

4.5 GEOLOGY AND SOILS

The environmental setting, regulatory framework, potential impacts, and mitigation measures concerning geology and soils are discussed in 2016 PEIR Section 4.5.1 and hereby incorporated by reference. The additions/changes to those analyses necessary to make the 2016 PEIR applicable to the revised Project are presented below.

This Section identifies the existing environmental conditions in the affected area, identifies and analyzes the Project's potentially significant environmental impacts, and recommends measures to avoid/reduce impacts. This Section addresses the Project's potential impacts concerning seismic hazards, soil erosion, and unstable and expansive soil. Information presented in this Section is based on a review of each candidate site in relation to the potential impact topics.

4.5.1 EXISTING ENVIRONMENTAL SETTING

2016 PEIR

The existing environmental setting concerning geology and soils is discussed in 2016 PEIR Section 4.5.1 (page 4.5-1) and the minor additions/changes necessary to make the 2016 PEIR applicable to the revised Project are presented below.

ADDITIONS/CHANGES SINCE 2016 PEIR

Faulting and Seismicity

The City is in an area that is exposed to risk from multiple earthquake fault zones. The Elsinore fault zone, the Rose Canyon fault zone, and offshore faults have the potential to cause moderate to large earthquakes that would cause ground shaking in Encinitas, inclusive of the Project area. As shown in Figure 4.5-1, *Alquist-Priolo Zones and Regional Faults*, no active or potentially active faults cross beneath the candidate sites.

