis Obispo. Two recognized active faults are located in this domain, the Hosgri and the Los Osos. Geologic hazards within this domain include ground shaking, liquefaction, seismic related settlement of alluvium in low-lying areas, and tsunamis and coastal erosion in the ocean front areas. The majority of the range has a low landslide potential. However, steeper terrain areas and the less developed areas of the Santa Lucia Range and Irish Hills have the potential for severe landslides.
- *Coastal Franciscan Range Domain*. This range covers the Estero, North Coast, and the central portion of the San Luis Obispo and San Luis Bay (Inland) planning areas. Geologic hazards within this domain include ground shaking, liquefaction, seismic related settlement of alluvium in low-lying coastal areas, tsunami and coastal erosion in ocean front areas, and severe landslide potential on moderate to steep hillsides.
- *Salinian Domain*. This range covers Adelaida, Salinas River, El Pomar/Estrella, and Las Pilitas planning areas. This domain has a lower occurrence of geologic hazard compared to the Santa Maria and Coastal Franciscan domains; however, there are still concerns with ground shaking, liquefaction, seismic related settlement of alluvium in low-lying areas, and landslide potential on moderate to steep hillsides.
- *Western San Joaquin Valley Domain*. This area is located adjacently west of the San Andreas Fault, and includes the Shandon-Carrizo planning area of the County. This domain does not encompass any major existing communities in the County but is considered active due to the proximity to the San Andreas Fault.

Ground Shaking and Surface Rupture. Faults generally produce damage in two ways: ground shaking and surface rupture. Seismically induced ground shaking covers a wide area and is greatly influenced by the distance of the site to the seismic source, soil conditions, and depth to groundwater. Ground shaking has the potential to result in the damage or destruction of buildings, infrastructure, and possible injury or loss of life throughout the County. Ground shaking can also trigger secondary seismic phenomenon such as liquefaction, lateral spreading, seismically induced settlement and slope instability, tsunami, and seiche, and other forms of surface rupture and seismic responses (SLO County 1999).

Table 4.5-2: San Luis Obispo County Fault Activity

Fault Name	Activity	Maximum Moment Magnitude
Hosgri-San Simeon	Active	7.3
Casmalia	Potentially Active	6.5
Los Osos	Active	6.8
San Luis Range	Potentially Active	7.0
San Juan	Potentially Active	7.0
Rinconada	Potentially Active	7.3
San Andreas-Carrizo	Active	7.2
San Andreas-Cholame	Active	6.9
San Andreas-Parkfield	Active	6.7
San Andreas (1857 rupture)	Active	7.8
San Andreas (1906)	Active	7.9
Big Spring	Inactive	n/a
Cambria	Potentially Active	6.25
Cayucos	Inactive	6.5
East Huasna	Potentially Active	n/a
Edna	Potentially Active	n/a
Morales	Potentially Active	n/a
Nacimiento	Active[1]	7.5
Oceano	Inactive	6.0
Pecho	Potentially Active	6.25
San Miguelito	Inactive	n/a
Santa Lucia Bank	Active	7.25
South Cuyama-Ozena	Potentially Active	7.0
West Huasna/Ozena	Potentially Active	7.0
Whiterock	Inactive	n/a
Black Mountain	Not Rated	5.0-7.5
La Panza	Not Rated	5.0-7.5
Point San Luis Thrust	Not Rated	5.0-7.5
Purisma-Solomon Thrust	Not Rated	5.0-7.5
Santa Lucia	Not Rated	5.0-7.5

[1] *Although the California Geological Survey (CGS) and the County of San Luis Obispo Safety Element consider the Nacimiento Fault inactive, its proximity to the active Oceanic Fault Zone, the source of the 2003 San Simeon earthquake suggests that the Nacimiento Fault Zone is possibly active (San Luis Obispo County – Affordable Housing Ordinance EIR, 2007). Therefore, for the purposes of this analysis, the Nacimiento Fault is considered active.*
Source: SLO County Safety Element (1999)

The active Los Osos fault zone crosses the portion of the coastal project area in the rural Estero planning area as well as eligible areas in the rural San Luis Obispo planning area. Surface rupture refers to displacement of the ground surface along a fault trace, and is a potential hazard where future development would cross or be constructed astride known fault zones.

