# 4.6 Geology and Soils

This section of the EIR describes the existing geology, soils, and seismic conditions in the proposed project area and analyzes the potential physical environmental impacts to people and property related to seismic hazards, underlying soil characteristics, slope stability, erosion, and excavation and export of soils. Potential impacts of soil conditions on air and water quality as a result of construction-related activities are discussed in Section 4.3, Air Quality, Section 4.7, Greenhouse Gas Emissions, and Section 4.9, Hydrology and Water Quality. This section is based on the review of data provided by the City of Escondido, the County of San Diego, the U.S. Geologic Service (USGS) and other sources, as cited throughout the section.

A summary of the geology and soils impacts identified in Section 4.6.3, Analysis of Project Impacts and Determination of Significance, is provided below.

**Geology and Soils Summary of Impacts**

| Issue Number | Issue Topic | Project Direct Impact | Project Cumulative Impact | Impact After Mitigation |
|---|---|---|---|---|
| 1 | Exposure to Seismic-Related Hazards | Less than Significant | Less than Significant | Less than Significant |
| 2 | Soil Erosion or Topsoil Loss | Less than Significant | Less than Significant | Less than Significant |
| 3 | Soil Stability | Less than Significant | Less than Significant | Less than Significant |
| 4 | Expansive Soils | Less than Significant | Less than Significant | Less than Significant |
| 5 | Wastewater Disposal Systems | Less than Significant | Less than Significant | Less than Significant |

## 4.6.1 Existing Conditions

Natural geologic processes that represent an existing or future hazard to life, health, or property are called geologic hazards. Natural geologic hazards that affect people and property in the proposed project area include earthquakes (which can cause surface fault rupture, ground shaking, and liquefaction), expansive soils, weathering, and mass wasting phenomena such as landslides or rockfalls. The Southern California region contains active faults, steep topography, and other geological characteristics that pose public safety concerns and constrain physical development.

### 4.6.1.1 Geologic Setting

#### Regional Geologic Setting

The proposed project area is located within western San Diego County. San Diego County is located along the Pacific Rim, an area characterized by island arcs with subduction zones forming mountain ranges and deep oceanic trenches, active volcanoes, and earthquakes. The USGS defines a subduction zone as any area where one lithospheric plate sinks under another (USGS 2008c). This occurs when plates move toward each other, or converge. During the Mesozoic Era subduction of the ancient oceanic plate under the continental plate created an archipelago of volcanic islands in the San Diego area. The heat caused by the subduction produced massive volumes of magma that either erupted at the surface forming volcanic rocks or congealed deep in the Earth's crust to form plutonic rocks (e.g., granite). This resulted in the creation of the plutonic rocks now exposed in the some areas. Subsequent heating also metamorphosed the volcanic and sedimentary rocks of the arc as well as the older Paleozoic rocks, forming the foothills of the western part of the ranges. Continuing subduction of the oceanic plate under the continent caused uplifting and erosion that unroofed the deeply buried plutonic rocks to form a steep and rugged, mountainous coastline. Younger Mesozoic and Cenozoic sedimentary rocks have buried these older rocks west of the mountains, while a thick accumulation of Cenozoic sedimentary rocks including layers of lava and ash has filled the basins east of the mountains.

During the Cenozoic Era, a tectonic spreading center began to separate the southwestern part of North America, including San Diego County, from the rest of the continent. The spreading center formed the Gulf of California and the Salton Trough Region. The slow northwestward movement of San Diego County caused intermittent uplift with subsequent erosion, as well as down warping with subsequent deposition of thick accumulations of sediments. Recorded in these Cenozoic sedimentary rocks are conditions of higher rainfall and subtropical climates that supported coastal rain forests with exotic faunas and floras, periods of extreme aridity and volcanism, sea level fluctuations (oceanic inundations and retreats), a great Eocene river and delta, and the formation of new seaways.

As a result of this geologic history, four general rock types are found within the County of San Diego: 1) Cretaceous Age crystalline and Upper Jurassic metavolcanics; 2) Mesozoic Age metamorphic rocks; 3) Tertiary Age sedimentary rocks; and 4) recent alluvium. Cretaceous Age crystalline rocks, including granites, diorites, and gabbros and Upper Jurassic metavolcanics underlie most of the mountainous terrain in the central portion of San Diego County. These rocks are associated with the Peninsular Ranges batholith of southern California and Baja California. Mesozoic Age metamorphic rocks include marble, schist, and gneiss outcrops that are found in the western foothills and mountains of the Peninsular Ranges and in the desert east of the mountains. Tertiary Age sedimentary rocks include sandstone, conglomerate, and mudstone and are found in the western portion of the County. Deposits of recent alluvium, including sand, gravel, silt, and clay are found in river and stream valleys, around lagoons, in intermountain valleys, and in the desert basins.

## Local Geologic Setting

The proposed project area lies within the Peninsular Range Region of San Diego County. The lower Peninsular Range Region is made up of foothills that span in elevation from 600 to 2,000 feet above mean sea level (MSL). It is characterized by rolling to hilly uplands that contain frequent narrow, winding valleys. Specifically, the proposed project area is located in the foothills subprovince of the Peninsular Ranges Geomorphic Province, a region typified by northwest-southeast trending structural blocks separated by major regional fault zones. The proposed project area lies west of the major regional fault and mountain ranges of the Peninsular Ranges Province in an area transitional between the coastal plain to the west and the granitic highlands to the east. Surface exposures in the area include rocks ranging from Mesozoic to Quaternary in ages as well as recent soils and alluvial deposits of variable depth and composition (Cotton 2000).

Geologic formations located within the proposed project area are shown in Figure 4.5-2, Geologic Formations. As identified in this figure, nine different geologic formations are found within the proposed project area. Characteristics of these local geologic formations are described in Table 4.6-1, Local Geologic Formations.

**Table 4.6-1 Local Geologic Formations**

| Geologic Formation Symbol | Geologic Formation Characteristic |
|---|---|
| Qls | Selected large landslides deposits from Holocene and Pleistocene era |
| Qoa | Old alluvial valley deposits from the late to middle Pleistocence era |
| Qof | Old alluvial fan deposits from the late to middle Pleistocene era |
| Qsu | Undifferientaid surface deposits, including colluviums, slope wash, talus deposits, and other surface deposits of all ages, from the Holocene and late Pleistocene era |
| Qsu | Undifferentiated surficial deposits, including colluviums, slope wash, talus deposits, and other surface deposits of all ages, from the late to middle Pleistocene era |
| Qya | Young alluvial valley deposits from the Holocene and late Pleistocene era |
| af | Artificial fill from the late Holocene era |
| gf | Granitic and other intrusive crystalline rocks of all ages, from the mid-Cretaceous era |
| pKm | Cretaceous and pre-Cretaceous metamorphic formations of sedimentary and volcanic origin, from the Mesozoic era |

Source: City of Escondido 2011

### Soil Associations

To generally describe soils types, soils are divided into associations (USDA 1973). A soil association normally consists of one or more major soils and at least one minor soil, and is named for the major soils. Soils in an association typically differ in slope, depth, stoniness, drainage, and other characteristics that affect management. The San Diego region has been divided into 34 soil associations, each with variable susceptibility to erosive forces, depending on their individual characteristics.

Soils in the proposed project area generally consist of well-drained, medium-to coarse-grained, often rocky sandy loams, commonly with clay loam substrata and underlying igneous and metamorphic bedrock. Most of the soils within the proposed project area have severe erodibility limitations (Cotton 2000). Soil types found within the proposed project area are identified in Table 4.6-2, Soil Types within the Proposed Project Area and shown in Figure 4.6-2, Soil Types.

**Table 4.6-2 Soil Types within the Proposed Project Area**

| Soil Type | Abbreviation | Total Acres |
|---|---|---|
| Acid Igneous Rock | AcG | 2,249 |
| Arlington coarse sandy loam, 2 to 9 percent slopes | AvC | 116 |
| Auld clay, 5 to 9 percent slopes | AwC | 44 |
| Bonsall sandy loam, 2 to 9 percent slopes | BIC | 290 |
| Chino fine sandy loam, 2 to 5 percent | ChB | 20 |
| Chino silt loam, saline, 0 to 2 percent | CkA | 154 |
| Cienaba very rocky coarse sandy loam, 30 to 75 percent slopes | CmrG | 6,684 |
| Cieneba coarse sandy loam, 15 to 30 percent slopes, eroded | ClE2 | 1,217 |
| Cieneba rocky coarse sandy loam, 9 to 30 percent slopes | CmE2 | 1,116 |
| Cieneba-Fallbrook rocky sandy loam | CnG2 | 4,080 |
| Escondido very fine sandy loam, 15 to 30 percent slopes | EsE2 | 1,967 |

**Table 4.6-2 continued**

| Soil Type | Abbreviation | Total Acres |
|---|---|---|
| Escondido very fine sandy loam, deep, 5 to 9 percent slopes | EvC | 17 |
| Fallbrook rocky sandy loam, 5 to 9 percent slopes | FeC | 97 |
| Fallbrook rocky sandy loam, 9 to 30 percent slopes | FeE | 76 |
| Fallbrook rocky sand loam, 9 to 30 percent slopes, eroded | FeE2 | 73 |
| Fallbrook sandy loam, 15 to 30 percent, eroded | FaE2 | 5,790 |
| Fallbrook sandy loam, 9 to 30 percent slopes, severely eroded | FaE3 | 54 |
| Fallbrook-Vista sandy loam, 15 to 30 percent slopes | FvE | 437 |
| Fallbrook-Vista sandy loam, 9 to 15 percent slopes | FvD | 956 |
| Friant fine sandy loam, 30 to 50 percent | FwF | 13 |
| Friant rocky fine sandy loam, 30 to 70 percent slopes | FxG | 1,911 |
| Friant rocky fine sandy loam, 9 to 30 percent slopes | FxE | 264 |
| Grangeville fine sandy loam, 0 to 2 percent slopes | GoA | 221 |
| Greenfield sandy loam, 0 to 2 percent slopes | GrA | 36 |
| Greenfield sandy loam, 2 to 5 percent slopes | GrB | 185 |
| Greenfield sandy loam, 5 to 9 percent slopes | GrC | 140 |
| Greenfield sandy loam, 9 to 15 percent slopes | GrD | 14 |
| Huerhuero loam, 2 to 9 percent slopes | HrC | 516 |
| Huerhuero loam, 5 to 9 percent slopes, eroded | HrC2 | 6 |
| Las Posas fine sandy loam, 15 to 30 percent slopes, eroded | LpE2 | 656 |
| Las Posas fine sandy loam, 5 to 9 percent slopes | LpC | 10 |
| Las Posas fine sandy loam, 5 to 9 percent slopes, eroded | LpC2 | 95 |
| Las Posas fine sandy loam, 9 to 15 percent slopes, eroded | LpD2 | 588 |
| Las Posas stondy fine sandy loam, 30 to 65 percent slopes | LrG | 2,543 |
| Las Posas stondy fine sandy loam, 9 to 30 percent slopes, eroded | LrE2 | 15 |
| Las Posas stondy fine sandy loam, 9 to 30 percent slopes | LrE | 406 |
| Placentia sandy loam, 0 to 2 percent slopes | PeA | 9 |
| Placentia sandy loam, 2 to 9 percent slopes | PeC | 1,590 |
| Placentia sandy loam, 2 to 9 percent slopes, eroded | PeC2 | 415 |
| Pacentia sandy loam, thick surface, 0 to 2 percent slopes | PfA | 317 |
| Pacentia sandy loam, thick surface, 2 to 9 percent slopes | PfC | 1,411 |
| Ramona sandy loam, 0 to 2 percent slopes | RaA | 112 |
| Ramona sandy loam, 2 to 5 percent slopes | RaB | 1,978 |
| Ramona sandy loam, 5 to 9 percent slopes, eroded | RaC | 962 |
| Ramona sandy loam, 9 to 15 percent slopes, eroded | RaD2 | 434 |
| Reiff fine sandy loam, 0 to 2 percent slopes | RkA | 460 |
| Reiff fine sandy loam, 5 to 9 percent slopes | RkC | 52 |
| San Miguel rocky silt loam, 9 to 30 percent slopes | SmE | 51 |
| Steep gullied land | StG | 266 |
| Visalia sandy loam, 0 to 2 percent slopes | VaA | 1,356 |
| Visalia sandy loam, 2 to 5 percent slopes | VaB | 1,499 |