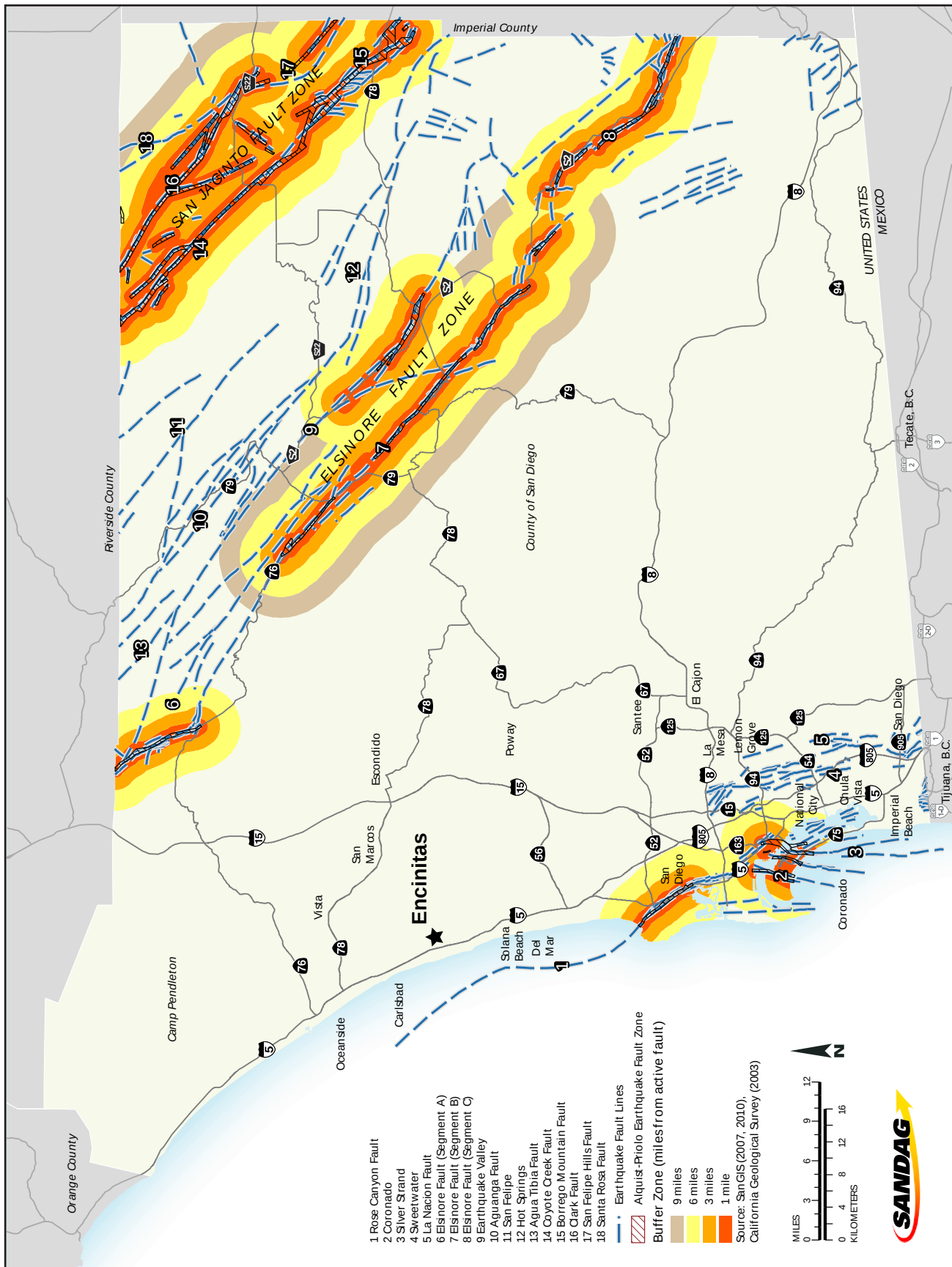
Seismic Settlement and Liquefaction

Figure 4.5-2, *Liquefaction Zones*, shows the City's liquefaction areas. Most of the City is within a low liquefaction risk. Areas with high liquefaction risk are located along the coastline that includes Batiquitos and San Elijo lagoons. All