4.6 GEOLOGY AND SOILS

This section provides an overview of geological and seismic conditions in the CPAs and evaluates geology and soils impacts associated with the Proposed Plans. This section was prepared utilizing documents and maps published by the United States Geological Survey (USGS), California Department of Conservation, California Geological Survey (CGS), County of Los Angeles, City of Los Angeles, and other applicable sources. Topics addressed in this section include the suitability of soil for development; geologic faults; and direct and indirect seismic hazards such as subsidence, liquefaction, and landslides.

EXISTING SETTING

The impact area or area of study for Geology and Soils is the area that could be impacted by the Proposed Plans.

The CPAs are relatively flat and highly urbanized, lacking geologic or topographic features such as hilltops, ridges, hill slopes, canyons, ravines, rock outcrops, and water bodies. In the Southeast Los Angeles CPA, the streambeds and riparian areas have been channelized and concretized. In the South Los Angeles CPA, there are no streambeds or riparian areas. There are also no natural, undisturbed open spaces in either of the CPAs. Existing open space areas in the CPAs consist primarily of public parks, utility corridors, and vacant lots.

SEISMICITY

Seismic events present the most widespread threat of devastation to life and property in the southern California region. With an earthquake, there is no containment of potential damage. Since 1800, there have been approximately 60 damaging seismic events, or earthquakes, in the Los Angeles Region. Since 1933, there have been four moderate-size earthquakes, which have caused numerous deaths and substantial property damage in the metropolitan Los Angeles area. These four events are identified by their location as the Long Beach (March 11, 1933; magnitude 6.3), San Fernando (February 9, 1971; magnitude 6.4), Whittier Narrows (October 1, 1987; magnitude 5.9), and Northridge (January 17, 1994; magnitude 6.7) earthquakes. As the entire Southern California area is considered a seismically active region, the CPAs may be exposed to strong ground shaking during a seismic event. General issues of concern relating to earthquakes include fault rupture, strong ground shaking, liquefaction, and landslides. According to the Local Hazard Mitigation Plan (LHMP), approved by the City in 2011, earthquakes are identified as high-risk hazards, but landslides/mudslides and tsunamis are considered low-risk hazards.

Faults. A fault is a fracture or line of weakness in the earth's crust, along which rocks on one side of the fault are offset relative to the same rocks on the other side of the fault. Based on criteria established by the CGS, faults may be categorized as active, potentially active, or inactive. Active faults are those that show evidence of surface displacement within the last 11,000 years (Holocene age). Potentially active faults are those that show evidence of displacement within the last 1.6 million years (Quaternary age). Faults showing no evidence of displacement within the last 1.6 million years may be considered inactive in most cases.

Many active earthquake fault zones have been mapped in the Los Angeles area. Typically, they have been visible, above ground faults, such as the San Andreas Fault. A review of the fault systems of Southern California revealed that no active or potentially active faults traverse the CPAs.

Table 4.6-1 provides a summary of major active faults in Southern California. Each of these generally trend northwest to southeast. **Figure 4.6-1** identifies active and potentially active faults in the region and in the vicinity of the CPAs. The CPAs are not located within an Alquist-Priolo Special Study Zone.[1]