Damage associated with fault-related surface rupture is normally confined to a narrow band along the trend of the fault, and fault displacement usually involved forces so great that it is generally not feasible (structurally and economically) to design and build structures to accommodate this rapid displacement. The greatest risk for fault displacement is generally thought to be along historically active and potentially active faults.

c. Slope Stability and Landslides. Landslides result when the driving forces that act on a slope (i.e., the weight of the slope material, and the weight of objects placed on it) are greater than the slope's natural resisting forces (i.e., the shear strength of the slope material). Slope instability may result from natural processes, such as the erosion of the toe of a slope by a stream, or by ground shaking caused by an earthquake. Slopes can also be modified artificially by grading, or by the addition of water or structures to a slope. Development that occurs on a slope can substantially increase the frequency and extent of potential slope stability hazards. Areas susceptible to landslides are typically characterized by steep, unstable slopes in weak soil/bedrock units which have a record of previous slope failure. There are numerous factors that affect the stability of the slope, including: slope height and steepness, type of materials, material strength, structural geologic relationships, ground water level, and level of seismic shaking.

According to the San Luis Obispo County Safety Element (1999), there are several geologic formations commonly associated with slope stability problems, including the Franciscan, Rincon, Toro, and Monterey formations. Of these, the Franciscan is the most notorious formation known for slope instability. Numerous landslides within the Franciscan complex are observable along the Highway 1 corridor from San Luis Obispo to San Simeon. Numerous landslides have also been mapped in the Franciscan and Toro formations along Highway 101 on the Cuesta Grade. Landslides in the Franciscan formation have impacted residences, roadway facilities, pipelines, and other infrastructure in the County. The Rincon and Toro formations have a similar geologic history of landsliding, but are generally not as widespread as the Franciscan.

Within the project area, GSAs due to slope stability and landslide are mainly located on the Agriculture-designated parcels throughout the rural North Coast and Estero planning areas as well as the Irish Hills in the rural San Luis Obispo planning area.

d. Soil Related Hazards. Soil related hazards include expansive soils, erosive soils, subsidence and settlement, and liquefaction. These types of hazards are discussed below.

Expansive Soils. During periods of water saturation, soils with high clay content tend to expand. Conversely, during dry periods, the soils tend to shrink. These volume changes with moisture content can cause cracking of structures built on expansive soils.

Erosive Soils. Soil erosion is the removal of soil by water and wind. The rate of erosion is estimated from four soil properties: texture, organic matter content, soil structure, and permeability. Other factors that influence erosion potential include the amount of rainfall and wind, the length and steepness of the slope, and the amount and type of vegetative cover.
Within the county, coastal bluff areas are commonly prone to erosion. Landslides and cliff retreat are part of the natural process of coastal erosion along the central coast. Waves that undercut bluffs often initiate landslides. During winter storms, heavy surf drags sand offshore,

denuding many beaches and exposing the cliff base to direct wave attack. Most cliff retreat occurs at this time; powerful breakers crash into the cliffs, splintering the softer rocks into fragments that fall into the retreating surf. Persistent winter rains beating down on coastal bluffs slowly penetrate rock fractures, lubricating the joints between rock layers. Fractured shales, sandstones, and siltstones are most likely to slip and cause landslides, especially at locations where the land slants towards the beach.

Subsidence and Settlement. Subsidence involves deep seated settlement due to the withdrawal of fluid (oil, natural gas, or water). Settlement is the downward movement of the land surface resulting from the compression of void space in underlying soils. Seismically induced settlement occurs in loose to medium dense unconsolidated soil above groundwater. These soils compress (settle) when subject to seismic shaking. The settlement can be exacerbated by increased loading, such as from the construction of buildings. Settlement can also result solely from human activities including improperly placed artificial fill, and structures built on soils or bedrock materials with differential settlement rates.