candidate sites are within a low liquefaction potential zone.

Landslides and Mudslides

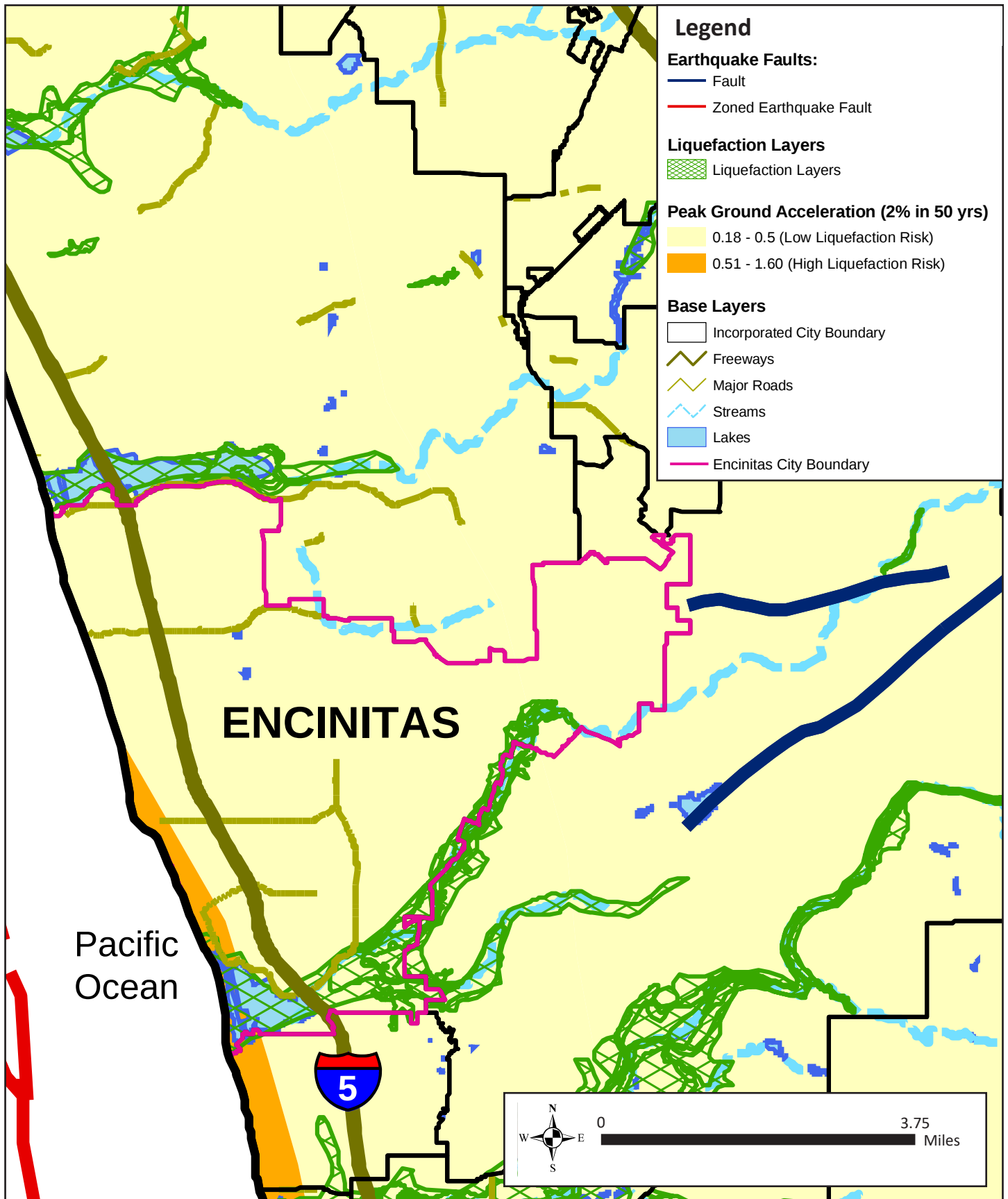
Figure 4.5-3, *Relative Landslide Susceptibility*, depicts the landslide susceptibility in the City and indicates the following candidate sites fall within susceptibility zones:

- Zone 2- Marginally Susceptible: Candidate Sites #AD8, #10, and #1
- Zone 3- Generally Susceptible: Candidate Sites #7, #AD7, #2, #9, #3, #6, #AD6, #AD2, #12, #5, #AD9, #11, and #AD1
- Zone 4- Most Susceptible: Candidate Site #8



Source: SANDAG, San Diego Forward: The Regional Plan, Program Environmental Impact Report, Figure 4.7-1, Earthquake Fault zones and Seismic Conditions, April 2015.





Source: SANGIS, Draft - Liquefaction County of San Diego Hazard Mitigation Planning.

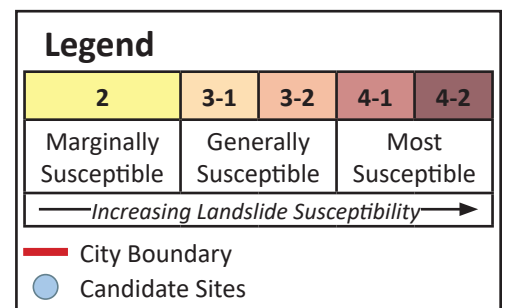
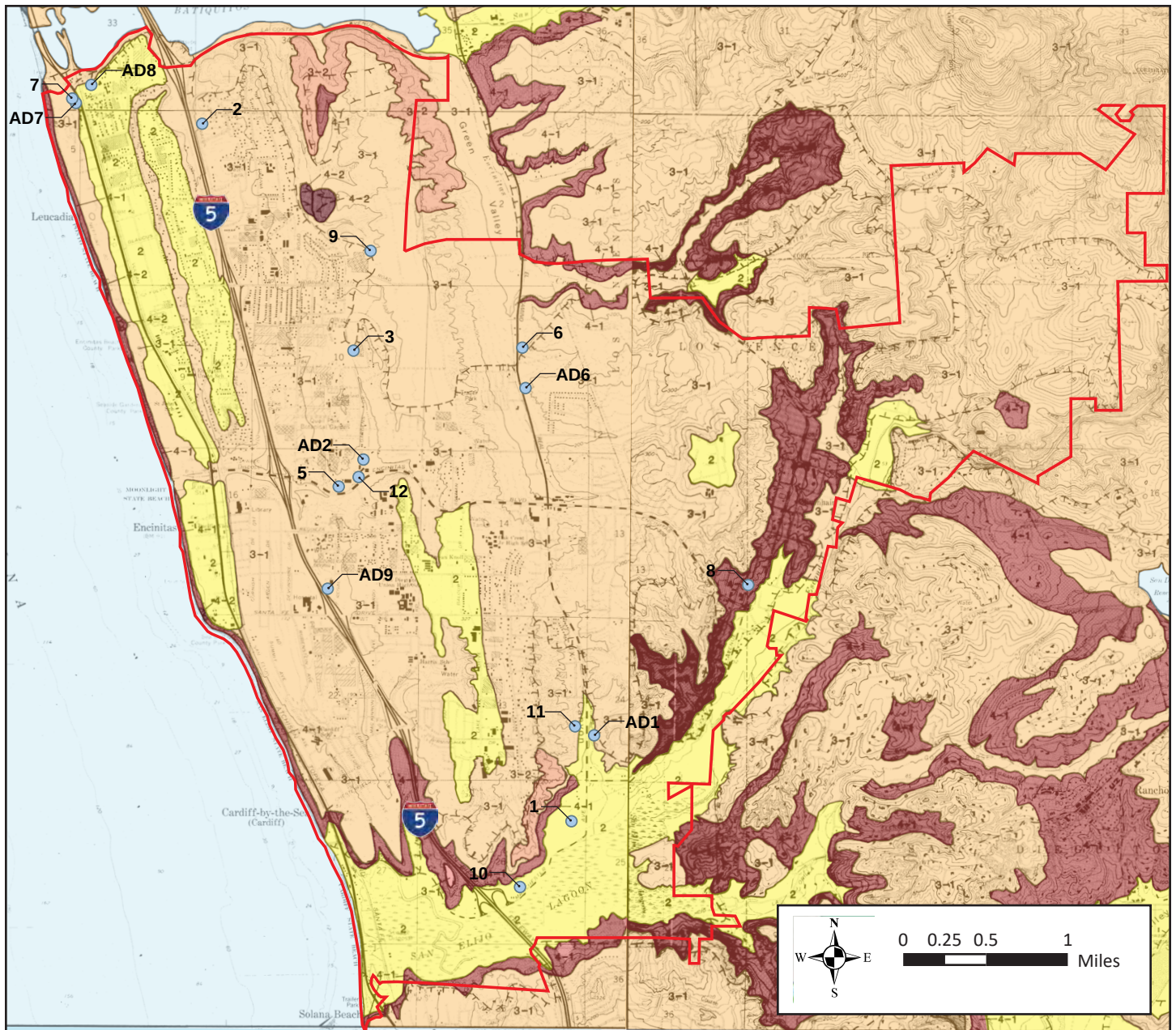
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May 2018



Environmental Assessment
City of Encinitas 2013-2021 Housing Element Update

Liquefaction Zones
Figure 4.5-2



Source: LANDSLIDE HAZARDS IN THE NORTHERN PART OF THE SAN DIEGO METROPOLITAN AREA, SAN DIEGO COUNTY, CALIFORNIA, 1995, ENCINITAS QUADRANGLE (PLATE D) & RANCHO SANTA FE QUADRANGLE (PLATE E)

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May 2018



Environmental Assessment
City of Encinitas 2013-2021 Housing Element Update

Relative Landslide Susceptibility

Figure 4.5-3

Hillside/Inland Bluff Overlay Zone

The Hillside/Inland Bluff Overlay Zone includes areas where 10 percent or more of a parcel's area exceeds 25% slope. Figure 4.5-4, *Hillside Overlay*, depicts this zone and indicates the following candidate sites are within this zone: #6, #AD2, #12, #5, #11, and #AD1.

Coastal Bluff Overlay Zone

The Coastal Bluff Overlay Zone includes areas of the City that include a coastal bluff. None of the candidate sites are within this zone.