TABLE 4.6-1: MAJOR NAMED ACTIVE FAULTS IN SOUTHERN CALIFORNIA

Fault	Maximum Magnitude	Slip Rate (mm/yr)	Type of Fault	Most Recent Seismic Event
Cabrillo	6.0 - 6.8	Uncertain	Right normal	Holocene
Cucamonga	6.0 - 7.0	5.0 - 14.0	Thrust	Holocene
Elsinore (Glen Ivy Segment)	6.8	5.0	Right lateral strike-slip	Late Quaternary
Hollywood	5.8 - 6.5	0.33 - 0.75	Left reverse	Holocene
Los Alamitos Thrust	Uncertain	Uncertain	Thrust	Uncertain
Malibu Coast	Uncertain	0.3	Reverse	Late Quaternary
Newport-Inglewood Zone	6.0 - 7.4	0.6	Right lateral	1933
Northridge Thrust	6.5 - 7.5	3.5 - 6.0	Thrust	1994
Oak Ridge	6.5 - 7.5	3.5 - 6.0	Thrust	Holocene
Palos Verdes	6.0 - 7.0	0.1 - 3.0	Right reverse	Holocene
Raymond	6.0 - 7.0	0.1 - 0.22	Left lateral	Holocene
San Andreas (Southern Segment)	6.8 - 8.0	20.0 - 35.0	Right lateral strike-slip	1857
San Cayetano	6.5 - 7.3	1.3 - 9.0	Thrust	Uncertain
San Fernando	6.0 - 6.8	5.0	Thrust	1971
San Gabriel	Uncertain	1.0 - 5.0	Right-lateral strike-slip	Late Quaternary
San Jacinto (San Bernardino Segment)	6.5 - 7.5	7.0 - 17.0	Right lateral strike-slip	1968
Santa Monica	6.0 - 7.0	0.27 - 0.39	Left reverse	Late Quaternary
Sierra Madre	6.0 - 7.0	0.36 - 4.0	Reverse	Holocene
Simi-Santa Rosa	Uncertain	Uncertain	Reverse	Holocene
Verdugo	6.0 - 6.8	0.5	Reverse	Holocene
Whittier	6.0 - 7.2	2.5 - 3.0	Right lateral strike-slip	1987

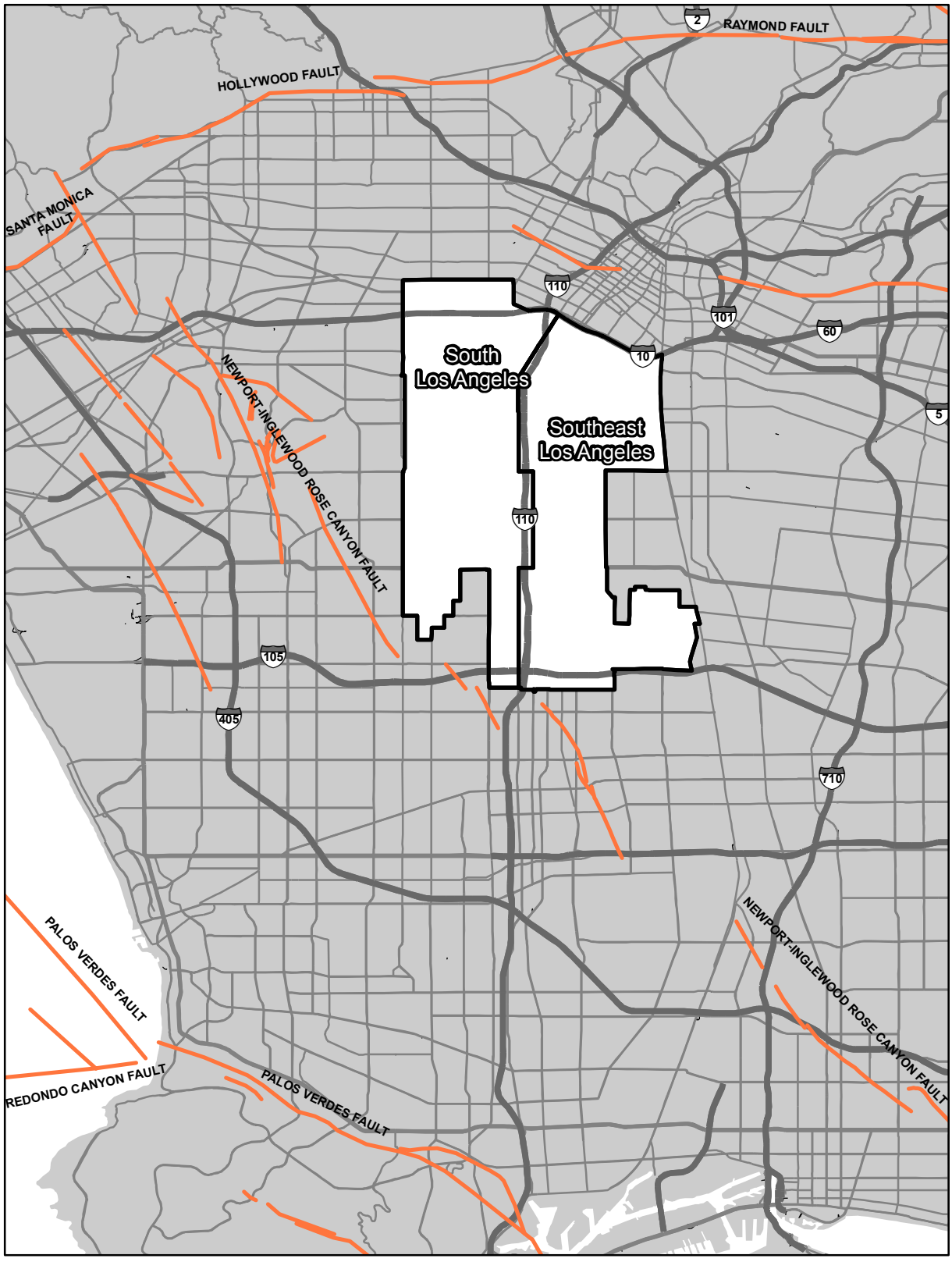
SOURCE: California Institute of Technology, Southern California Earthquake Data Center, *Significant Southern California Earthquakes and Faults*, http://scedc.caltech.edu/significant/fault-index.html, February 18, 2016.