Liquefaction. Liquefaction is defined as the sudden loss of soil strength due to a rapid increase in soil pore water pressure resulting from seismic ground shaking. Liquefaction potential is dependent on such factors as soil type, depth to ground water, degree of seismic shaking, and the relative density of the soil. When liquefaction of the soil occurs, buildings and other objects on the ground surface may tilt or sink, and lightweight buried structures (such as pipelines) may float toward the ground surface. Liquefied soil may be unable to support its own weight or that of structures, which could result in loss of foundation bearing or differential settlement. Liquefaction may also result in cracks in the ground surface followed by the emergence of a sand-water mixture.

Figure 4.5-1: Geologic Hazards Overlay

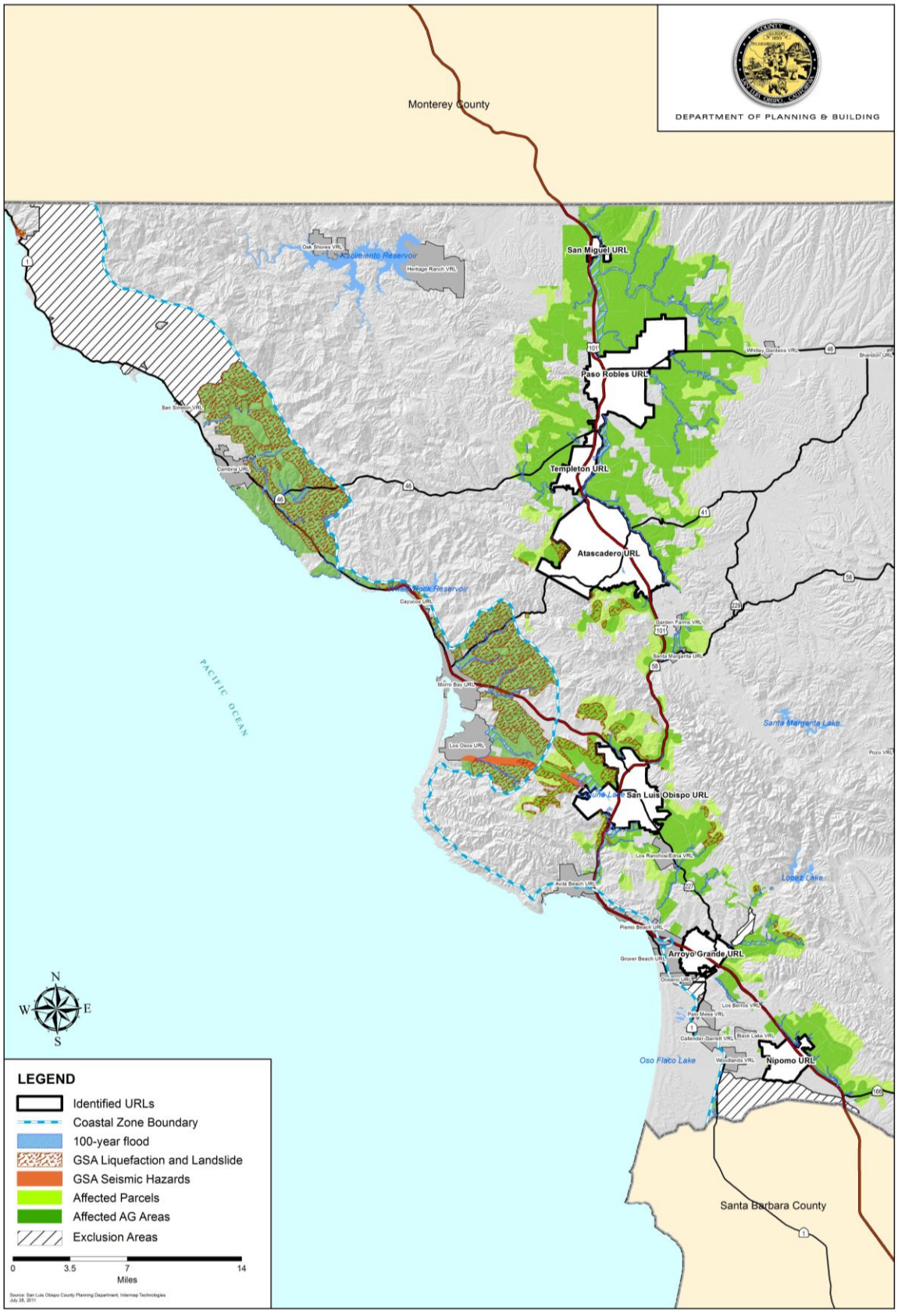

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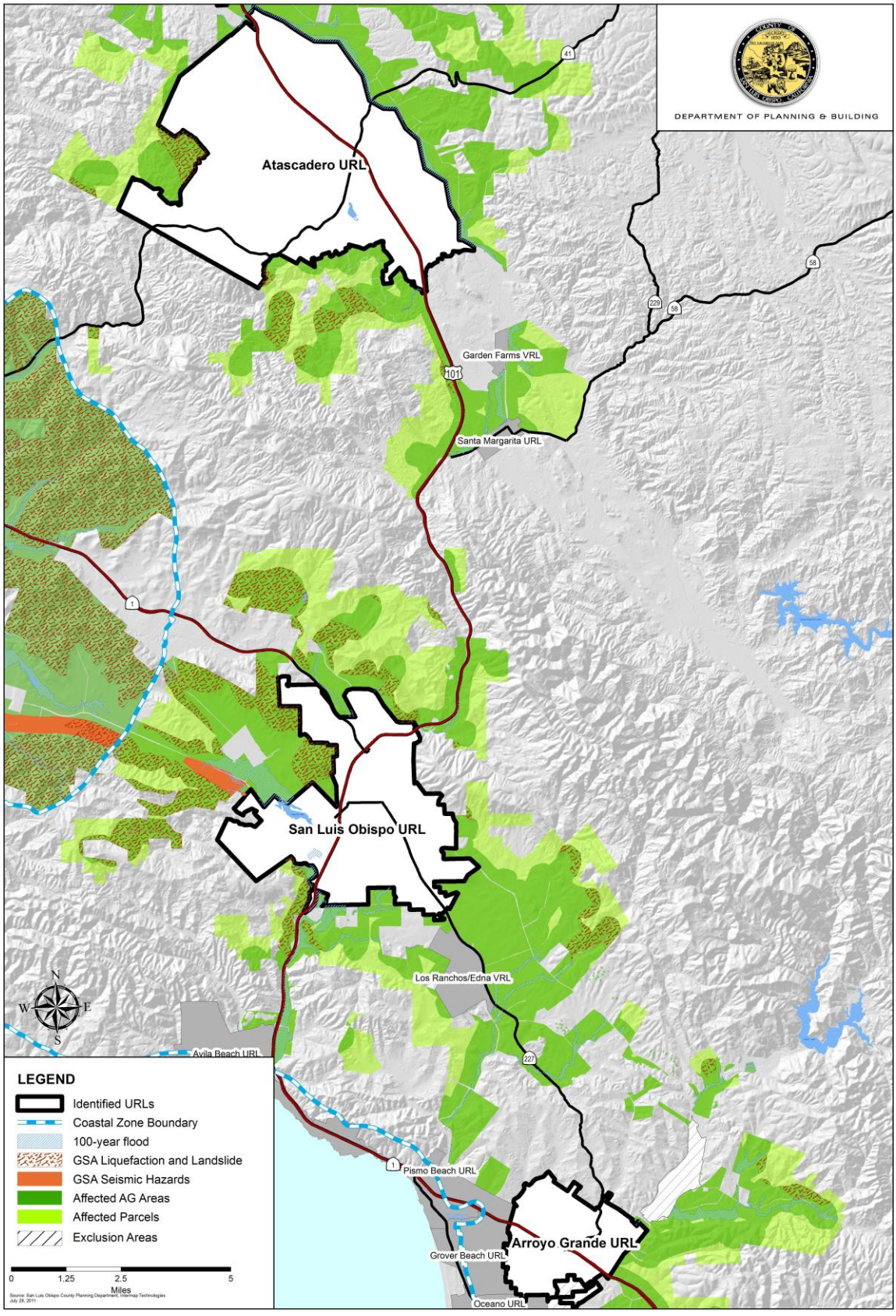
Figure 4.5-2: Geologic Hazards Overlay (Inland Area Only)



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e. Regulatory Setting

Federal and State Regulations. The Alquist-Priolo Earthquake Hazard Zone Act was developed by the State to regulate development near active faults and mitigate the surface fault rupture and other hazards. The Act identifies active earthquake fault zones and restricts building habitable structures over known active or potentially active faults.