4.5.2 REGULATORY FRAMEWORK

2016 PEIR

The regulatory framework concerning geology and soils, which is discussed in 2016 PEIR Section 4.5.2 (page 4.5-5), applies to the revised Project and no additions/changes are necessary.

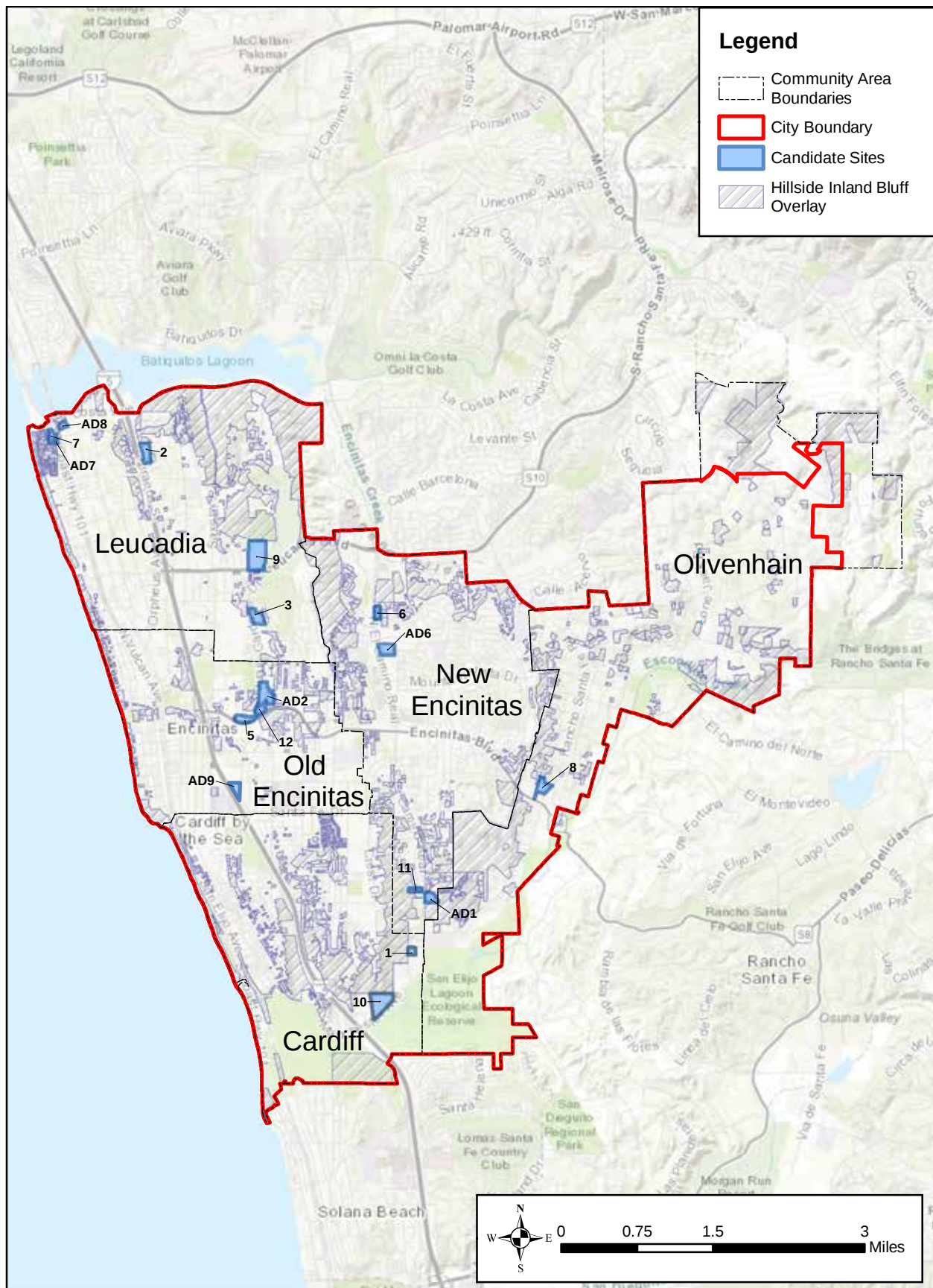
ADDITIONS/CHANGES SINCE 2016 PEIR

No additions or changes are necessary. All regulatory requirements and guidelines related to potential geologic and soil issues apply to the HEU.