Seismic Ground Shaking. The principal seismic hazard occurring as a result of an earthquake produced by local faults is strong ground shaking. Seismic ground shaking is the direct result of movement along a fault. The intensity of ground shaking depends on several factors, including the magnitude of the earthquake, distance from the earthquake epicenter, and the underlying soil conditions.

In general, the larger the magnitude of an earthquake and the closer a site to the epicenter of the event, the greater the effects will be. However, soil conditions can also amplify the earthquake shock waves. Generally, the shock waves remain unchanged in bedrock, but are amplified to a degree in thick alluvium, and are greatly amplified in thin alluvium. Modern, well-constructed buildings are designed to resist ground shaking through the use of shear walls and reinforcements. However, buildings in this seismically active region are susceptible to ground shaking and earthquakes.

Liquefaction. Liquefaction involves the sudden loss of strength in saturated, cohesionless soils that are subjected to ground vibration and result in temporary transformation of the soil into a fluid mass. If the liquefying layer is near the surface, the effects are much like that of quicksand for any structures located on top of it. If the layer is deeper in the subsurface, it may provide a sliding surface for the material above it. The effects of liquefaction include the loss of the soil's ability to support footings and foundations, which may cause buildings and foundations to buckle. These failures have been observed in the 1971 San Fernando and the 1994 Northridge earthquakes.

[1]City of Los Angeles, *GeoHub*, http://geohub.lacity.org/datasets/7f6e322db1d24909a90a4ddc2bba8d28_0, February 18, 2016.



LEGEND:

Community Plan Area — Geological Faults

N
W E
S

0 2 4 Miles

SOURCE: USGS Earthquake Faults, TAHA, 2016.

taha environmental planners

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FIGURE 4.6-1

ACTIVE FAULTS

Areas susceptible to liquefaction in the CPAs are identified in **Figure 4.6-2**.[2] As shown, liquefaction areas cover a large portion of the CPAs. Methods exist for safely designing and constructing facilities in liquefaction-prone areas; however, they are costly. While avoidance is a better option, liquefaction areas lie within already developed regions. Therefore, early planning recognition will allow more intelligent siting of critical facilities that must remain functional following a local earthquake.