Local Regulations. San Luis Obispo County has mapped and established a Geologic Study Area (GSA) combining designation in potentially hazardous areas to ensure new development considers geologic and soil conditions that may create a danger to life and property. The County Land Use Ordinance contains design considerations with respect to seismic, landslide, and liquefaction hazards.

Section 22.14.070 of the County Inland Land Use Ordinance and Section 23.07.080 of the Coastal Land Use Ordinance require land use permit applications within a GSA be accompanied by a geology and soils report prepared by a certified engineering geologist and or registered soils engineer. Unless it is determined by the County Engineer that sufficient information exists in previous geology or soils reports, the report must include:

1. A review of the local and regional seismic and other geological conditions that may significantly affect the proposed use.

2. An assessment of conditions on or near the site that would contribute to the potential for the damage of a proposed use from a seismic or other geological event, or the potential for a new use to create adverse effects upon existing uses because of identified geologic hazards. The conditions assessed are to include, where applicable, rainfall, soils, slopes, water table, bedrock geology, and other substrate conditions that may affect seismic response, landslide risk or liquefaction potential.

3. Conclusions and recommendations regarding the potential for, where applicable:
    a. Surface rupture or other secondary ground effects of seismic activity at the site;
    b. Active landslide or slope failure;
    c. Adverse groundwater conditions; and
    d. Liquefaction hazards.

4. Recommend building techniques, site preparation measures, or setbacks necessary to reduce risk to life and property from seismic damage, landslides, groundwater and liquefaction to insignificant levels.

4.5.2 Impact Analysis

a. Methodology and Significance Thresholds. In accordance with Appendix G of the State CEQA Guidelines, impacts would be significant if development in accordance with the proposed Agricultural Cluster Subdivision Program would:

- *Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, including liquefaction, or landslides.* Refer to Impact G-1, below.

- *Result in substantial soil erosion or the loss of topsoil.* Refer to Impact G-2, below.
- *Be located on a geologic unit or soil that is unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.* Refer to Impact G-2, below.
- *Be located on expansive soil, as defined in Table 1-B of the Uniform Building Code, creating substantial risks to life or property.* Refer to Impact G-2, below.
- *Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.* Refer to Impact PS-1 in Section 4.9: Public Services and Utilities.

Additionally, the County of San Luis Obispo has established local thresholds pertaining to geology. Impacts would be significant if development resulting from the project would:

- *Result in exposure to or production of unstable earth conditions, such as landslides, earthquakes, liquefaction, ground failure, land subsidence or other similar hazards*. Refer to Impacts G-1 and G-2, below.
- *Be within a California Geological Survey "Alquist-Priolo" Earthquake Fault Zone.* Refer to Impact G-1, below.
- *Be inconsistent with the goals and policies of the County's Safety Element relating to Geologic and Seismic Hazards*. Refer to Impacts G-1 and G-2, below.
- *Preclude the future extraction of valuable mineral resources.* Refer to Section 4.13: Effects Found Not to be Significant.

b. Project Impacts and Mitigation Measures

Impact G-1 **The proposed Agricultural Cluster Subdivision Program would modify current land division and development standards. As a result, development could be located in areas affected by active or potentially active faults zones. Compared to the existing ordinance, the program would reduce the potential for development to occur in these areas. Impacts compared to the existing ordinance are therefore Class III, *less than significant.* However, compared to existing conditions, the program would potentially allow additional residential development in these areas. Impacts compared to existing conditions would therefore be Class II, *significant but mitigable.***

Compared to Development Potential under the Existing Ordinance

When compared to development potential under the existing ordinance, the proposed amendments would reduce the number of residential cluster parcels that could potentially be created in the county from 4,582 to 418, a 91 percent reduction. The program would also introduce the Agricultural Cluster Subdivision Program into the Coastal Zone; however, the coastal version of the program would only authorize the reconfiguration of existing underlying lots into residential cluster lots, essentially replacing current lot line adjustment procedures with more restrictive agricultural clustering standards.