**Table 4.6-2 continued**

| Soil Type | Abbreviation | Total Acres |
|---|---|---|
| Visalia sandy loam, 5 to 9 percent slopes | VaC | 312 |
| Visalia sandy loam, 9 to 15 percent slopes | VaD | 62 |
| Vista coarse sandy loam, 15 to 30 percent slopes | VsE | 1,190 |
| Vista coarse sandy loam, 15 to 30 percent slopes, eroded | VsE2 | 703 |
| Vista coarse sandy loam, 30 to 65 percent slopes | VsG | 113 |
| Vista coarse sandy loam, 5 to 9 percent slopes | VsC | 785 |
| Vista coarse sandy loam, 9 to 15 percent slopes | VsD | 725 |
| Vista coarse sandy loam, 9 to 15 percent slopes, eroded | VsD2 | 424 |
| Vista rocky coarse sandy loam, 15 to 30 percent slopes | VvE | 562 |
| Vista rocky coarse sandy loam, 30 to 65 percent slopes | VvG | 629 |
| Vista rocky coarse sandy loam, 5 to 15 percent slopes | VvD | 762 |
| Wyman loam, 2 to 5 percent slopes | WmB | 148 |

Source: City of Escondido 2011

## 4.6.1.2 Faults and Seismicity

### Regional Seismic Setting

The faulting and seismicity of southern California is dominated by the compressionary regime associated with the “Big Bend” of the San Andreas Fault Zone. The San Andreas Fault Zone separates two of the major tectonic plates that comprise the earth’s crust. West of the San Andreas Fault Zone lies the Pacific Plate which is moving in a northwesterly direction relative to the North American Plate, which is located east of the San Andreas Fault Zone. This relative movement between the two plates is the driving force of fault ruptures on the west coast of California. The San Andreas Fault generally trends northwest to southeast and is located to the northeast of the proposed project area, outside of San Diego County. A series of sub-parallel faults are located to the west of the San Andreas Fault Zone including the active San Jacinto, Elsinore, and Rose Canyon Fault Zones which each traverse through San Diego County. North of the Transverse Ranges Province, located generally between Santa Barbara and Joshua Tree, the San Andreas fault trends more in an east to west direction (the Big Bend), causing the fault’s right-lateral strike-slip movement to produce north-south compression between the two plates. This compression has produced rapid uplift of many of the mountain ranges in southern California. This crustal shortening is accommodated by faulting (mainly reverse faulting) and causes a large potential for seismicity throughout most of southern California. Faults of the northern Peninsular Ranges Province generally reflect reverse as well as strike-slip faulting patterns, since the province is in a transitionary position between areas dominated by strike-slip movement and by compression.

### Local Seismic Setting

Potential faulting within the proposed project area is limited to a number of inferred fault traces in the southwestern portion of the City. These fault traces have not exhibited any recent activity and are not considered active. Faults showing movement within 1.6 million years (Quaternary) are considered potentially active, and faults showing movement greater than 1.6 million years (Pre-quaternary) are considered inactive. Three active faults, including the San Jacinto Fault, Elsinore Fault and Rose Canyon Fault, have the potential to result in seismic groundshaking within the proposed project area. The Rose

Canyon fault zone is located approximately 15 miles southwest of the proposed project area. The Elsinore fault zone is located approximately 20 miles northeast of the proposed project area. The San Jacinto fault zone is located approximately 40 miles northeast of the proposed project area. These three faults are discussed in greater detail below.

## Magnitude Scales

The strength of an earthquake is generally expressed in two ways: magnitude and intensity. The magnitude is a measure that depends on the seismic energy radiated by the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (such as 6.8). The intensity at a specific location is a measure that depends on the effects of the earthquake on people or buildings. Intensity is expressed in Roman Numerals or whole numbers (example: VI or 6). Although there is only one magnitude for a specific earthquake, there may be many values of intensity (damage) for that earthquake at different sites.

Several magnitude scales have been developed by seismologists. The original is the Richter magnitude, developed in 1932 by the late Dr. Charles F. Richter who was a professor at the California Institute of Technology. The Richter scale quantifies the magnitude and intensity of an earthquake through logarithmic equations. The most commonly used scale today is the Moment magnitude (Mw) scale, jointly developed in 1978 by Dr. Thomas C. Hanks of the USGS and Dr. Hiroo Kanamori, a professor at CalTech. Moment magnitude is related to the physical size of fault rupture and the movement (displacement) across the fault, and as such is a more uniform measure of the strength of an earthquake.

Another measure of earthquake size is seismic moment. The seismic moment determines the energy that can be radiated by an earthquake and hence the seismogram recorded by a modern seismograph. The moment magnitude of an earthquake is defined relative to the seismic moment for that event.

It is important to recognize that earthquake magnitude varies logarithmically with the wave amplitude or seismic moment recorded by a seismograph. Each whole number step in magnitude represents an increase of ten times in the amplitude of the recorded seismic waves, and the energy release increases by a factor of about 31 times. The size of the fault rupture and the fault's displacement (movement) also increase logarithmically with magnitude.

Magnitude scales have no fixed maximum or minimum. Observations have placed the largest recorded earthquake (off-shore from Chile in 1960) at moment magnitude 9.6 and the smallest at -3. Earthquakes with magnitudes smaller than about 2 are called microearthquakes.

Magnitudes are not used to directly estimate damage. An earthquake in a densely populated area, which results in many deaths and considerable damage, may have the same magnitude as an earthquake that occurs in a barren, remote area that does nothing more than frighten wildlife.

## Earthquake Intensity

The first scale to reflect earthquake intensities (damage) was developed by de Rossi of Italy and Forel of Switzerland in the 1880s and is known as the Rossi-Forel Intensity scale. This scale, with values from I to X, was used for about two decades. A need for a more refined scale increased with the advancement of the science of seismology. In 1902, the Italian seismologist, Mercalli, devised a new scale on an I to XII range. The Mercalli intensity scale was modified in 1931 by American seismologists Harry O. Wood and Frank Neumann to take into account modern structural features. Table 4.6-3, Modified Mercalli Intensity Scale, lists the measurements/values in the Modified Mercalli Intensity (MMI) scale.

**Table 4.6-3 Modified Mercalli Intensity Scale**

| MMI Scale Number | Description of Effect |
|---|---|
| I | Not felt except by a very few under especially favorable circumstances. |
| II | Felt only be a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing. |
| III | Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motorcars may rock slightly. Vibration like passing of truck. Duration estimated. |
| IV | During the day felt indoors by many, outdoors by few. At night some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motorcars rocked noticeably. |
| V | Felt by nearly everyone, many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop. |
| VI | Felt by all, many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight. |
| VII | Everybody runs outdoors. Damage negligible in building of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motorcars. |
| VIII | Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, and walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motorcars disturbed. |
| IX | Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken. |
| X | Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks. |
| XI | Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bend greatly. |
| XII | Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted. Objects are thrown upward into the air. |

Source: USGS 2008b

The MMI scale measures the intensity of an earthquake's effects in a given locality, and is perhaps much more meaningful to the layperson because it is based on observations of earthquake effects at specific places. It should be noted that because the data used for assigning intensities are obtained from direct accounts of the earthquake's effects at numerous towns, considerable time (weeks to months) is sometimes needed before an intensity map can be assembled for a particular earthquake.

On the MMI scale, values range from I to XII. The most commonly used adaptation covers the range of intensities from the conditions of I, not felt except by very few, favorably situated, to XII, damage total, lines of sight disturbed, objects thrown into the air. While an earthquake has only one magnitude, it can have much intensity, which typically decreases with distance from the epicenter.

It is difficult to compare magnitude and intensity because intensity is linked with the particular ground and structural conditions of a given area, as well as distance from the earthquake epicenter, while magnitude depends on the energy released by earthquake faulting. However, there is an approximate relation between magnitude and maximum expected intensity close to the epicenter. Table 4.6-4, Comparison of Richter Magnitude and Modified Mercalli Intensity, compares Richter magnitude and MMI values. The areas shaken at or above a given intensity increase logarithmically with earthquake magnitude.

**Table 4.6-4 Comparison of Richter Magnitude and Modified Mercalli Intensity (MMI)**

| Richter Magnitude | Expected MMI Value | Effect at Site |
|---|---|---|
| 2 | I – II | Usually detected only by instruments |
| 3 | III | Felt indoors |
| 4 | IV – V | Felt by most people; slight damage |
| 5 | VI – VII | Felt by all; many frightened and run outdoors; damage minor to moderate |
| 6 | VII – VIII | Everybody runs outdoors; damage moderate to major |
| 7 | IX – X | Major damage |
| 8 | X – XII | Total and major damage |

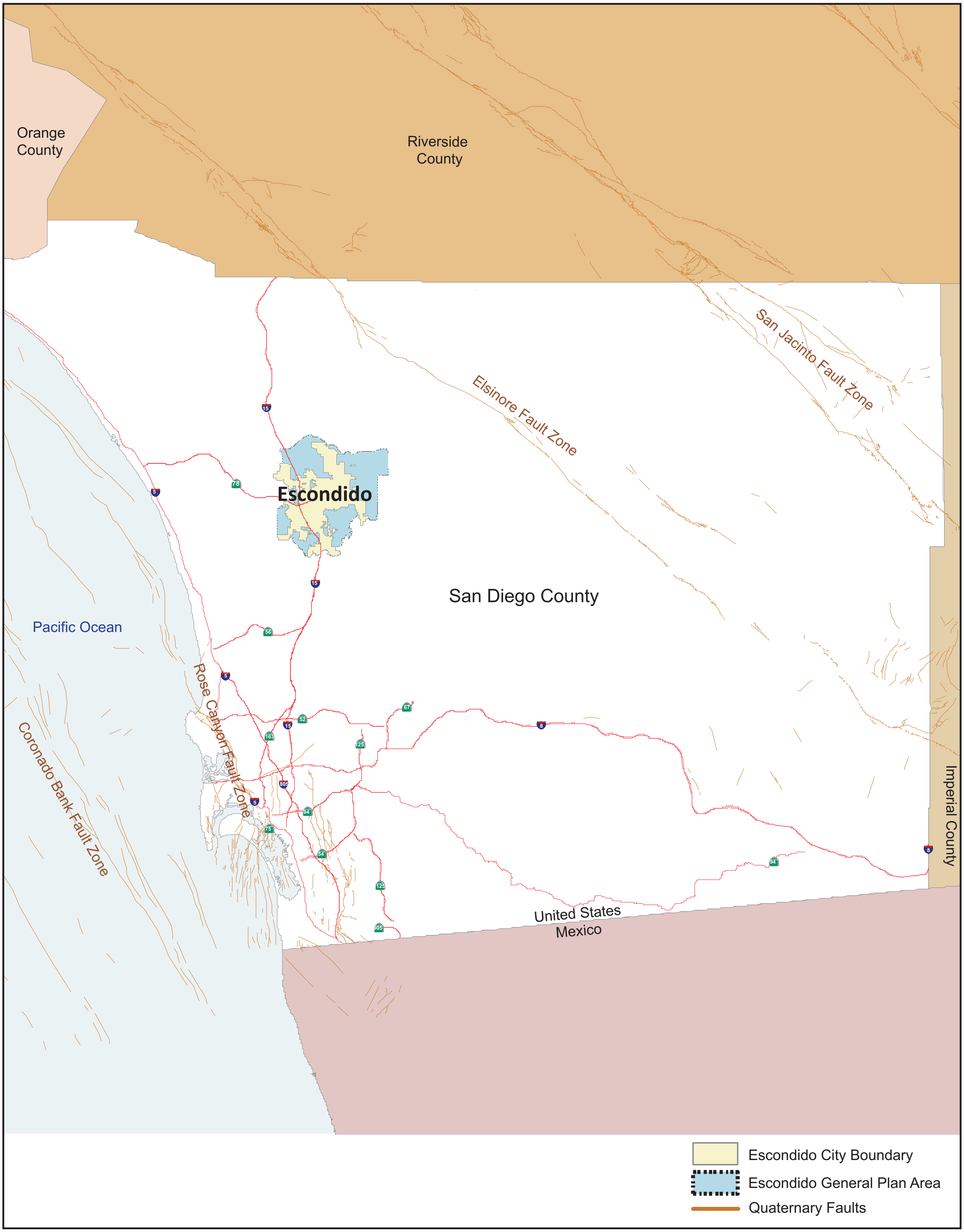
Source: USGS 2008b

## Local Faults and Seismicity

As shown in Figure 4.6-1, Regional Faults, numerous faults have been mapped throughout San Diego County in the vicinity of the proposed project area. Each fault is classified based on its most recent movement as indicated below:

- Historic (movement within the last 200 years)
- Holocene (movement within the past 11,000 years)
- Late-Quaternary (movement within the past 700,000 years)
- Quaternary (age undifferentiated within the past 1.6 million years)
- Pre-Quaternary (movement older than 1.6 million years)

Several major active faults and fault zones are present within the San Diego region, as described below in Table 4.6-5, Active Faults Relevant to the Proposed Project, and shown on Figure 4.6-1, Regional Faults. Active fault zones relevant to the proposed project area include San Jacinto Fault Zone, including Coyote Creek Fault; Elsinore Fault Zone and the nearby Earthquake Valley Fault; and the Rose Canyon Fault Zone, including a series of unnamed faults trending from downtown San Diego across San Diego Bay to the City of Coronado. The San Andreas Fault Zone is not located within the proposed project area, but is included in this discussion because it is a major fault zone with a length of roughly 900-miles in California. A portion of the fault zone traverses through Imperial County, east of the proposed project area.

