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## IV. ENVIRONMENTAL IMPACT ANALYSIS

### G. GEOLOGY AND SOILS

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The following section is based upon the City of El Segundo General Plan and General Plan EIR and addresses the following geologic issues: soil erosion, liquefaction, landslides/slope stability, and subsidence/expansive soils. It was determined in the Revised Initial Study that impacts from seismic ground shaking and surface fault rupture would be less than significant. Therefore, these issues are not discussed further in the following sections. For more information regarding these issues, see the copy of the Revised Initial Study provided in Appendix A.

#### ENVIRONMENTAL SETTING

##### *Topography*

The City of El Segundo is located in the northwestern corner of the Los Angeles Basin in the transition zone between the Transverse Range and the Peninsular Range Structural Provinces of Southern California. The topography in the City is characterized by a series of northwest trending rounded hills consisting of stabilized sand dunes rising above the main coastal plain. The elevation rises from sea level along the southwestern border to approximately 160 feet above mean seal level in the northern section of the City. Some of the northern area of the City retains the natural dune landscape. In the southern portion of the City more of the natural topography has been altered. A series of stabilized sand dunes referred to as the El Segundo Sand Dunes and Sand Hills cover the western part of the City.<sup>1</sup> To the west of the City are steep coastal bluffs, exceeding 30% slope, descending to a coastal beach area.

The eastern section is flat, almost at sea level; the surface represents the original erosion terrace of the Torrance Plain on which the coastal sand dunes were deposited. The Torrance Plain is underlain by marine and non-marine sediments of the Lakewood Formation. The Lakewood Formation consists of fine to medium grained sandstones, gravelly sandstones and clays which weather into clays and silty clays. The western section of the City is underlain by dune sands in varying stages of consolidation.

Current groundwater levels are at 20 feet below surface or deeper. The Los Angeles County Safety Element maps groundwater levels in the western and central portion of the City as between 10 and 30 feet below ground surface. Numerous environmental investigations have been conducted on the Sepulveda/Rosecrans site during which groundwater monitoring wells were installed. Groundwater was encountered during these studies at depths ranging from approximately 71 to 77 feet below the existing

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<sup>1</sup> *EIP Associates, City of El Segundo General Plan Draft Environmental Impact Report, Volume One, December 1991.*

ground surface. Based on these studies, natural groundwater levels east of Sepulveda, between Sepulveda-Nash and Park Place-Avalon Blvd., would generally be expected to occur at the same depths.

### ***Soils***

The soils of the El Segundo area belong to four major groups: the Croyley, the Oakley, the Chino, and the Ramona-Placentia associations (Figure IV.G-1). The Croyley association occurs in the area east of Douglas Street. It consists of dark gray soil underlain by calcareous clay subsoil. The mildly to moderately alkaline well drained surface soils are underlain by slowly draining clay subsoils.

The Chino and Oakley associations are the predominant soils of the City. The area west of Sepulveda Boulevard is underlain by Chino soils. These soils are made up of gray and dark gray loam, silty sands, silt loam, and clay loam and are associated with high water tables. They are composed of loosely bound grains formed by wind processes. The coastal portions include sand dunes. These soils have good permeability overlying subsoils with low rates of permeability.

The Ramona-Placentia association is a brown to reddish-brown heavy loam, loam, or sandy loam occurring in the southeastern portion of the City. Subsoils consist of similarly colored clay and clay loam. It is not as well drained as other local soils. The Montezuma clays belong to this unit and have low to medium permeability.

### ***Liquefaction***

Liquefaction is the process in which loose granular soils below the groundwater table temporarily lose strength during strong ground shaking as a consequence of increased pore pressure and thereby, reduced effective stress. The vast majority of liquefaction hazards are associated with sandy soils and silty soils of low plasticity. Potentially liquefiable soils (based on composition) must be saturated or nearly saturated to be susceptible to liquefaction.