In addition to reducing overall development potential, the program includes restrictive provisions limiting residential development to five percent of the overall property and requiring the remainder of the property to be placed under a permanent agricultural preservation easement. Consequently, the proposed amendments would reduce the potential for residential development to be located in areas affected by active or potentially active faults. Therefore, compared to the existing ordinance, impacts would be Class III, *less than significant.*

Compared to Existing Conditions

Compared to existing conditions, the proposed Agricultural Cluster Subdivision Program would allow for the development of up to 418 new single family residences in agricultural areas within five miles of the URLs of Arroyo Grande, Atascadero, San Luis Obispo, San Miguel, Nipomo, Templeton, and Paso Robles. Based on a minimum lot size of 2.5 acres and a maximum lot size of 5 acres, the proposed program could result in between 1,045 and 2,090 acres (less than one percent of the 223,656 acre project area) of site disturbance.

The Agricultural Cluster Subdivision Program would also allow for the reconfiguration of legally established underlying lots in eligible areas of the Coastal Zone (rural North Coast and Estero planning areas, excluding Hearst Ranch) to accommodate residential development. To date, 320 legal underlying lots have been identified in these areas. However, since many of these lots could already be developed in their current configuration with fewer restrictions than would be required under the proposed amendments, only a small percentage of the eligible lots would be likely to participate in the program. Nonetheless, any future reconfiguration would result in the construction of new single family residences in the Coastal Zone.

New residential units constructed under the proposed amendments could be located in areas affected by active or potentially active faults zones, including the Los Osos Alquist-Priolo fault zones. In addition, due to the smaller parcel sizes allowed under the program and the requirement for a physically contiguous parcel layout, the program would facilitate more concentrated residential development. This could result in development being re-positioned to areas which could be affected by active and/or potentially active fault zones. Development in these areas could potentially cause significant impacts resulting from seismic events.

The Alquist-Priolo Earthquake Hazard Zone Act identifies fault zones and requires the County to regulate development near active faults. Per the Alquist-Priolo legislation, no structure for human occupancy is permitted on the trace of an active fault. The term "structure for human occupancy" is defined as any structure used or intended for supporting or sheltering any use or occupancy, which is expected to have a human occupancy rate of more than 2,000 person-hours per year. If development is proposed within an Alquist-Priolo Zone, a geologic study must be conducted to determine the location of the fault trace. Based on the findings in the geologic study, all structures for human occupancy must be setback a minimum of 50-feet from the fault trace because, unless proven otherwise, an area within 50-feet of an active fault is presumed to be underlain by active branches of the fault. All new development would also be subject to the goals and policies of the San Luis Obispo County Safety Element.

The proposed ordinance would not affect existing requirements for sites which have been covered under the Geologic Study Area (GSA) combining designation. Projects in these areas are already required to provide engineering geology and/or geotechnical engineering reports

to address all soils and geology issues (LUO Section 22.14.070 /CZLUO Section 23.07.080). These reports will include recommendations by the Certified Engineering Geologist and/or Registered Civil Engineer pertaining to design and construction techniques. Incorporation of these recommendations into proposed grading and construction plans is already required under Titles 19 (Building and Construction), 22 (Land Use), and 23 (Coastal Zone Land Use) of the County Code. The California Building Code additionally provides standards which affect building design in seismic hazard areas. Impacts would therefore be Class II, *significant but mitigable.*

Mitigation Measures. Existing ordinance standards require individual projects to submit engineering geology and geotechnical engineering reports and to incorporate the recommendations of these reports into the project design. These requirements will ensure that potential impacts are avoided or minimized to a level of insignificance. Additionally, all site construction is required to adhere to Title 19 (Building and Construction Ordinance) and California Building Code requirements which already include standards for constructing in seismic hazard areas. To ensure that projects potentially affected by faults are subject to project-specific geologic evaluation, the following mitigation measure shall be required:

G-1(a) **Project-specific Geologic Evaluation.** Individual agricultural cluster subdivision applications require discretionary approval and are therefore subject to individual environmental determinations. In reviewing individual projects, the County shall consider the location of proposed development relative to existing faults, and shall require engineered grading plans, prepared by a civil engineer, and an engineering geology report and geotechnical (soils) engineering report for projects involving site development which can be affected by active or potentially active faults zones. The geologic reports shall be reviewed by the County Geologist and/or plans examiners, as applicable, and individual projects shall be conditioned to comply with the recommendations of the geologic reports.