4.5.3 SIGNIFICANCE DETERMINATION THRESHOLDS

Consistent with the 2016 PEIR and in substantial conformance with CEQA Guidelines Appendix G, impacts related to geology and soils would be significant if the Project would:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
 - a. Rupture of a known earthquake fault, as delineated on the most recent Alquist Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault (refer to Division of Mines and Geology Special Publication 42)
 - b. Strong seismic ground shaking;
 - c. Seismic-related ground failure, including liquefaction; or
 - d. Landslides
(see Issue 1).
- Result in substantial soil erosion or the loss of topsoil (see Issue 2).
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse (see Issue 3).
- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property (see Issue 4).



Source: City of Encinitas, GIS.



4.5.4 IMPACTS AND MITIGATION MEASURES

4.5.4 - Issue 1: Seismic Hazards

Impacts related to geology and soils would be significant if the Project would expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

- a. Rupture of a known earthquake fault, as delineated on the most recent Alquist Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault (refer to Division of Mines and Geology Special Publication 42);*
- b. Strong seismic ground shaking;*
- c. Seismic-related ground failure, including liquefaction; or*
- d. Landslides.*

IMPACTS:

2016 PEIR

The potential impacts concerning geology and soils/seismic hazards are discussed in 2016 PEIR Section 4.5.5 (Issue 1, page 4.5-12). The analysis concluded no active fault was located near any of the housing sites; however, the project area is subject to seismic activity from the San Andreas fault to the east and the parallel fault systems of the Elsinore fault to the east, as well as the offshore Rose Canyon and Coronado Bank faults. Seismic hazards affecting the Project area could include ground acceleration (shaking), liquefaction, and earthquake-induced landslides.

Future development would involve construction of two to three-story structures in a seismically active area. Impacts related to surface rupture, ground shaking, liquefaction, and seismically induced landslides would occur in the City, inclusive of the proposed housing sites. The analysis concluded compliance with Encinitas General Plan (EGP) Land Use Element Policy 8.1, City ordinances and the CBC, engineering standards and codes, and future site-specific geotechnical reports would reduce risks of seismic hazards in conjunction with future development. Additionally, typical site constraints for steep slopes would limit development potential and exposure to slope failure and landslides. Therefore, impacts related to earthquake fault ruptures, seismic shaking, liquefaction and ground failure, and landslides were concluded to be less than significant.

The minor additions/changes necessary to make the 2016 PEIR applicable to the revised Project are presented below.

REVISED PROJECT

Figure 4.5-1, *Alquist-Priolo Fault Zones and Regional Faults*, displays the Elsinore fault segments to the east and the offshore Rose Canyon and Coronado Bank faults west of the City. As shown in Figure 4.5-1, no active faults or Alquist Priolo Fault Zones traverse the candidate sites and none are in their vicinity. Therefore, no impact would occur concerning exposure of people/structures to adverse effects involving fault rupture.

The Elsinore fault zone, the Rose Canyon fault zone, and the offshore faults have the potential to cause moderate to large earthquakes that would cause ground shaking throughout the area including at the candidate sites. Therefore, the Project would expose people/structures to the following seismic-related hazards:

- Strong seismic ground shaking (all sites);
- Landslide hazard susceptibility:
 - Marginally Susceptible (Zone 2): Candidate Sites #AD8, #10, and #1,
 - Generally Susceptible (Zone 3): Candidate Sites #7, #AD7, #2, #9, #3, #6, #AD6, #AD2, #12, #5, #AD9, #11, and #AD1,
 - Most Susceptible (Zone 4): Candidate Site #8
- Seismic-related ground failure (Hillside/Inland Bluff Overlay Zone): Candidate Sites #6, #AD2, #12, #5, #11, and #AD1.