Landslides. A landslide is a mass down-slope movement of earth materials under the influence of gravity, and includes a variety of forms including: rockfalls, debris slides, mudflows, block slides, soil slides, slumps, and creeps. These mass movements are triggered or accelerated by earthquake-induced ground motion, increased water content, excessive surface loading, or alteration of existing slopes by man or nature. Earthquake-induced landslides, usually associated with steep canyons and hillsides, can originate on, or move down, slopes as gentle as one degree in areas underlain by saturated, sandy materials. The CPAs are relatively flat and do not contain any major hills or land forms. There are no identified landslide zone areas within the CPAs.[3]

Unstable Soils. The CPAs would be subject to low-level differential settlement due to the intense shaking associated with seismic events.[4] This type of hazard results primarily in damage to property when an area settles to different degrees over a relatively short distance. The actual potential for settlement is difficult to predict as the conditions, under which this hazard can occur, are site specific.

SOILS AND GEOLOGIC MATERIALS

The northern portion of the CPAs is composed of Hanford Association soil, while the southern portion of the CPAs is composed of Chino, Ramona and Hanford Association soils. The soils underlying the CPAs are described in **Figure 4.6-3**.[5] The Hanford Association soil is a pale brown, course sandy loam located on gently sloping alluvial fans. Hanford Association soil is known to have good natural drainage properties and a slight erosion hazard.[6] The Ramona Association soil is a brown/red-brown, heavy or sandy loam located on gently sloping terraces; which has moderate natural drainage properties and a moderate erosion hazard. The Chino Association soil is a gray, calcareous silt loam located in basins and floodplains; which has poor drainage properties and a moderate erosion hazard.

Soil Erosion. The factors contributing to potential soil erosion include: climate, the physical characteristics of soils, topography, land use, and the amount of soil disturbance. In general, the loss of ground cover caused by construction activities is a primary factor contributing to an increase in soil erosion potential. Erosion potential is also directly related to the terrain's steepness. Since the CPAs are highly urbanized areas covered by impermeable surfaces, the potential for erosion is relatively low. However, the actual potential for erosion is difficult to predict as the conditions under which this hazard can occur are site specific. The Los Angeles Building Code (Building Code) Section 91.700 regulates grading, excavations, landfill, and other construction activities that might cause or be impacted by slope or ground instability, erosion, or flooding in hillside areas.

Expansive Soils. Expansive soils are typically associated with fine-grained clayey soils that have the potential to shrink and swell with repeated changes in the moisture content. The ability of clayey soil to change volume can result in uplift or cracking to foundation elements or other rigid structures such as slabs-on-grade, rigid pavements, sidewalks, or other slabs or hardscape founded on these soils. Expansive soils may be present within the CPAs.