G-1(b) **Fault Line Setbacks.** If development is proposed within an Alquist-Priolo Zone, a geologic study shall be conducted to determine the location of the fault trace. Based on the findings in the geologic study, all structures for human occupancy shall be setback a minimum of 50-feet from the fault trace.

Residual Impacts. When compared to development potential under the existing ordinance, impacts would be Class III, *less than significant.* When compared to existing conditions, impacts would be Class II, *significant but mitigable.*

Impact G-2 **The proposed Agricultural Cluster Subdivision Program would modify current development standards. As a result, development could be located in areas where soil related hazards (e.g. expansive soils, erosive soils, subsidence and settlement, landslide, and liquefaction) occur. Compared to the existing ordinance, the program would reduce the potential for development to occur in these areas. Impacts compared to the existing ordinance are therefore Class III, *less than significant.* However, compared to existing conditions, the program would potentially allow residential development in these areas. Impacts compared to existing conditions would therefore be Class II, *significant but mitigable.***

Compared to Development Potential under the Existing Ordinance

As described in Impact G-1, several proposed ordinance revisions would reduce overall development potential in agricultural areas of the county. As a result of these revisions, the area of the county eligible for agricultural cluster subdivision would be reduced from 1,221,249 to 223,656 acres, and the number of residences that could be developed through an agricultural cluster subdivision would be reduced from 4,582 to 418. The program would also introduce the Agricultural Cluster Subdivision Program into the Coastal Zone; however, the coastal version of the program would only authorize the reconfiguration of existing underlying lots into residential cluster lots, essentially replacing current lot line adjustment procedures with more restrictive agricultural clustering standards. Consequently, the proposed amendments would reduce the potential for residential development to be located in areas where soil related hazards (e.g. expansive soils, erosive soils, subsidence and settlement, landslide, and liquefaction) occur. Therefore, compared to the existing ordinance, impacts would be Class III, *less than significant.*

Compared to Existing Conditions

As described in Impact G-1, the proposed Agricultural Cluster Subdivision Program could result in the development of up to 418 new single family residences in the Inland portion of the county, and additional residential development in eligible areas of the Coastal Zone. As shown in Figures 4.5-1 and 4.5-2, these units could potentially be constructed within mapped Geologic Study Areas, including areas with identified soil related hazards (e.g. expansive soils, erosive soils, subsidence and settlement, landslide, and liquefaction).

Expansive soils can result in cracking of structures. Erosive soils can also cause damage to structures. Subsidence involves deep seated settlement due to the withdrawal of fluid (oil, natural gas, or water). Settlement is the downward movement of the land surface resulting from the compression of void space in underlying soils. Both subsidence and settlement can cause significant property damage. Landslide could result in complete dislocation of a structure. Lastly, when liquefaction of the soil occurs, buildings and other objects on the ground surface may tilt or sink, and lightweight buried structures (such as pipelines) may float toward the ground surface. Liquefied soil may be unable to support its own weight or that of structures, which could result in loss of foundation bearing or differential settlement.

Liquefaction may also result in cracks in the ground surface followed by the emergence of a sand-water mixture.

Chapter 18 of the 2007 California Building Code (CBC) requires that a geotechnical (soils) report be submitted for all new construction. Limited exceptions to this requirement are allowed for the following types of structures:

- Greenhouses.
- Detached non-habitable residential accessory structures, such as garages, workshops, and storage buildings.
- Prefabricated or "light framed" engineered agricultural structures up to 3,000 square feet in size and meeting other specifications.
- Single family dwellings and additions that meet conventional construction requirements.
- Retaining walls and swimming pools, unless a site inspection reveals that a soils report is warranted.

An additional exception is granted where a Registered Civil Engineer can classify soil based on observation and materials tests as "Site Class D." This exemption from the soils report requirement must be accompanied with written findings prepared by the engineer justifying the classification. At the minimum, an expansion index must also be required unless waived by a building inspector.