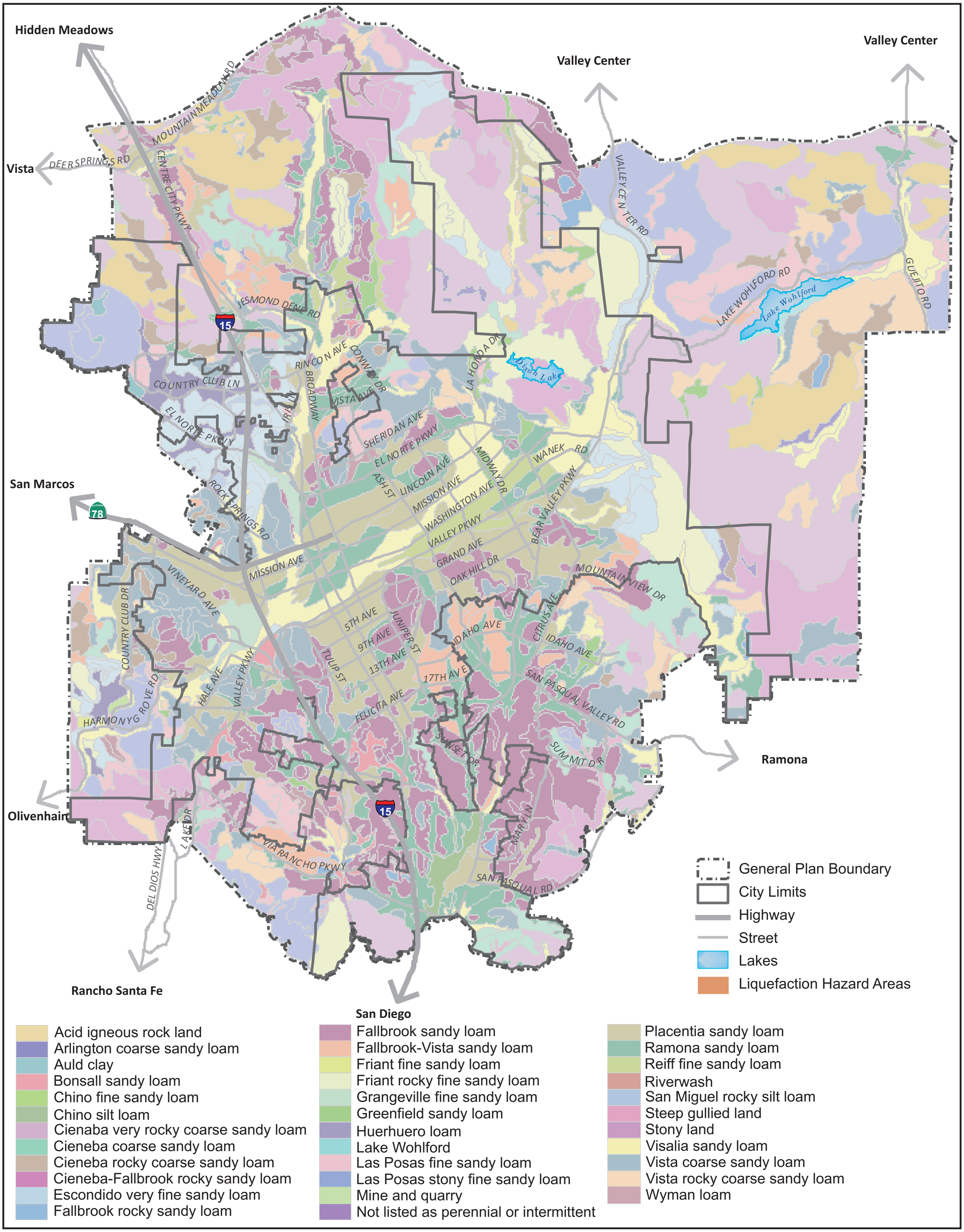



Source: City of Escondido 2011

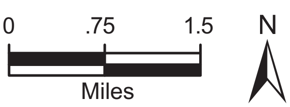


ATKINS

**REGIONAL FAULTS**
**FIGURE 4.6-1**




Source: City of Escondido 2011




**SOIL TYPES**
**FIGURE 4.6-2**

**Table 4.6-5 Active Faults Relevant to the Proposed Project**

| Fault Name | Approximate Distance from Proposed Project Area | Maximum Credible Event[(1)] | Maximum Probably Event[(2)] |
|---|---|---|---|
| San Andreas | 65 miles northwest | 8.2 | -- |
| San Jacinto | 40 miles northeast | 7.2 | -- |
| Coyote Creek | 40 miles northeast | 7.5 | 7.0 |
| Coronado Banks | 28 miles southwest | 6.8 | 6.0 |
| Elsinore | 20 miles northeast | 7.0 | 6.8 |
| Rose Canyon | 15 miles southwest | 7.0 | 6.5 |

(1) The maximum credible earthquake is the maximum earthquake that appears capable of occurring under the presently known tectonic framework, or the earthquake magnitude having a 10 percent probability of being exceeded in a 250-year period.

(2) The maximum probable earthquake is the maximum earthquake having a 10-percent probability of being exceeded in 50 years.

Source: Cotton 2000

## 4.6.1.3 Seismic Hazards

Although no active faults are located within the proposed project area, earthquake-related geologic hazards from other active faults in the region pose a significant threat to the proposed project area and can impact extensive regions of land. Earthquakes can produce fault rupture and strong ground shaking, and can trigger landslides, rockfalls, soil liquefaction, tsunamis, and seiches. In turn, these geologic hazards can lead to other hazards such as fires, dam failures, and toxic chemical releases.

Primary effects of earthquakes include violent ground motion, and sometimes permanent displacement of land associated with surface rupture. Earthquakes can snap and uproot trees, or knock people to the ground. They can also shear or collapse large buildings, bridges, dams, tunnels, pipelines and other rigid structures, as well as damage transportation systems, such as highways, railroads and airports.

Secondary effects of earthquakes include near-term phenomena such as liquefaction, landslides, fires, tsunamis, seiches, and floods. Long-term effects associated with earthquakes include phenomena such as regional subsidence or emergence of landmasses and regional changes in groundwater levels.

The number of people potentially exposed to various hazards in the proposed project area was identified within the most recent Multi-jurisdictional Hazard Mitigation Plan, San Diego, CA (URS 2004). Under existing conditions and within the City of Escondido, the Multi-jurisdictional Hazard Mitigation Plan estimates that 133,666 persons, 31,374 residential buildings, and 409 commercial buildings are potentially at risk of being exposed to losses due to earthquake hazards.

### Fault Rupture

During earthquakes, the ground can rupture at or below the surface. Ground rupture occurs when two lithospheric plates heave past each other, sending waves of motion across the earth. The lithosphere is approximately 75 miles thick and consists of the upper continental and oceanic crusts and the rigid mantle layer that is directly beneath the crust. Earthquakes can cause large vertical and/or horizontal displacement of the ground along the fault. Ground rupture can completely demolish structures by rupturing foundations or by tilting foundation slabs and walls, as well as damage buried and above ground utilities. Drinking water can be lost, and the loss of water lines or water pressure can affect emergency services, including fire fighting ability. Research of historical earthquakes has shown that, although only a few structures have been ripped apart by fault rupture, this hazard can produce severe damage to structures built across active fault lines.

## Alquist-Priolo Earthquake Fault Zones

In 1972, the state passed the Alquist-Priolo (AP) Earthquake Zoning Act to help identify areas subject to severe ground shaking. It also regulated the siting of buildings with regard to surface fault rupture following the 1971 San Fernando Earthquake. Earthquake faults are categorized as active, potentially active, and inactive. A fault is classified as active if it is included as an Earthquake Fault Hazard Zone (EFHZ), which indicated movement within the past 11,000 years. The purpose of this Act is to prohibit the placement of most structures for human occupancy across the traces of active faults; thereby mitigating the hazard of fault ruptures. EFHZs identify the probability of ground rupture for future earthquakes. Where such zones are designated, no buildings or structures may be constructed on the trace of the fault. No EFHZs exist within the proposed project area.

As discussed above, the San Jacinto Fault, Elsinore Fault and Rose Canyon Fault have the potential to result in seismic groundshaking within the proposed project area. These three faults are discussed in greater detail below.

**Rose Canyon Fault Zone**

The Rose Canyon fault zone is about 19 miles in length and extends through the City of San Diego, La Jolla and Linda Vista communities. The Rose Canyon fault zone is located approximately 15 miles southwest of the proposed project area. It has a slip rate category of approximately 1.1 mm/yr. According to the USGS (2000), no historic rupture has occurred on this fault; however, data suggests that there have been a minimum of three surface fault-rupture events in the last approximately 8,100 years. The last large earthquake is estimated to have occurred between 225 and 500 years ago. The faults in this zone typically dip to the east.

**Elsinore Fault Zone**

The Elsinore fault zone crosses eastern San Diego County on an approximately 124-mile path from the Mexican border to the northern end of the Santa Ana Mountains in Los Angeles County. Near its northwestern end in Riverside County, the fault splits into the Whittier and Chino faults. The Elsinore fault zone is located approximately 20 miles northeast of the proposed project area. The maximum probable earthquake for the Elsinore fault zone is estimated at a magnitude of 6.5 to 7.3 on the Richter scale, with a recurrence interval of 60 years. The largest historical earthquake on record on the Elsinore fault is a magnitude 6.0 event in 1910. No surface rupture was found resulting from this earthquake.

An approximately 12-mile wide zone on the northeast flank of the Elsinore fault is occupied by four major fault zones. These are the Agua Tibia-Earthquake Valley zone, Aguanga-San Felipe zone, Agua Caliente fault zone, and the Hot Springs fault zone. Of these zones, only the Agua Tibia-Earthquake Valley fault has shown surface displacement during the last 11,000 years. Therefore, this fault zone is classified as a state-designated Earthquake Fault Rupture Zone (an area of ground ruptures due to fault activities within the past 11,000 years).

**San Jacinto Fault Zone**

The San Jacinto fault zone is a complex fault system that is approximately six miles wide and 155 miles long, extending from its junction with the San Andreas zone in the San Gabriel Mountains to the northern edge of the Gulf of California. The San Jacinto fault zone is located approximately 40 miles northeast of the proposed project area. This zone, which is characterized by straightness, continuity, and high seismicity, is the most active of the southern California plate area faults. It has had 10 earthquakes of magnitude 6.0 or greater since 1890. The San Jacinto fault trends from the northwest to the southeast across the northeastern corner of San Diego County, where its zone includes the Coyote Creek, Clark, San Felipe Hills, Borrego Mountain, and many smaller, unnamed Quaternary faults.

## Ground Shaking

Ground shaking is the earthquake effect that produces the vast majority of damage. Several factors control how ground motion interacts with structures, making the hazard of ground shaking difficult to predict. Earthquakes, or earthquake-induced landslides, can cause damage near and far from fault lines. The potential damage to public and private buildings and infrastructure can threaten public safety and result in significant economic loss. Ground shaking is the most common effect of earthquakes that adversely affects people, animals, and constructed improvements. Several factors control how ground motion interacts with structures, making the hazard of ground shaking difficult to predict. Seismic waves propagating through the earth's crust are responsible for the ground vibrations normally felt during an earthquake. Seismic waves can vibrate in any direction, and at different frequencies, depending on the frequency content of the earthquake rupture mechanism and the path and material through which the waves are propagating. The earthquake rupture mechanism is the distance from the earthquake source, or epicenter, to an affected site.

The California Building Code (CBC) defines different Seismic Design Categories based on building occupancy type and the severity of the probable earthquake ground motion at the site. There are six Seismic Design Categories designated A through F, with Category A having the least seismic potential and Category F having the highest seismic potential. All of San Diego County, including the proposed project area, is located within Seismic Design Categories E and F.

## Liquefaction

Liquefaction occurs primarily in saturated, loose, fine to medium-grained soils in areas where the groundwater table is generally 50 feet or less below the surface. When these sediments are shaken during an earthquake, a sudden increase in pore water pressure causes the soils to lose strength and behave as a liquid. In general, three types of lateral ground displacement are generated from liquefaction: 1) flow failure, which generally occurs on steeper slopes; 2) lateral spread, which generally occurs on gentle slopes; and 3) ground oscillation, which occurs on relatively flat ground. In addition, surface improvements on liquefiable areas may be prone to settlement and related damage in the event of a large earthquake on a regionally active fault. The primary factors that control the type of failure that is induced by liquefaction (if any) include slope, and the density, continuity, and depth of the liquefiable layer.