However, the Project would not exacerbate the environmental effects caused by the seismic-hazards. Because all candidate sites are within a low liquefaction potential zone, a less than significant impact would occur concerning exposure of people/structures to adverse effects involving liquefaction.

EGP Land Use Element Policy 8.1 requires that soils and geotechnical studies be prepared for development on any site containing slopes greater than 25 percent grade. In general, all future development must demonstrate conformance with seismic design guidelines and requirements contained in the California Building Standards Code (CBSC), which is adopted by EMC Chapter 23.12, *Uniform Codes for Construction*. Compliance with EMC and CBSC requirements would be confirmed through the design review and building plan review processes. The CBSC contains design and construction regulations pertaining to seismic safety for buildings, which covers issues such as ground motion, soil classifications, redundancy, drift, and deformation compatibility. In addition, pursuant to EMC Section 23.24.170, *Soil Engineering Report*, and as needed, the City Engineer would require a Soil Engineering Report, which would include conclusions and recommendations addressing grading procedures, soil stabilization during and post-construction, foundation design, and slope stability. The Report would also include recommendations for corrective measures relative to other potential site geotechnical issues such as temporary shoring, interim slopes during construction, expansive soils, liquefaction, collapsible soils, consolidation, undocumented fill, compressible material, soil erosion, seepage, and landslides. Similarly, the Hillside/Inland Bluff Overlay Ordinance regulations would apply to candidate sites containing slopes of greater than 25 percent grade, requiring a Geological Reconnaissance Report and, where unstable conditions are indicated, a Preliminary Engineering Geology Report (EMC Section 30.34.030(B)(5)).

Additionally, pursuant to the City's Grading, Erosion, and Sediment Control Ordinance an Engineering Geology Report would be required when the City Engineer determines that a proposed development is located within an existing or potential geologic hazard area (i.e., an area subject to landslide, faulting, or other hazards). A faulting and seismic evaluation of the site must be included. The Report would also include conclusions and recommendations regarding the mitigation of geologic conditions on the proposed development, as well as opinions and recommendations addressing the site's adequacy for the proposed development. Adherence to the established regulatory framework (i.e., EGP policies, CBSC, the City of Encinitas' Hillside/Inland Bluff Overlay Ordinance and Grading, Erosion, and Sediment Control Ordinance), as well as the site-specific reports' recommendations for corrective measures would ensure the Project results in a less than significant impact concerning adverse seismic-related hazards.

GENERAL PLAN POLICIES AND MITIGATION MEASURES:

GENERAL PLAN POLICIES:

Refer to Appendix E, *Relevant General Plan Policies*, for the full text of these policies.

- LUE Policy 8.1

MITIGATION MEASURES:

No mitigation measures concerning geology and soils/seismic hazards were identified in 2016 PEIR Section 4.5.5 and none are necessary for the revised Project.

LEVEL OF SIGNIFICANCE: Less than Significant Impact

4.5.4 - Issue 2: Soil Erosion

Impacts related to geology and soils would be significant if the Project would result in substantial soil erosion or the loss of topsoil.

IMPACTS:

2016 PEIR

The potential impacts concerning loss of top soils and soil erosion are discussed in 2016 PEIR Section 4.5.6 (Issue 2, page 4.5-14). The 2016 PEIR concluded that grading activities associated with future development would disrupt soil profiles and thereby result in increased exposure of soils to wind and rain. Erosion on graded slopes could cause downstream sedimentation impacts. Other related impacts resulting from substantial short-term erosion or loss of topsoil include topography changes and the creation of impervious surfaces. As part of the future development permitting process, adherence to the City's Grading, Erosion, and Sediment Control Ordinance, CBC and the National Pollutant Discharge Elimination System (NPDES) General Construction Permit would be required. Conformance with these standards would ensure that future grading and construction operations would avoid significant soil erosion impacts. The 2016 PEIR concluded that compliance with the existing regulatory process and General Plan policies, potential soil erosion impacts associated with future housing development would be less than significant.