Under all circumstances, proposed structures that occur in the following locations cannot qualify for an exemption from the preparation of a soils report:

- Within a Geologic Study Area (GSA) combining designation.
- Within a known liquefaction area.
- On a cut/fill over-excavation re-compacted pad or fill pad.
- In a flood zone or high groundwater area.
- In any other hazardous area as determined by the Building Official.

The soils report will include recommendations which must be implemented by the applicant in the proposed design and construction of a project. Project plans are reviewed for compliance with these requirements by the Building Division, and building inspectors ensure that any required inspections by the geotechnical engineer are conducted. Impacts would therefore be Class II, *significant but mitigable.*

Mitigation Measures. Individual development projects would be required to submit a soils/foundation report. Implementation of the recommendations of this report would reduce potential soil related hazards to a less than significant level. No further measures will be necessary.

G-2(a) **Soils/Foundation Report.** Upon implementation of the proposed Agricultural Cluster Subdivision Program, individual property developers proposing development of new structures shall submit a soils/foundation report as part of the application for any proposed

building permit(s). To reduce the potential for foundation cracking, one or more of the following shall be implemented and/or as recommended by a qualified engineer:

- Use continuous deep footings (i.e., embedment depth of 3 feet or more) and concrete slabs on grade with increased steel reinforcement together with a pre-wetting and long-term moisture control program within the active zone;
- Removal and recompaction of loose soils;
- Removal of the highly expansive material and replacement with non-expansive compacted import fill material;
- The use of specifically designated drilled pier and grade beam system incorporating a structural concrete slab on grade supported approximated 6 inches above the expansive soils;
- Chemical treatment with hydrated lime to reduce the expansion characteristics of the soils; and
- Where necessary, construction on transitional lots shall include over excavation to expose firm sub-grade, use of post tension slabs in future structures, or other geologically acceptable method.

Residual Impacts. When compared to development potential under the existing ordinance, impacts would be Class III, *less than significant.* When compared to existing conditions, impacts would be Class II, *significant but mitigable.*

c. Cumulative Impacts. This section describes the cumulative impacts of the proposed Agricultural Cluster Subdivision Program compared to development potential under both the existing ordinance and existing conditions. The geographic scope for the geologic hazards cumulative analysis includes agricultural and rural areas within five miles of the identified URLs and eligible areas of the Coastal Zone (the rural North Coast and Estero planning areas, not including Hearst Ranch).

Compared to Development Potential under the Existing Ordinance

When compared to development potential under the existing ordinance, the proposed amendments would reduce the number of residential cluster parcels that could potentially be created in the county from 4,582 to 418, a 91 percent reduction. Although the program would introduce agricultural clustering provisions into the Coastal Zone, it would only allow for the reconfiguration of existing underlying lots, essentially replacing current lot line adjustment procedures with more restrictive agricultural clustering standards. As a result, the proposed amendments would result in fewer potential impacts related to geologic hazards. Cumulative impacts would therefore be Class III, *less than significant*, when compared to the existing ordinance.

Compared to Existing Conditions

Future development in accordance with the proposed Agricultural Cluster Subdivision Program, together with other cumulative projects proposed throughout the project area, could

potentially expose people and property to soil-stability related hazards. The magnitude of geologic hazards for individual projects would depend upon the location, type, and size of development and the specific hazards associated with individual sites. Any geologic issues present on an individual development site would be limited to that site and would not contribute to any cumulative impacts in other areas of the county. For example, the discovery of landslide concerns on two individual sites one mile apart would not create a cumulative issue in which one condition adds to the other. Rather, any specific geologic hazards associated with each individual site would be limited to that site without affecting other areas. Therefore, cumulative geologic impacts would not occur.

As discussed above, new development within the county would be required to comply with the Alquist-Priolo Earthquake Hazard Zone Act and the California Building Code, as well as additional mitigation measures and recommendations pertaining to fault location investigations, building envelope setbacks, grading and erosion. These measures would reduce impacts to a less than significant level. Therefore, the project's contribution to the cumulative increase in exposure of people to geologic hazards would be considered Class III, *less than significant*.