Adverse effects of liquefaction include:

- Loss of bearing strength so that the ground loses its ability to support structures. Structures can be left leaning or they can collapse.
- Lateral spreading where the ground can slide on a buried liquefied layer. Buildings, roads, pipelines and other structures can be damaged.
- Sand boils of sand-laden water can be ejected from a buried liquefied layer and erupt at the surface. The surrounding ground often fractures and settles.
- Ground oscillation so that the surface layer, riding on a buried liquefied layer, is thrown back and forth by the shaking and can be severely deformed. Land containing walkways, roads, highways, and structures can all be shaken, broken, damaged and/or destroyed.
- Flotation to the surface of light-weight structures that are buried in the ground (e.g., pipelines, sewers, and nearly empty fuel tanks).
- Settlement when liquefied ground re-consolidates following an earthquake.

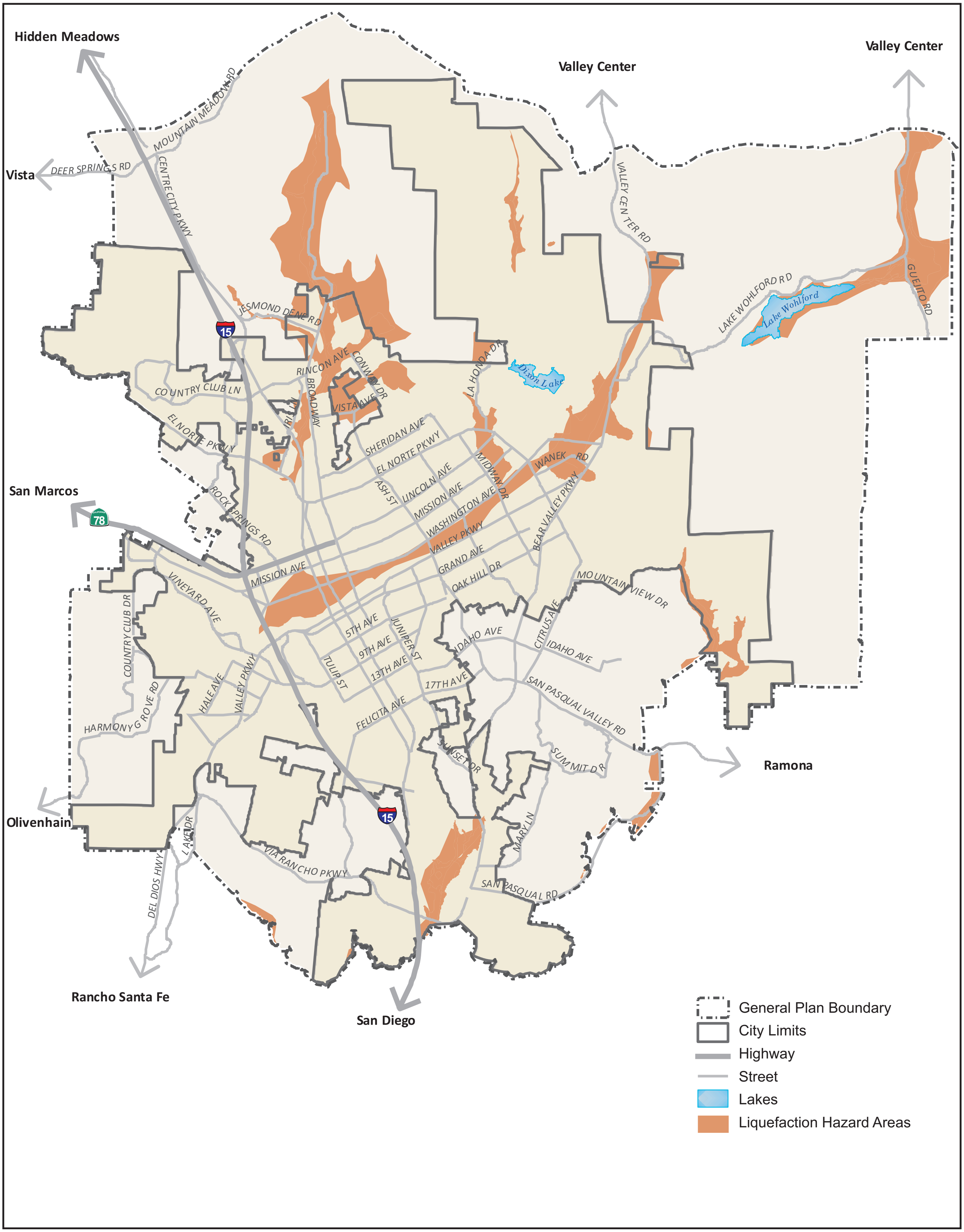
During an earthquake, the solid particles in a shallow sedimentary layer tend to decrease in volume due to ground shaking, causing a reduction in soil strength. Liquefaction only occurs if the sediment is sand sized, loosely consolidated, saturated, subject to vibration. Liquefaction occurs primarily in saturated, loosely consolidated, and fine to medium-grained sandy soils in areas where the groundwater table is generally 50 feet or less below the surface and is subject to vibration. Other important factors contributing to liquefaction include the earthquake's magnitude and the duration of the shaking.

Figure 4.6-3, Liquefaction Hazard Area, depicts locations within the proposed project area that have the potential for liquefaction hazards to occur. In total, approximately 4,082 acres of soil within the proposed project area have the potential for liquefaction to occur. As shown in this figure, liquefaction hazard areas primarily occur along natural waterways, such as Escondido Creek and near Lake Wohlford.

## Landslides

A landslide is the down slope movement of soil and/or rock. Landslides can range in speed from very rapid to an imperceptible slow creep. Landslides can be caused by ground shaking from an earthquake or water from rainfall, septic systems, landscaping, or other origins that infiltrate slopes with unstable material. Boulder-strewn hillsides can pose a boulder-rolling hazard from ground shaking, blasting or a gradual loosening of their contact with the surface. The likelihood of a landslide depends on an area's geologic formations, topography, ground shaking potential, and influences of man. Improper or excessive grading can increase the probability of a landslide. Land alterations such as excavation, placement of fill, removal of vegetative cover, and introduction of water from drainage, irrigation or septic systems may contribute to the instability of a slope and increase the likelihood of a landslide. Undercutting support at the base of a slope, or adding too much weight to the slope, can also produce a landslide.

An example of a typical adverse effect of landslides is the loss of manmade structures, utilities and roads and/or loss of life by a landslide or rockfall that originated on an unstable area upslope of a home. Adverse effects vary with the size or volume of individual landslides/rockfall events and density of development below. The magnitude of such events can range from movement as small as a single boulder to massive movement of millions of cubic yards of material.




Source: City of Escondido 2011

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**LIQUEFACTION HAZARD AREAS**
**FIGURE 4.6-3**

Figure 4.6-4, Landslide Hazard Areas, identifies locations within the proposed project area with landslide potential. In total, approximately 1,678 acres of soils susceptible to landslide hazards exist within the proposed project area. As shown in this figure, the majority of landslide hazards areas are located along the periphery of the proposed project area on slopes greater than 25 percent.

## Subsidence and Settlement

Subsidence, which can be caused by groundwater depletion, seismic activity, and other factors, refers to elevation changes of the land whether slow or sudden. Subsidence can cause a variety of problems including broken utility lines, blocked drainage, or distorted property boundaries and survey lines. According to the Multi-jurisdictional Hazard Mitigation Plan (URS 2004), the underlying geologic formations in the proposed project area are mostly granitic and have a very low potential of subsidence.

## Expansive Soils

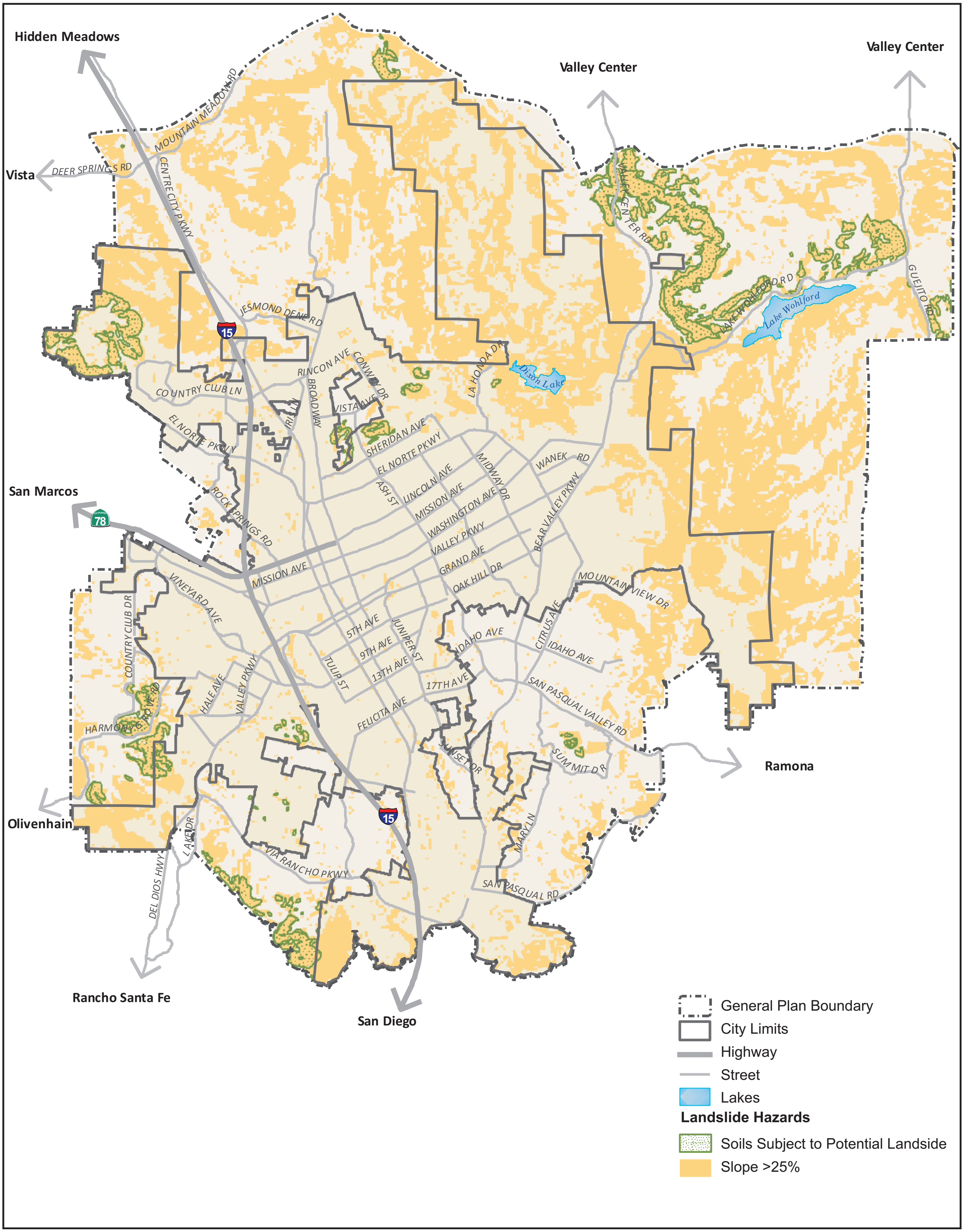
Certain types of clay soils expand when they are saturated and shrink when dried. These are called expansive soils, and can pose a threat to the integrity of structures built on them without proper engineering. Expansive soils are derived primarily from weathering of feldspar minerals and volcanic ash.

The expansion and contraction of the soil varies with the soil moisture content (wet or dry), and can be aggravated by the way a property is maintained or irrigated. Human activities can increase the moisture content of the soils, and the threat of expansive soil damage. For example, a subdivision of homes that continually irrigates the landscaping or removes significant amounts of native vegetation could create this condition.

As shown in Figure 4.6-5, Expansive Soils, areas of highly expansive soils occur predominantly around the periphery of the proposed project area. Soil types within the proposed project area that are considered expansive include: Las Posas stony fine sandy loam, Las Posas fine sandy loam, Auld Clay, and Huerhuero loam. Collectively, expansive soils cover approximately 3,528 acres within the proposed project area.

## Soil Erosion

Erosion of soils can occur from both wind and water sources. Wind erosion physically removes the lighter, less dense soil constituents such as organic matter, clays and silts, which are often the most fertile part of the soil. Surface water runoff erodes agricultural land and undercuts roadbanks, landfills, and riverbanks. Wind moves exposed loose soils off site and can contribute to reduced air quality. Eroded materials fill reservoirs, ponds, and drainage ditches and silt up harbors, streams, and rivers. In the proposed project area, most of the soils series have severe erodibility limitations, the exceptions being the Las Posas, Vista and Wyman series whose limitations are moderate (Cotton 2000).