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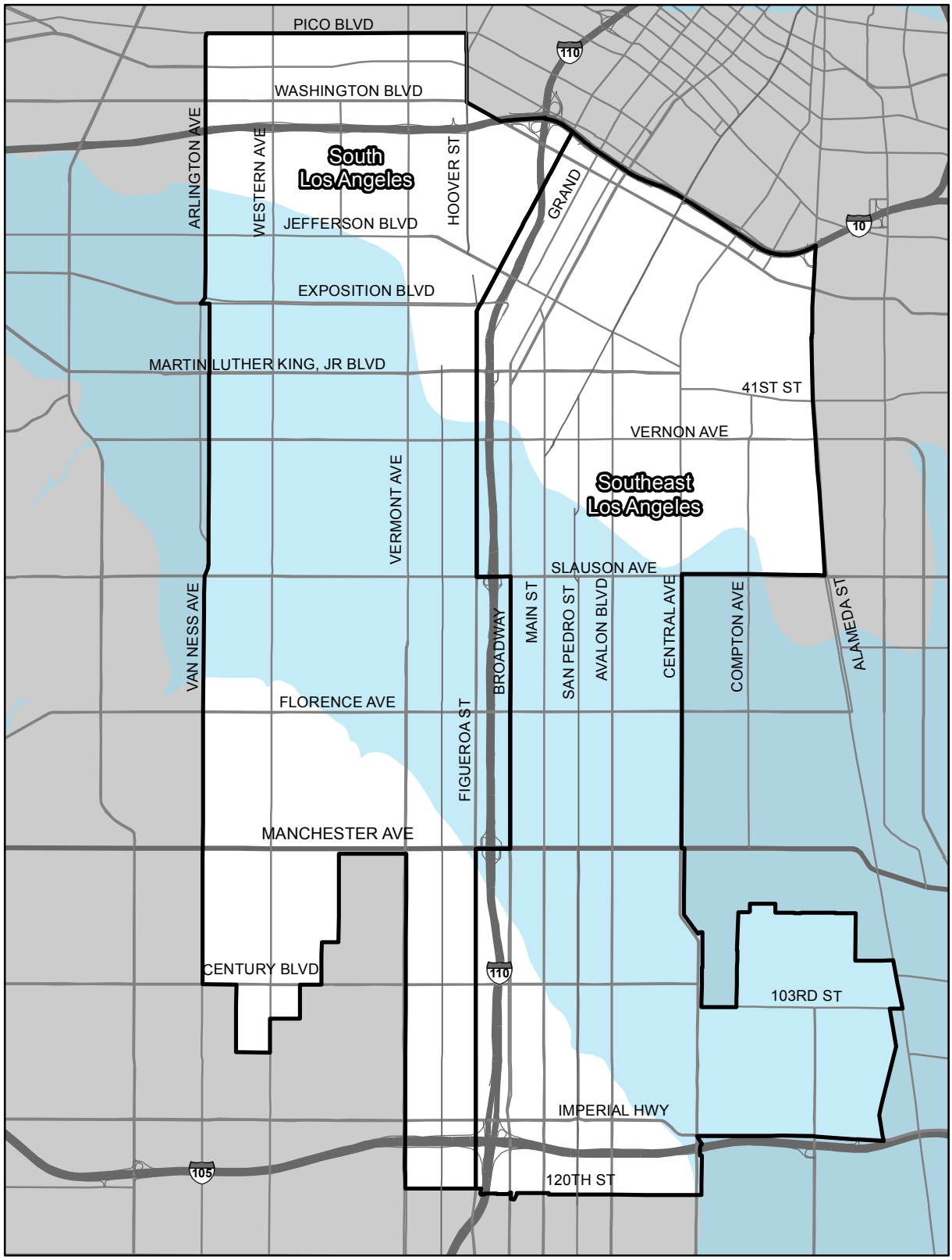
[2]City of Los Angeles, Department of City Planning, *https://data.lacity.org/browse?tags=gis,* 2009.

[3]California Department of Conservation, *Seismic Hazard Zonation Program,* Interactive Mapping and GIS Data, http://www.conservation.ca.gov/cgs/shzp/Pages/Index.aspx, 2016.

[4]City of Los Angeles, *The Citywide General Plan Framework, Final Environmental Impact Report,* 1995.

[5]City of Los Angeles, Department of City Planning, *GIS Data*, http://planning.lacity.org/, accessed 2016.

[6]United States Department of Agriculture Natural Resources Conservation Service Soil Survey Division, *Online Web Soil Survey,* http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/survey/, 2016.



LEGEND:

Community Plan Area Liquefaction

N
W E
S

0 4,000 8,000 Feet

SOURCE: California Department of Conservation 2006, TAHA, 2016.