Significant factors that affect liquefaction include water level, soil type, particle size and gradation, relative density, confining pressure, intensity of shaking, and duration of shaking. Liquefaction potential has been found to be the greatest where the groundwater level is shallow and submerged loose, fine sands occur within a depth of about 50 feet or less. Liquefaction potential decreases with increasing grain size and clay and gravel content, but increases as the ground acceleration and duration of shaking increase. Liquefaction is therefore more likely to occur in sand dune areas, as is quake triggered slope failure. According to the State of California Seismic Hazard Zones Map, Venice Quadrangle, the only area of the City with high liquefaction potential, occurs along the coast (Figure IV.G-2).

**Figure IV.G-1, Soil Classification**

**Figure IV.G-2, Liquefaction Potential**

### ***Landslides***

Areas at risk from landslides typically have steep slopes (15% or greater), unstable rock or soil characteristics, or other geologic evidence of instability. The bluffs along the coast have slopes greater than 30%.<sup>2</sup>

Some soil materials, such as clay minerals, have a great capacity to absorb water. The result is a reduction of shear strength. The force of gravity can cause landsliding when the shear strength of a saturated clay is reduced below its minimum stability threshold. Earthquake induced landsliding of steep slopes can occur in either bedrock or soils. Firm bedrock can usually stand in steeper, more stable slopes than what soils are able to maintain, but rock type, grain size, degree of consolidation and angle of the beds as contribute to the strength of weakness of a bedrock hillside. Shales and deeply weathered rocks are very susceptible to slope failures. The presence of excessive amounts of water, or the lack of shear strength in the soil or at the soil/rock interface can also contribute to unstable soil conditions. Each of these conditions is observable in the City.

## **ENVIRONMENTAL IMPACTS**

### **Threshold of Significance**

A project could have a potentially significant impact if it were to cause one or more of the following conditions:

- a. Expose people or structures to potentially adverse effects, including the risk of loss, injury, or death involving liquefaction or landslides.
- b. Result in substantial soil erosion or the loss of topsoil.
- c. 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.
- d. Be located on expansive soil, as in the California Building Code (2001) creating substantial risks to life or property.

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<sup>2</sup> *United States Geologic Survey (USGS) Topographic Map, Venice, California Quadrangle, 1964 photorevised 1981.*

## **Project Impacts**

The changes in roadway designations proposed under the proposed Circulation Element Update would not produce any geologic impacts. These changes are strictly “paper changes” and would not produce any changes to the existing physical roadway network.

Several physical changes to the roadway network are also proposed under the Circulation Element Update. These include converting Nash Street and Douglas Street to two-way operation, adding intersection modifications along Nash Street and Douglas Street, and creating an internal roadway network on the Sepulveda/Rosecrans property. In addition, modifications to 14 intersections have been identified to accommodate growth in future traffic levels within the City of El Segundo. These could include the widening of the intersections, increasing the number of turn and through lanes, and adding additional lights and traffic signals.

### ***Soil Erosion***

The conversion of Nash and Douglas Streets from one-way to two-way operation would occur within the existing right-of-way. No removal and compaction of fill material or grading would occur with the implementation of this component of the proposed Circulation Element Update. Therefore, soil erosion impacts associated with the conversion of Nash and Douglas Streets would be less than significant.

Removal of existing asphalt, removal and compaction of fill material, grading of areas for new roadway surfaces, etc. would expose soils to localized erosion during periods of high winds and heavy precipitation. Control of waterborne soil erosion during construction is governed by existing regulations that are discussed in detail in Section IV.H, Hydrology and Water Quality. Windborne erosion during construction would constitute a significant impact.

### ***Liquefaction***

As seen in Figure IV.G-2, only the coastal portion of the City of El Segundo is designated as having a high risk for liquefaction. None of the proposed roadway network modifications, including the conversion of Nash Street and Douglas Street, or the roadway on the Sepulveda/Rosecrans site, are located in the high risk area. In addition, none of the 14 intersections identified for improvements are located in this high risk area. Therefore, no impacts from liquefaction are anticipated.

### ***Landslides***

A majority of the City of El Segundo is relatively level and developed, and no known landslides exist within the City. The roadway network that would be modified and the 14 intersections where improvements have been identified are not at risk from landslides. Therefore, no impacts from landslides are anticipated.