Source: City of Escondido 2011

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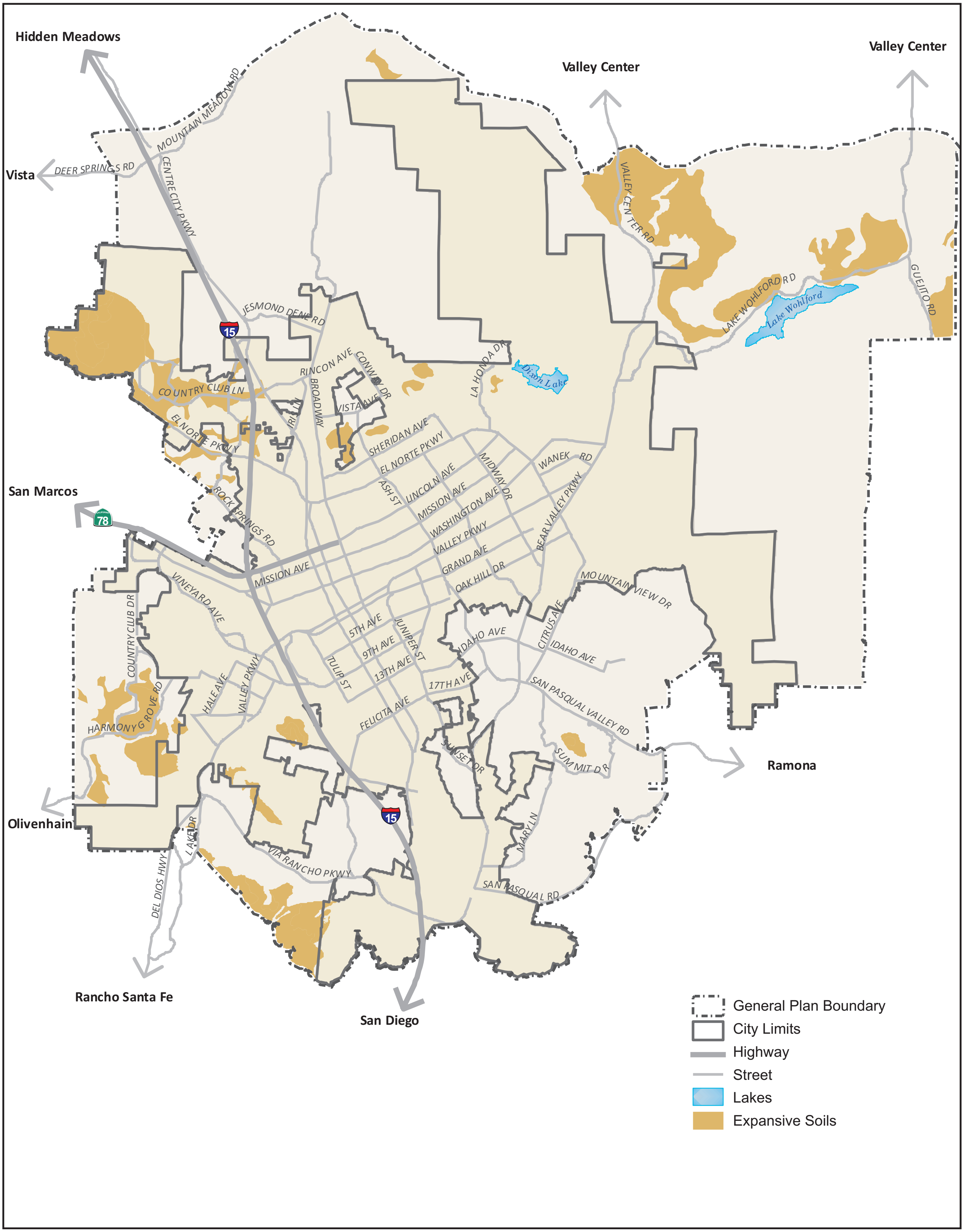
**LANDSLIDE HAZARD AREAS**
**FIGURE 4.6-4**




Source: City of Escondido 2011

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**EXPANSIVE SOILS**
**FIGURE 4.6-5**

# 4.6.2 Regulatory Framework

## 4.6.2.1 Federal

### U.S. Geological Survey Landslide Hazard Program

In fulfillment of the requirements of Public Law 106-113, the USGS created the Landslide Hazard Program in the mid-1970s. According to USGS, the primary objective of the National Landslide Hazards Program (LHP) is to reduce long-term losses from landslide hazards by improving the understanding of the causes of ground failure and suggesting mitigation strategies (USGS 2008a). The federal government takes the lead role in funding and conducting this research, whereas the reduction of losses due to geologic hazards is primarily a state and local responsibility.

## 4.6.2.2 State

### Alquist-Priolo Earthquake Fault Zoning Act

The California Legislature passed this law in 1972 to help identify areas subject to severe ground shaking. This state law requires that proposed developments incorporating tracts of four or more dwelling units investigate the potential for ground rupture within AP zones. These zones identify the probability of ground rupture during future earthquakes. Where such zones are designated, no buildings or structures 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.

### California Building Code

The CBC provides a minimum standard for building design. Chapter 16 of the 2010 CBC contains specific requirements for seismic safety. The CBC includes the addition of more stringent seismic provisions for hospitals, schools, and essential facilities. The CBC contains specific provisions for structures located in seismic zones. Buildings within the proposed project area must conform to Seismic Design Category E or F. Also, California law requires all cities and counties in Seismic Zone 4 (as defined in pre-1997 versions of the code) to identify unreinforced masonry (URM) buildings in their jurisdiction, which are not designed to withstand an earthquake.

### Seismic Hazards Mapping Act

This Act was passed by the state in 1990, to address non-surface fault rupture earthquake hazards, including liquefaction and seismically-induced landslides. No seismic hazard mapping has been completed by the state for the proposed project area. Guidelines for Evaluation and Mitigating Seismic Hazards in California (Special Publication 117) were adopted by the California Mining and Geology Board in 1997 (revised and re-adopted on September 11, 2008 as Special Publication 117a) in accordance with the Seismic Hazards Mapping Act of 1990. The publication contains the guidelines for evaluating seismic hazards other than surface fault rupture (landslides and liquefaction), and for recommending mitigation measures to minimize impacts.

### 4.6.2.3 Regional/Local

#### Chapter 22 of the City of Escondido Municipal Code

Chapter 22 of the City of Escondido's Municipal Code establishes regulations related to storm water management and discharge control, harmful waters and wastes, sewer service charges, private sewage disposal systems, sewer connection fees, sewer-connection laterals, and industrial wastewaters. Article 5 of Chapter 22 of the Code requires all subsurface sewage disposal units and systems to be designed, placed and maintained in accordance with the rules and regulations of the County of San Diego. The County Department of Environmental Health (DEH) is the primary agency charged with regulating the design, construction, and maintenance of septic tanks, leach lines, seepage pits, and alternative onsite wastewater treatment systems throughout the County through a delegation from the Regional Water Quality Control Board (RWQCB).

#### City of Escondido Grading and Erosion Control Ordinance

Article 55 of the Escondido Municipal Code establishes the grading and erosion control regulations for the City. The purpose of this article is to assure that development occurs in a manner which protects the natural and topographic character and identity of the environment, visual integrity of hillsides and ridgelines, sensitive species and unique geologic/geographic features, and the health, safety, and welfare of the general public. This Article regulates grading on private and public property and provides standards and design criteria to control stormwater and erosion during construction activities. The ordinance sets forth rules and regulations to control excavation, grading, earthwork construction (including fills and embankments) and development on hillsides and along ridgelines; establishes the administrative procedures for the issuance of permits; and provides for approval of plans and inspection of grading construction in compliance with stormwater management requirements.

#### County of San Diego Onsite Wastewater System Groundwater Separation Policy

The purpose of the County DEH Onsite Wastewater System Groundwater Separation Policy is three-fold. It serves to: 1) protect groundwater quality by ensuring proper treatment of sewage effluent prior to its entering into groundwater; 2) protect the public health from failing onsite wastewater systems caused by high groundwater; and 3) provide a methodology for the evaluation of potential building sites using onsite wastewater systems.

## 4.6.3 Analysis of Project Impacts and Determination of Significance

### 4.6.3.1 Issue 1: Exposure to Seismic-Related Hazards

#### Guidelines for Determination of Significance

Based on Appendix G of the CEQA Guidelines and existing City policies and regulations, the proposed project would result in a significant impact if it would expose people or structures to potential substantial adverse impacts, including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent AP Earthquake Fault Zoning Map issued by the State Geologist or based on other substantial evidence of a known fault; strong seismic ground shaking; or seismic-related ground failure, including liquefaction; or landslides. The threshold for each of these seismic-related hazards is discussed below.

**Fault Rupture**

The proposed project would result in a significant impact from fault rupture if any building or structure to be used for human occupancy would occur over or within 50 feet of the trace of an AP Fault.

**Seismic Ground Shaking**

The proposed project would result in a significant impact from ground shaking if any building or structure to be used for human occupancy would be located within Seismic Design Category E and F of the CBC and would not conform to the CBC.

**Ground Failure**

The proposed project would have the potential to expose people or structures to substantial adverse effects from liquefaction if:

a. Areas proposed for development contain potentially liquefiable soils;
b. Potentially liquefiable soils are saturated or have the potential to become saturated; or
c. In-situ soil densities are not sufficiently high to preclude liquefaction.

Liquefaction occurs when sediments are shaken during an earthquake and a sudden increase in pore water pressure causes the soils to lose strength and behave as a liquid. In general, three types of lateral ground displacement are generated from liquefaction: 1) flow failure, which generally occurs on steeper slopes; 2) lateral spread, which generally occurs on gentle slopes; and 3) ground oscillation, which occurs on relatively flat ground.

**Landslides**

The proposed project would result in a significant impact from landslide risk if:

a. It would expose people or structures to substantial adverse effects, including the risk of loss, injury, or death involving landslides;

b. It is located on a geologic unit or soil that is unstable, or would become unstable as a result of the proposed project, potentially resulting in an on or offsite landslide; or

c. It lies directly below or on a known area subject to rockfall which would result in the collapse of structures.

## Impact Analysis

The General Plan Update, Downtown Specific Plan Update and E-CAP encompass the same project area, as identified in Figure 3-4, Proposed Land Uses, in Chapter 3, Project Description. For this reason, the following discussion related to seismic-related hazards within the proposed project area applies to the General Plan Update, Downtown Specific Plan Update and E-CAP.

Natural geologic processes that represent a hazard to life, health, or property are considered geologic hazards. Natural geologic hazards that affect people and property in the proposed project area include earthquakes, which can cause surface fault rupture, ground shaking, landslides and liquefaction. As discussed below, these seismic hazards pose a high potential for causing widespread damage. The project's potential to be impacted by the various types of seismic geologic hazards is described below.