The minor additions/changes necessary to make the 2016 PEIR applicable to the revised Project are presented below.

REVISED PROJECT

Construction-related activities associated with future development would include excavation, grading, and trenching, which would displace soils and temporarily increase the potential for soils to be subject to wind and water erosion. Short-term construction-related erosion would be addressed through compliance with the National Pollutant Discharge Elimination System (NPDES) program, which requires implementation of a Storm Water Pollution Prevention Plan (SWPPP) and best management practices (BMPs) intended to reduce soil erosion. Future development must also adhere to the City's Grading, Erosion, and Sediment Control Ordinance (EMC Section 23.24.010) regulations, which would require a Grading Plan and Soils Engineering Report before issuance of grading permits. Conformance NPDES and the City's Grading, Erosion, and Sediment Control Ordinance would reduce impacts related to loss of topsoil to less than significant impact.

GENERAL PLAN POLICIES AND MITIGATION MEASURES:

GENERAL PLAN POLICIES:

Refer to Appendix E, *Relevant General Plan Policies*, for the full text of these policies

- LUE Policy 8.1

MITIGATION MEASURES:

No mitigation measures concerning geology and soils/soil erosion were identified in 2016 PEIR Section 4.5.6 and none are necessary for the revised Project.

LEVEL OF SIGNIFICANCE: Less Than Significant Impact

4.5.4 - Issues 3 and 4: Unstable and Expansive Soils

Impacts related to geology and soils would be significant if the Project would:

- *Be located on a geologic unity or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse; or*
- *Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.*

IMPACTS:

2016 PEIR

The potential impacts concerning unstable and expansive soils are discussed in 2016 PEIR Section 4.5.7 (Issue 3 and 4, page 4.5-15). The 2016 EIR identified the presence of fine-grained (clay) soils that are moderately to highly expansive throughout the project area. No areas of high liquefaction potential occur on the housing sites. The project area contains steep slopes and formations that are susceptible to landslides. Compressible and expansive soils throughout the City have potential to impact development.

All three housing strategies were determined to expose people/structures to substantial adverse effects involving unstable or expansive soils. Potential impacts related to unstable and expansive soils were determined to be less than significant with implementation of General Plan Land Use Policy 8.1 and adherence to the CBC, City Grading, Erosion, and Sediment Control Ordinance, which would avoid or reduce the severity of impacts. Therefore, impacts were determined to be less than significant.

The minor additions/changes necessary to make the 2016 PEIR applicable to the revised Project are presented below.

REVISED PROJECT

As discussed in Issue 1, future development would be required to comply with the established regulatory framework (i.e., EGP policies, CBSC, the City of Encinitas' Hillside/Inland Bluff Overlay Ordinance and Grading, Erosion, and Sediment Control Ordinance), as well as the site-specific reports' recommendations for corrective measures. EGP Land Use Element Policy 8.1 contains provisions related to soil stability. Adherence to the established regulatory framework and implementation of any recommendations

described in site-specific geotechnical investigations would avoid or reduce potentially significant impacts related to unstable or expansive soils to less than significant.

GENERAL PLAN POLICIES AND MITIGATION MEASURES:

GENERAL PLAN POLICIES:

Refer to Appendix E, *Relevant General Plan Policies*, for the full text of these policies

- LUE Policy 8.1

MITIGATION MEASURES:

No mitigation measures concerning geology and soils/unstable and expansive soils were identified in 2016 PEIR Section 4.5.7 and none are necessary for the revised Project.

LEVEL OF SIGNIFICANCE: Less Than Significant Impact

4.5.5 SIGNIFICANT UNAVOIDABLE IMPACTS

No significant unavoidable impacts concerning geology and soils have been identified following compliance with the established regulatory framework.

4.5.6 SOURCES CITED

California Department of Conservation, Relative Landslide Susceptibility and Landslide Distribution Map Encinitas Quadrangle Plate D, 1995.

San Diego Association of Governments, Earthquake Fault Zones and Seismic Conditions, April 2015.