### **Expansive Soils**

According to the 1992 City of El Segundo General Plan EIR, Montezuma and Ramona soils tend to have a high shrink/swell potential. These soils tend to occur primarily in the eastern portion of the City, east of Sepulveda Boulevard. Both Nash Street and Douglas Street are located within these soil types as are 9 of the 14 intersections where improvements have been identified. These intersections are identified in Table IV.G-1. However, because the conversion of Nash and Douglas Streets from one-way to two way operation would consist of restriping and minor construction activities within the existing right-of-way, this component of the proposed Circulation Element Update would have less than significant impacts with respect to expansive soils. Depending upon the configuration and specific location of the new roads proposed for the Sepulveda/Rosecrans site, they may be located on expansive soils. Roads and intersections could be damaged by the shrinking and swelling of soils if constructed on expansive soils, which would be a significant impact.

**Table IV.G-1  
Intersections with Identified Improvements Located in Areas with Expansive Soils**

<b>009 – Montezuma Clay Adobe</b>
#8 – Aviation Boulevard/Imperial Highway
#16 – Aviation Boulevard/Rosecrans
<b>013 – Ramona Sandy Loam</b>
#12 – Aviation Boulevard/El Segundo Boulevard
#13 – Aviation Boulevard/Utah Street
#34 – Atwood Way/I-105 EB Ramp Entrance
#39 – Douglas Street/El Segundo Boulevard
#50 – El Segundo Boulevard/Isis Avenue
<b>014 – Ramona Loam</b>
#19- Sepulveda Boulevard/Imperial Highway
#44 – Continental Boulevard/Grand Avenue

## **CUMULATIVE IMPACTS**

Geotechnical hazards are site-specific and there is little, if any, cumulative relationship between implementation of the proposed Circulation Element Update and the development of future projects. As such, construction of future projects is not anticipated to combine with the proposed Circulation Element Update to cumulatively expose people or structures to geologic hazards such as liquefaction, landslides, expansive soils, or to increase the potential for soil erosion or the loss of topsoil. Therefore, no cumulative geological impacts are anticipated from the proposed Circulation Element Update and the future development of projects.

## **SUBSEQUENT ENVIRONMENTAL DOCUMENTATION**

Subsequent environmental documentation shall be prepared for any new roadway construction or intersection improvement project located within areas with expansive soil hazards, as listed above. The subsequent environmental documentation shall address the following:

- Prior to the construction of new roadways or the implementation specific intersection improvements, impacts associated with expansive soil hazards shall be examined in light of this Program EIR to determine whether a new Initial Study would be required to be prepared leading to either an EIR or Negative Declaration. The analysis shall include a comprehensive geotechnical investigation which shall be submitted as part of the design process for individual portions of the proposed Circulation Element Update and shall also incorporate the mitigation measures identified below, as appropriate.

## **MITIGATION MEASURES**

The following mitigation measures shall be incorporated as appropriate for intersections and roadways located within areas with expansive soil hazards, as listed above. Mitigation measure G-3 shall apply to all construction activities associated with the proposed Circulation Element Update to address wind-borne erosion impacts. Regulatory requirements to address water-related erosion impacts are contained in Section IV.H, Hydrology and Water Quality.

- G-1** Specific design recommendations presented in a comprehensive geotechnical report, discussed above under Subsequent Environmental Documentation, shall be incorporated into the final design and approved by the City Engineer and City Council prior to construction.
- G-2** Specifications for site grading shall be subject to approval by the City Engineer.
- G-3** Suspend all soil disturbance and travel on unpaved surfaces if winds exceed 25 miles per hour (mph).

Impacts associated with the conversion of Nash and Douglas Streets from one-way to two-way operation would be less than significant. No mitigation measures are required.

## **LEVEL OF IMPACT AFTER MITIGATION**

Impacts associated with the conversion of Nash and Douglas Streets from one-way to two-way operation would be less than significant.

Impacts at the nine identified intersections and the new roadway system on the Sepulveda/Rosecrans site with respect to expansive soil would be determined by the subsequent environmental documentation described above.

With implementation of Mitigation Measure G-3, impacts related to wind-borne erosion would be less than significant

Impacts from landslides, and liquefaction at the intersections with identified improvements and the new roadway system on the Sepulveda/Rosecrans site would be less than significant. .