**Fault Rupture**

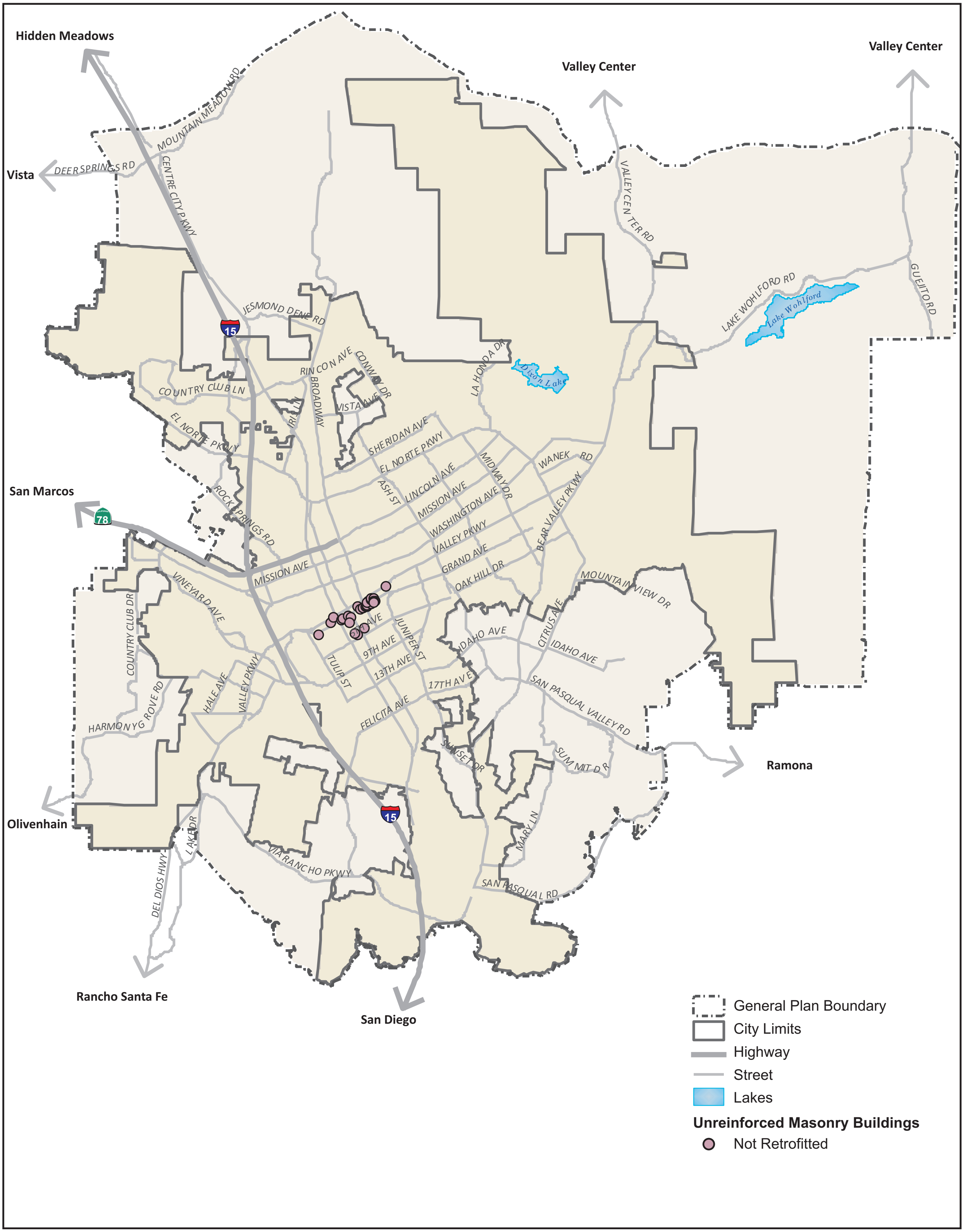
During earthquakes, the ground can rupture at or below the surface. Ground rupture occurs when two lithosphere plates heave past each other, sending waves of motion across the earth. Ground rupture can completely demolish structures by rupturing foundations or by tilting foundation slabs and walls, as well as damage buried and above ground utilities. Drinking water can be lost, and the loss of water lines or water pressure can affect emergency services, including fire fighting ability.

The AP Earthquake Fault Zoning Act identifies areas that are subject to fault rupture. Active faults in the region that could result in fault rupture include segments of the San Jacinto, Elsinore, and Rose Canyon Fault Zones, all of which are located outside of the proposed project area. There are no EFHZs within the proposed project area. Potential faulting within the proposed project area is limited to a number of inferred fault traces in the southwest portion of the City. These faults have not exhibited any recent activity and are not considered active (Cotton 2000). Due to the lack of EFHZs and active faults within the proposed project area, implementation of the proposed project would not place any building or structure to be used for human occupancy over or within 50 feet of the trace of an AP Fault. Therefore, impacts related to fault rupture are considered less than significant.

**Seismic Ground Shaking**

Ground shaking is the most common effect of earthquakes that adversely affects people and constructed improvements. Several factors control how ground motion interacts with structures, making the hazard of ground shaking difficult to predict. Seismic waves propagating through the earth's crust are responsible for the ground vibrations normally felt during an earthquake. Existing, older structures that have not been retrofitted to current building standards (unreinforced masonry buildings) are particularly susceptible to seismic hazards. Unreinforced masonry buildings within the proposed project area that have not been retrofitted to meet seismic safety standards are identified in Table 4.6-6, Unreinforced Masonry Buildings within the Proposed Project Area, and Figure 4.6-6, Unreinforced Masonry Buildings.

The CBC defines different regions of the U.S. and ranks them according to their seismic hazard potential. The entire proposed project area is located within Seismic Design Categories E and F, which have the highest seismic potential. Therefore, exposure to seismic-related ground shaking would result in a potentially significant impact in the proposed project area.




Source: City of Escondido 2011

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**UNREINFORCED MASONRY BUILDINGS**
**FIGURE 4.6-6**

**Table 4.6-6 Unreinforced Masonry Buildings within the Proposed Project Area**

| Building Address | Year Built | Number of Stories | Floor Area (square feet) | Is the Building Historic? | Has the Building Been Retrofitted? |
|---|---|---|---|---|---|
| 133. West Grand Avenue | 1910 | 1 | 3,000 | Yes | No |
| 115 West Grand Avenue | 1910 | 1 | 3,000 | Yes | No |
| 135 West Grand Avenue | 1930 | 1 | 5,000 | Yes | No |
| 154 and 156 West Grant Avenue | 1944 | 1 | 4,950 | Yes | No |
| 323 West Grand Avenue | 1920 | 1 | 3,500 | Yes | No |
| 413/415 West Grand Avenue | 1947 | 1 | 2,000 | No | No |
| 562 West Grand Avenue | Late 1920s | 1 | 4,000 | Yes | No |
| 755 West Grand Avenue | 1920 | 1 | 4,800 | No | No |
| 105 East Grand Avenue | 1909 | 2 | 7,000 | Yes | No |
| 113 East Grand Avenue | 1909 | 1 | 3,500 | Yes | No |
| 119-121 East Grand Avenue | 1909 | 1 | 7,000 | Yes | No |
| 125 East Grand Avenue | 1900 | 1 | 2,500 | Yes | No |
| 132 East Grand Avenue | 1980 | 1 | 1,250 | Yes | No |
| 146-156 East Grand Avenue | 1890 | 1 | 6,255 | Yes | No |
| 157 East Grand Avenue | 1905 | 1 | 7,000 | Yes | No |
| 212 East Grand Avenue | 1927 | 1 | 3,500 | Yes | No |
| 214 East Grand Avenue | 1927 | 1 | 2,125 | Yes | No |
| 215 East Grand Avenue | 1930 | 1 ½ | 3,500 | Yes | No |
| 217 East Grand Avenue | 1930 | 1 | 3,500 | Yes | No |
| 224 East Grand Avenue | 1940 | 1 | 13,000 | Yes | No |
| 237 East Grand Avenue | 1924 | 1 | 2,125 | Yes | No |
| 151-155 East Valley Parkway | 1920s | 2 | 6,000 | Yes | No |
| 515 West Valley Parkway | 1920 | 1 | 5,000 | Yes | No |
| 341-345 West Second Avenue | 1920 | 1 | 3,160 | Yes | No |
| 361 West 4th Avenue | 1887 | 1 | 2,200 | Yes | No |
| 228 North Broadway | 1920 | 1 | 1,650 | No | No |
| 131/133 South Escondido Boulevard | 1930 | 1 | 1,200 | Yes | No |
| 444 South Escondido Boulevard | 1928 | 1 | 2,784 | Yes | No |

Source: Escondido GIS 2011

### Liquefaction

Liquefaction occurs primarily in saturated, loose, fine to medium-grained soils in areas where the groundwater table is generally 50 feet or less below the surface. When these sediments are shaken during an earthquake, a sudden increase in pore water pressure can cause the soils to lose strength and behave as a liquid. There may be a potential for liquefaction in areas with loose sandy soils combined with a shallow groundwater table, which typically are located in alluvial river valleys/basins and floodplains. Figure 4.6-3, Liquefaction Hazard Areas, depicts areas with the potential for liquefaction to occur within the proposed project area. In total, approximately 4,082 acres of soil with the potential for liquefaction are located within the proposed project area. As shown in this figure, liquefaction hazard areas primarily occur along natural waterways, such as Escondido Creek, Reidy Creek and Lake Wohlford. Under the proposed General Plan Update, a variety of land uses would be located in areas subject to liquefaction. For example, areas along Washington Avenue designated for rural, estate, urban, commercial and industrial land uses would be subject to liquefaction. In addition, areas along Reidy Creek designated for rural and estate land uses and areas near Lake Wohlford designated for rural land uses would be subject to liquefaction (see Figure 4.6-3, Liquefaction Hazard Areas). These land use designations would allow for the construction of structures which allow human habitation and occupation. Therefore, implementation of the proposed General Plan Update would have the potential to expose people or structures to substantial adverse effects from liquefaction.

**Landslides**

Ground shaking from an earthquake can cause landslides or result in a boulder-rolling hazard in boulder-strewn hillside areas. Figure 4.6-4, Landslide Hazard Areas, identifies areas within the proposed project area that have a potential for landslides to occur. In total, approximately 1,678 acres of soils susceptible to landslide hazards exist within the proposed project area. As shown in this figure, the majority of the landslide hazard areas are located along the periphery of the proposed project area. The proposed project area has an abundance of steep slopes above 25 percent in grade. However, as shown in Figure 4.6-4, Landslide Hazard Areas, only a small amount of these steep slopes are considered at risk of landslide.

The General Plan Update primarily proposes low density land use designations in areas identified with landslide hazards. For example, under implementation of the proposed General Plan Update, the landslide hazard area that exists in the northeast area of the proposed planning area along Valley Center Road and Lake Wohlford Road would be designated with Residential I and public/open space land uses (see Figure 4.6-4, Landslide Hazard Areas). Further, landslide susceptible areas in the southwestern portion of the proposed project area along Harmony Grove Road would be designated with Residential I and Residential II land uses under implementation of the General Plan Update. Although the proposed General Plan Update generally allows only low density land uses within landslide hazard areas, such as estate and residential, development of these land uses would still allow for structures that involve human occupation or habitation. Therefore, implementation of the proposed General Plan Update could expose people or structures to substantial adverse effects, including the risk of loss, injury, or death, involving landslides.

**Federal, State and Local Regulations and Existing Regulatory Processes**

Seismic hazard regulations are in place at the state level that reduce risks associated with seismic-related hazards, such as seismic groundshaking, through avoidance or building standards and include the AP Earthquake Fault Zoning Act and Special Publication 117, as described above in Section 4.6.2, Regulatory Framework. Construction standards have been developed to ensure structures can withstand seismic events, including structural engineering requirements that have been incorporated into the CBC, which lower the associated risks of seismic shaking. The CBC includes specific seismic hazards standards for construction within areas of high seismic activity. To ensure that these safety measures are met, the CBC employs a permit system based on hazard classification. The CBC, which was updated in 2010, is based largely on the IBC but includes the addition of more stringent seismic provisions for hospitals, schools, and essential facilities. Buildings within proposed project area must conform to the Seismic Design Categories E and F structural design requirements of the CBC, which identify the requirements for the most active seismic zone. Effective design measures include constructing earth fills to partially absorb underlying ground movements; isolating foundations from the underlying ground movements; and designing strong, ductile foundations that can accommodate some deformation without compromising the functionality of the structure (Bray 2006). Any above-ground structure is required to comply with the structural parameters set forth within the most current edition of the CBC in order to anticipate and avoid the potential for adverse impacts from seismic ground shaking.

**Proposed General Plan Update Policies**

The proposed General Plan Update addresses geologic hazards in the Community Protection Element. Within this Element, Soils and Seismicity Policies 7.1 through 7.4 require adoption and enforcement of seismic and geologic safety standards; minimal public utility development in areas with geologic and seismic hazards; and preparation of a site-specific geotechnical analysis in areas with potential geologic and seismic hazards. Soils and Seismicity Policies 7.5 and 7.6 require the avoidance of development in areas susceptible to erosion and sediment loss and encourage the upgrade of buildings that do not meet current building code standards.

Within the Land Use and Community Form Element, Environmental Review Policies 18.1 through 18.4 require project conformance with CEQA, the General Plan, facilities plans, and quality of life standards; mitigation of environmental impacts; and an update of environmental thresholds in sensitive areas.

**Proposed Downtown Specific Plan Update Policies**

The proposed Downtown Specific Plan Update does not contain any policies related to seismic hazards.

**Proposed Escondido Climate Action Plan Reduction Measures**

The proposed E-CAP does not contain any reduction measures related to seismic hazards.

### Summary

Implementation of the proposed General Plan Update would designate land uses that would allow development to occur in areas with geological risks such as seismically-induced ground shaking, liquefaction, and landslides. Impacts from seismically-induced fault rupture would not occur due to the lack of active fault traces in the proposed project area. Future development consistent with the proposed project would be required to comply with all relevant federal and state regulations and building standards, including Seismic Design Categories E and F structural design requirements identified in the CBC. Additionally, the proposed General Plan Update includes multiple policies intended to reduce seismic hazards. Therefore, impacts from seismically-induced fault rupture, ground shaking, liquefaction, and landslides would be less than significant.

## 4.6.3.2 Issue 2: Soil Erosion or Topsoil Loss

### Guidelines for Determination of Significance

Based on Appendix G of the CEQA Guidelines and existing City policies and regulations, the proposed project would result in a significant impact if it would result in substantial soil erosion or loss of topsoil from construction or operational activities.

## Impact Analysis

The General Plan Update, Downtown Specific Plan Update and E-CAP encompass the same project area, as identified in Figure 3-4, Proposed Land Uses, in Chapter 3, Project Description. For this reason, the following discussion related to soil erosion or topsoil loss within the proposed project area applies to the General Plan Update, Downtown Specific Plan Update and E-CAP.

Topsoil is the uppermost layer of soil, usually comprised of the top six to eight inches below the ground surface. It has the highest concentration of organic matter and microorganisms, and is where most biological soil activity occurs. Plants generally concentrate their roots in, and obtain most of their nutrients from, this layer of soil. Topsoil erosion is of concern when the topsoil layer is blown or washed away. This creates an environment that doesn't support the plants and animals otherwise present in topsoil and disrupts the food chain and local ecosystem. It can also increase the rate of pollutants that become airborne or are discharged to watersheds.

Implementation of the General Plan Update would allow the development of designated land uses that would have the potential to expose topsoil to erosion from water or wind resulting from construction or operational activities. Development of land uses would expose topsoil to erosion during earthmoving and grading activities. Land uses proposed under the General Plan Update that would allow for development that generally requires intensive construction activities include urban, commercial and industrial uses. These types of uses are proposed throughout the 15 study areas and non-study areas throughout the General Plan Update planning boundary. Additionally, the development of land uses would result in a permanent increase in impermeable areas, which would increase surface water runoff and associated erosion. Erosion from water runoff is discussed in greater detail in Section 4.9, Hydrology and Water Quality, Issue 3: Erosion or Siltation. As described in this section, projects that result in channel modification and hydromodification, which is the alteration of the natural flow of water through a landscape, as well grading and excavation during construction, would have the potential to result in an increase in erosion or topsoil loss from surface water runoff. Additionally, removal of vegetation during or after construction that would expose topsoil to wind may result in topsoil being blown away. Some components of topsoil may also become airborne and contribute to air pollution in the form of particulate matter. Project-related airborne pollutants, including particulate matter, are discussed in Section 4.3, Air Quality. Implementation of the proposed project would have the potential to result in substantial soil erosion or loss of topsoil from construction or operational activities. Impacts would be potentially significant.

#### Federal, State and Local Regulations and Existing Regulatory Processes

All construction activities occurring under the proposed project would be required to comply with the CBC, which would ensure implementation of appropriate measures during grading and construction activities to reduce soil erosion. Construction occurring under the proposed General Plan Update would be required to comply with the National Pollutant Discharge Elimination System (NPDES) permit program, which requires stormwater pollution prevention plans (SWPPPs) to be prepared and best management practices (BMPs) to be identified for construction sites greater than one acre. Implementation of appropriate BMPs would protect water quality by controlling storm water runoff.

#### Proposed General Plan Update Policies

Within the Community Protection Element, Soils and Seismicity Policy 7.5 requires the avoidance of development in areas susceptible to erosion and sediment loss. Within the Mobility and Infrastructure

Element, Storm Drainage Policy 12.6 requires new development to minimize impervious surfaces and maximize low impact development to reduce erosion.

Within the Land Use and Community Form Element, Environmental Review Policies 18.1 through 18.4 require project conformance with CEQA, the General Plan, facilities plans, and quality of life standards; mitigation of environmental impacts; and an update of environmental thresholds in sensitive areas.

**Proposed Downtown Specific Plan Update Policies**

The proposed Downtown Specific Plan Update does not contain any policies related to soil erosion or topsoil loss.

**Proposed Escondido Climate Action Plan Reduction Measures**

The proposed E-CAP does not contain any reduction measures related to soil erosion or topsoil loss.

## Summary

Compliance with existing regulations, such as the CBC and NPDES permit program, and the policies identified in the General Plan Update would reduce potential impacts to soil erosion or the loss of topsoil from implementation of the proposed project to below a level of significance.

# 4.6.3.3 Issue 3: Soil Stability

## Guidelines for Determination of Significance

Based on Appendix G of the CEQA Guidelines and existing City policies and regulations, the proposed project would result in a potentially significant impact if it would be located on a geologic unit or soil that is unstable, or that would become unstable as a result of future development, and potentially result in on or offsite landslides, lateral spreading, subsidence, liquefaction, or collapse. Lateral spreading is a shallow, water-saturated landslide deformation often triggered from seismically-induced liquefaction. Subsidence, which can be caused by groundwater depletion, seismic activity, and other factors, refers to elevation changes of the land whether slow or sudden.

## Impact Analysis

The General Plan Update, Downtown Specific Plan Update and E-CAP encompass the same project area, as identified in Figure 3-4, Proposed Land Uses, in Chapter 3, Project Description. For this reason, the following discussion related to soil stability within the proposed project area applies to the General Plan Update, Downtown Specific Plan Update and E-CAP. The soil stability risks that can cause such geologic hazards are addressed individually below.

**Landslide and Lateral Spreading**

Non-seismically induced landslides can be caused by water from rainfall, septic systems, landscaping, or other origins that infiltrate slopes with unstable material. Boulder-strewn hillsides can pose a boulder-rolling hazard from blasting or a gradual loosening of their contact with the surface.

Figure 4.6-4, Landslide Hazard Areas, identifies areas within the proposed project area with landslide potential. In total, approximately 1,678 acres of soils susceptible to landslide hazards exist within the proposed project area. As shown in this figure, the majority of landslide hazard areas are located along the periphery of the proposed project area. The City has an abundance of steep slopes above 25 percent in grade. However, as shown in this figure, only a small amount of these steep slopes are considered at risk of landslide. According to the Multi-jurisdictional Hazard Mitigation Plan (URS 2004), no people, residential buildings or commercial buildings within the City are at high risk for rain-induced landslides. Approximately 15,158 persons, 5,880 residential buildings, and 40 commercial buildings are at moderate risk for rain-induced landslides. As discussed in Section 4.6.3.1, Issue 1: Exposure to Seismic Related Hazards, implementation of the proposed General Plan Update would designate land uses that allow for human occupation or habitation within potential landslide areas. Therefore, implementation of the proposed project could expose people or structures to substantial adverse effects, including the risk of loss, injury, or death, involving landslides.

Lateral spreading is a shallow, water-saturated landslide deformation. According to the Multi-jurisdictional Hazard Mitigation Plan, the entire County of San Diego, including the proposed project area, has had no known cases of lateral spreading resulting in damage to property or structures (URS 2004). Therefore, implementation of the proposed project would not expose people or structures to adverse effects associated with lateral spreading.

**Subsidence**

Subsidence refers to elevation changes of the land whether slow or sudden. Subsidence can cause a variety of problems including broken utility lines, blocked drainage, or distorted property boundaries and survey lines. According to the Multi-jurisdictional Hazard Mitigation Plan (URS 2004), the underlying geologic formations in the entire County of San Diego, including the proposed project area, are mostly granitic and have a very low potential of subsidence. Therefore, the proposed project is not anticipated to result in a potentially significant impact resulting from locating structures in areas at risk for subsidence.

**Liquefaction**

Figure 4.6-3, Liquefaction Hazard Areas, depicts areas with the potential for liquefaction to occur in the proposed project area. In total, approximately 4,082 acres of soil with the potential for liquefaction exist within the proposed project area. As shown in this figure, liquefaction hazard areas primarily occur along natural waterways, such as Escondido Creek and near Lake Wohlford. Under the proposed General Plan Update, a variety of land uses would be located in areas subject to liquefaction. For example, areas along Washington Avenue designated for residential, estate, urban, commercial and industrial land uses would be subject to liquefaction (see Figure 4.6-3, Liquefaction Hazard Areas). These land use designations would allow for the construction of structures used for human habitation and occupation. Therefore, implementation of the proposed project would have the potential to expose people or structures to substantial adverse effects from liquefaction.

**Federal, State and Local Regulations and Existing Regulatory Processes**

Chapter 33 of the CBC contains specific requirements pertaining to site demolition, excavation, and construction to protect people and property from hazards associated with excavation cave-ins and falling debris or construction materials. Chapter 70 of the CBC regulates grading activities, including drainage and erosion control. The City's Grading Ordinance also includes requirements to ensure soil stability during grading and construction, including requirements for steepening of slopes. Additionally, the Multi-Jurisdictional Hazard Mitigation Plan (URS 2004) is relied upon to determine the potential for subsidence.

**Proposed General Plan Update Policies**

The proposed General Plan Update addresses geologic hazards in the Community Protection Element. Within this Element, Soils and Seismicity Policies 7.1 through 7.4 require adoption and enforcement of seismic and geologic safety standards; minimal public utility development in areas with geologic and seismic hazards; and preparation of a site-specific geotechnical analysis in areas with potential geologic and seismic hazards. Soils and Seismicity Policy 7.6 encourages the upgrade of buildings that do not meet current building code standards.

Within the Land Use and Community Form Element, Environmental Review Policies 18.1 through 18.4 require project conformance with CEQA, the General Plan, facilities plans, and quality of life standards; mitigation of environmental impacts; and an update of environmental thresholds in sensitive areas.

**Proposed Downtown Specific Plan Update Policies**

The proposed Downtown Specific Plan Update does not contain any policies related to soil stability.

**Proposed Escondido Climate Action Plan Reduction Measures**

The proposed E-CAP does not contain any reduction measures related to soil stability.

## Summary

Implementation of the proposed General Plan Update would have the potential to result in hazards associated with landslides and liquefaction. However, future development under the General Plan Update would be required to comply with federal and state building standards and regulations, including the CBC. Compliance with such regulations, in addition to implementation of the proposed General Plan Update policies, would reduce impacts associated with on or offsite landslides and liquefaction to a less than significant level.

# 4.6.3.4 Issue 4: Expansive Soils

## Guidelines for Determination of Significance

Based on Appendix G of the CEQA Guidelines and existing City policies and regulations, the proposed project would result in a significant impact if it would be located on expansive soil, as defined in Section 1802A.3.2 of the CBC, creating substantial risks to life or property.

## Impact Analysis

The General Plan Update, Downtown Specific Plan Update and E-CAP encompass the same project area, as identified in Figure 3-4, Proposed Land Uses, in Chapter 3, Project Description. For this reason, the following discussion related to expansive soils within the proposed project area applies to the General Plan Update, Downtown Specific Plan Update and E-CAP.

Certain types of clay soils expand when they are saturated and shrink when dried. These are called expansive soils, and can pose a threat to the integrity of structures built on them without proper engineering. If the moisture content and/or soil type differs at various locations under the foundation of a structure, localized or non-uniform movement may occur. This movement can cause damage to the foundation and building structural system, evidenced by cracking of the slab or foundation, cracking in the exterior or interior wall coverings (indicating movement of support framing), uneven floors, and/or misaligned doors and windows.

As shown in Figure 4.6-5, Expansive Soils, areas of highly expansive soils occur predominantly around the periphery of the proposed project planning area. Soil types within the proposed project area that are considered expansive include: Las Posas stony fine sandy loam, Las Posas fine sandy loam, Auld Clay, and Huerhuero loam. Collectively, expansive soils cover approximately 3,528 acres within the proposed project area. Under the proposed General Plan Update, the majority of land uses in areas with expansive soils would be low density. For example, the General Plan Update would designate Residential I and public land/open space land uses along Valley Center Road, which is located in an area subject to expansive soils. Additionally, areas surrounding Country Club Lane, which is also located in an area subject to expansive soils, would be designated with neighborhood commercial land uses under implementation of the General Plan Update. These land uses would allow for the development of homes and/or other structures which would have the potential to be adversely impacted by expansive soils. Therefore, implementation of the proposed General Plan Update would result in a significant expansive soil impact.

**Federal, State and Local Regulations and Existing Regulatory Processes**

Construction standards have been developed to ensure structures can withstand changes in the integrity of the soil. Structural engineering standards have been incorporated into the CBC. If a project is located within a zone that has high shrink-swell soils, compliance with the structural and engineering standards set forth within the CBC are required. Such standards require that all development adhere to strict guidelines for construction on soils that are within a high shrink-swell category as defined by the U.S. Department of Agriculture, San Diego Soil Survey. The CBC also contains construction and engineering standards for projects located in areas that have high shrink-swell soils. The provisions of the CBC require that a geotechnical investigation be performed to provide data for the architect and/or engineer to responsibly design the project.

**Proposed General Plan Update Policies**

The proposed General Plan Update addresses geologic hazards in the Community Protection Element. Within this Element, Soils and Seismicity Policies 7.1 through 7.4 require adoption and enforcement of seismic and geologic safety standards; minimal public utility development in areas with geologic and seismic hazards; and preparation of a site-specific geotechnical analysis in areas with potential geologic and seismic hazards. Soils and Seismicity Policy 7.6 encourage the upgrade of buildings that do not meet current building code standards.

Within the Land Use and Community Form Element, Environmental Review Policies 18.1 through 18.4 require project conformance with CEQA, the General Plan, facilities plans, and quality of life standards; mitigation of environmental impacts; and an update of environmental thresholds in sensitive areas.

**Proposed Downtown Specific Plan Update Policies**

The proposed Downtown Specific Plan Update does not contain any policies related to expansive soils.

**Proposed Escondido Climate Action Plan Reduction Measures**

The proposed E-CAP does not contain any reduction measures related to expansive soils.

## Summary

The General Plan Update would designate land uses that would allow for the development of structures on potentially expansive soils. Therefore, future construction projects in the proposed project area would be affected by expansive soils. However, projects would be required to comply with all applicable federal and state regulations, including the CBC. Compliance with such regulations, and implementation of proposed General Plan Update policies, would reduce potentially significant impacts to below a level of significance.

# 4.6.3.5 Issue 5: Wastewater Disposal Systems

## Guidelines for Determination of Significance

Based on Appendix G of the CEQA Guidelines and existing City policies and regulations, the proposed project would result in a significant impact if it would 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. Soil types that may be incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems include soils in the Auld, Bonsall, Chino, Fallbrook, Huerhuero, Los Posas, Placentia, Ramona, San Miguel, and Wyman series.

## Impact Analysis

The General Plan Update, Downtown Specific Plan Update and E-CAP encompass the same project area, as identified in Figure 3-4, Proposed Land Uses, in Chapter 3, Project Description. For this reason, the following discussion related to soils capable of adequately supporting wastewater disposal systems within the proposed project area applies to the General Plan Update, Downtown Specific Plan Update and E-CAP.

As described in Section 4.17, Utilities and Service Systems, wastewater districts are generally responsible for providing collection, transmission, and disposal of sewage within the proposed project area. However, some areas within the proposed project area would require the installation of septic systems to serve the wastewater needs of future development. Figure 4.17-2, Future Septic System Areas, identifies areas within the proposed project area that would potentially require the installation of septic systems. As shown in this figure, the majority of areas that would potentially require septic systems under implementation of the General Plan Update are located along the periphery of the planning area, primarily within the unincorporated communities of Valley Center, Twin Oaks, Hidden Meadows and NC Metro. Land uses proposed in these areas include rural, estate, SPAs and public land/open space. Land uses designated as rural, estate and SPAs have the potential to result in residential development that would potentially require the installation of septic systems. Some of the areas identified as requiring septic systems would potentially be located on soil units incapable of adequately supporting the use of septic systems, including Auld, Bonsall, Chino, Fallbrook, Huerhuero, Los Posas, Placentia, Ramona, San Miguel, and Wyman soils. Therefore, impacts would be potentially significant.

**Federal, State and Local Regulations and Existing Regulatory Processes**

Discharged wastewater must conform to the RWQCB applicable standards of the San Diego RWQCB, including the Regional Basin Plan and the California Water Code. Onsite wastewater treatment systems (OWTS) discharge pollutants to groundwater, and therefore are regulated by the State Water Code. California Water Code Section 13282 allows RWQCBs to authorize a local public agency to issue permits for OWTS to ensure that systems are adequately designed, located, sized, spaced, constructed and maintained. The San Diego RWQCB has authorized the County DEH to issue OWTS permits within the City of Escondido. The County DEH is responsible for ensuring that septic systems are properly sited and installed both in the unincorporated County and the City of Escondido.

Project-specific analyses would be required for future developments that would rely on OWTS in order to determine if the site is capable of supporting an OWTS. A permit must be obtained to install any new OWTS. The County DEH has several policies in place for the permitting of septic systems. The Design Manual for Onsite Wastewater Treatment Systems (County 2008) describes how OWTS are reviewed and permits are issued in San Diego County. The document also includes design criteria for these systems.

The first step in obtaining a permit is a percolation test that determines if the soil is capable of supporting OWTS. Additionally, several other factors are considered. The distance between the bottoms of the OWTS leach field and groundwater is a factor. All conventional OWTS require at least five feet of unsaturated soil between the bottom of the sewage disposal system and the highest anticipated groundwater level for the site. Anticipated peak daily flow is also considered and is often a factor in the number of bedrooms proposed by residential projects. The area available on a parcel that meets all setback requirements to structures, easements, watercourses, or other geologic limiting factors for the design of an OWTS determines whether a site is large enough to accommodate all design features required for an OWTS. Future development within the proposed project area that would require OWTS would also be required to comply with the County's Onsite Wastewater System Groundwater Separation Policy and County Code Sections 68.301 and 68.601, described above in Section 4.6.2, Regulatory Framework.

Any septic system constructed within the City of Escondido would be subject to Article 5 of Chapter 22 of the City of Escondido Municipal Code, which requires all subsurface sewage disposal units and systems to be designed, placed and maintained in accordance with the rules and regulations of the County of San Diego.

**Proposed General Plan Update Policies**

There are no General Plan Update policies specific to septic systems. However, multiple policies exist that are related to municipal wastewater treatment including Wastewater System Policies 11.1 through 11.11 within the Mobility and Infrastructure Element.

Within the Land Use and Community Form Element, Environmental Review Policies 18.1 through 18.4 require project conformance with CEQA, the General Plan, facilities plans, quality of life standards; mitigation of environmental impacts; and an update of environmental thresholds in sensitive areas.

**Proposed Downtown Specific Plan Update Policies**

The proposed Downtown Specific Plan Update does not contain any policies pertaining to soils capable of supporting the use of septic tanks or alternative wastewater disposal systems.

**Proposed Escondido Climate Action Plan Reduction Measures**

The proposed E-CAP does not contain any reduction measures pertaining to soils capable of supporting the use of septic tanks or alternative wastewater disposal systems.

### Summary

Implementation of the proposed General Plan Update would designate land uses that have the potential to allow development to occur in areas where soils are incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems. However, future development projects would be required to comply with all applicable state and local regulations related to septic tanks and wastewater disposal, including County DEH requirements for issuance of an OWTS permit. Compliance with such regulations would reduce the potential for septic systems to be located in areas with soils incapable of supporting such systems. Therefore, impacts would be less than significant.

## 4.6.4 Cumulative Impacts

The geographic scope of the cumulative impact analysis for geology is limited to the immediate area of the geologic constraint, with the exception of some geologic impacts that are regional, such as earthquake risk.

### Issue 1: Exposure to Seismic Related Hazards

Most of southern California is located in an area of a relatively high seismic activity, including cumulative projects in the San Diego region. Cumulative projects, such as those located in adjacent city and county jurisdictions, would be subject to the CBC, which contains requirements for development in areas subject to Seismic Design Categories E and F. Additionally, cumulative projects would be subject to the AP Earthquake Fault Zone Act, which restricts development on active fault traces. Compliance with these regulations would result in a less than significant regional cumulative impact. The proposed project, in combination with other cumulative projects, would not contribute to a potentially significant cumulative impact.

### Issue 2: Soil Erosion or Topsoil Loss

Cumulative projects would have the potential to result in substantial soil erosion or the loss of topsoil through construction activities such as grading and excavation that would result in topsoil being washed or blown away. Cumulative projects would result in sedimentation to stream courses which would result in a potentially significant cumulative impact. Most cumulative projects would be subject to state and local runoff and erosion prevention requirements, including the applicable provisions of the CBC and SWRCB general construction permit which requires the implementation of BMPs to reduce potential impacts associated with the hydromodification of project sites. These measures would be required to be implemented as conditions of approval for future development projects and are subject to continuing enforcement. Therefore, cumulative projects in the region would not result in a significant cumulative impact. The proposed project, in combination with other cumulative projects, would not contribute to a potentially significant cumulative impact.

### Issue 3: Soil Stability

Cumulative projects would have the potential to be located on geologic units or soils that are unstable, or that would become unstable as a result of the project, and potentially result in on or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse. Cumulative projects would be required to undergo analysis of geological and soil conditions applicable to the development site in question during CEQA environmental review and comply with all applicable regulations to reduce risks, including the CBC. Cumulative project compliance with applicable regulations would ensure that a significant regional cumulative impact would not occur. The proposed project, in combination with other cumulative projects, would not contribute to a potentially significant cumulative impact.

### Issue 4: Expansive Soils

Cumulative projects would have the potential to be located on expansive soil, as defined in Section 1802A.3.2 of the CBC, which would potentially create substantial risks to life or property. Cumulative projects would be subject to construction standards that have been developed to ensure structures can withstand changes in the integrity of the soil, including those identified in the CBC. Therefore, cumulative projects in the region would not result in a significant cumulative impact. The proposed project, in combination with other cumulative projects, would not contribute to a potentially significant cumulative impact.

### Issue 5: Wastewater Disposal Systems

Many cumulative projects would be located in areas served by municipal sewer systems and would not require OWTS. However, some cumulative projects would be located in areas where sewers are not available and would have the potential to contain soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems. Adjacent jurisdictions have permit requirements for OWTS in place for the purpose of public health and safety and cumulative projects would be required to comply with these requirements or they would not receive an OWTS permit. Therefore, cumulative projects in the region would not result in a significant cumulative impact. The proposed project, in combination with other cumulative projects, would not contribute to a potentially significant cumulative impact.

## 4.6.5 Significance of Impacts Prior to Mitigation

The proposed project would not result in potentially significant direct or cumulative impacts associated with the exposure to seismic-related hazards, soil erosion or topsoil loss, soil stability, expansive soils and wastewater disposal systems.

# 4.6.6 Mitigation

## Issue 1: Exposure to Seismic-Related Hazards

The proposed project would not result in a significant direct or cumulative impact associated with exposure to seismic-related hazards. Therefore, no mitigation is necessary.

## Issue 2: Soil Erosion or Topsoil Loss

The proposed project would not result in a significant direct or cumulative impact associated with soil erosion and topsoil loss. Therefore, no mitigation is necessary.

## Issue 3: Soil Stability

The proposed project would not result in a significant direct or cumulative impact associated with soil stability. Therefore, no mitigation is necessary.

## Issue 4: Expansive Soils

The proposed project would not result in a significant direct or cumulative impact associated with expansive soils. Therefore, no mitigation is necessary.

## Issue 5: Wastewater Disposal Systems

The proposed project would not result in a significant direct or cumulative impact associated with wastewater disposal systems. Therefore, no mitigation is necessary.

# 4.6.7 Conclusion

The discussion below provides a synopsis of the conclusion reached in each of the above impact analyses.

## Issue 1: Exposure to Seismic-Related Hazards

Implementation of the proposed project would designate residential, commercial and industrial land uses that have the potential to allow development to occur in areas with seismically-related risks, such as seismically-induced ground shaking, liquefaction, and landslides. However, future development would be required to comply with all relevant proposed General Plan Update policies and federal, state and local regulations and building standards, including the CBC. Therefore, direct impacts from seismically-induced ground shaking, liquefaction, and landslides would be less than significant. In addition, the proposed project would not contribute to a significant cumulative impact associated with seismically-related hazards.

## Issue 2: Soil Erosion or Topsoil Loss

The land uses designated by the proposed project would have the potential to allow construction and operational activities associated with future development that would have the potential to expose topsoil to erosion from water or wind. However, compliance with existing applicable regulations, including the NPDES program and CBC, and implementation of the applicable proposed General Plan Update policies would reduce potential direct impacts to below a significant level. Additionally, the proposed project would not contribute to a potentially significant cumulative impact associated with soil erosion or topsoil loss.

## Issue 3: Soil Stability

The proposed project would have the potential to allow development to occur in areas susceptible to on or offsite landslides, lateral spreading, subsidence, liquefaction, or collapse. However, future development associated with the land uses designated in the proposed General Plan Update would be required to comply with all applicable proposed General Plan Update policies and state and local building standards and regulations, including the CBC. Compliance with such policies and regulations would reduce direct impacts associated with on or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse to a less than significant level. Additionally, the proposed project would not contribute to a potentially significant cumulative impact associated with soil stability.

## Issue 4: Expansive Soils

The proposed project would designate land uses that would allow for the development of structures on potentially expansive soils. Future projects located in areas with expansive soils would be required to comply with all applicable proposed General Plan Update policies and state and local regulations, including the CBC. Compliance with such regulations would reduce direct impacts to below a level of significance. Therefore, the proposed General Plan Update would not create substantial risks to life or property due to expansive soils. Additionally, the proposed project would not contribute to a potentially significant cumulative impact associated with expansive soils.

## Issue 5: Wastewater Disposal Systems

Implementation of the proposed General Plan Update would designate land uses that have the potential to allow development in areas where soils are incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems. However, future development projects would be required to comply with all applicable proposed General Plan Update policies and state and local regulations related to OWTS, including County DEH requirements. Compliance with these regulations and policies would reduce the potential for septic systems to be located in soils incapable of supporting such systems. Therefore, impacts would be less than significant. Additionally, the proposed project would not contribute to a potentially significant cumulative impact related to wastewater disposal systems.

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