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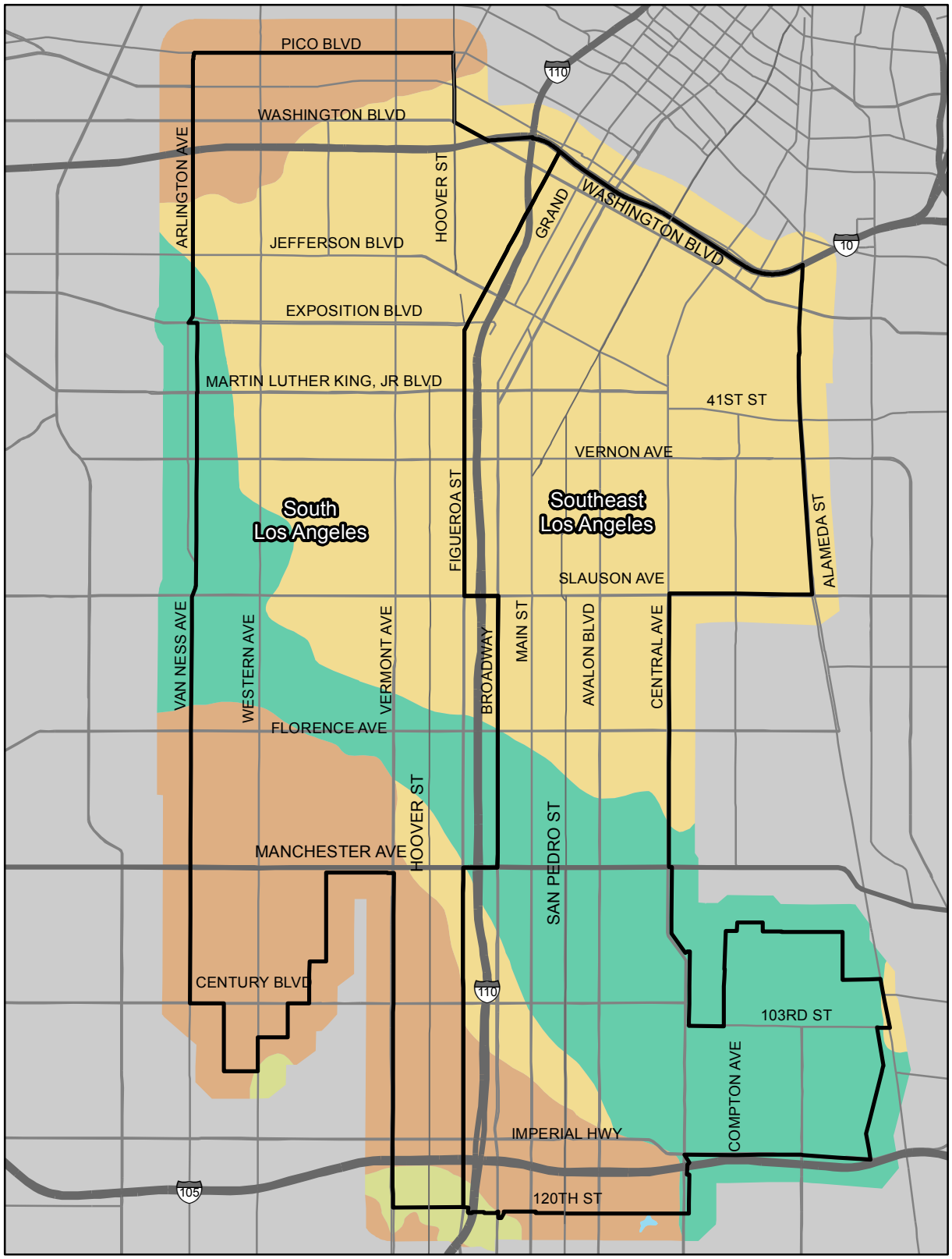
FIGURE 4.6-2

LIQUEFACTION ZONES



LEGEND:

- Community Plan Area
- Water
- Chino Association
- Cropley Association
- Hanford Association
- Ramona - Placentia Association

N W E S

0 4,000 8,000 Feet

SOURCE: TAHA, 2016.

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FIGURE 4.6-3

SOIL TYPES

Subsidence. Subsidence is a localized mass movement that involves the gradual downward settling of or sinking of the Earth's surface, resulting from the extraction of mineral resources, subsurface oil, groundwater, or other subsurface liquids, such as natural gas.

REGULATORY FRAMEWORK

FEDERAL

U.S. Code Title 42. Federal law codified in the U.S. Code Title 42, Chapter 86 (Earthquake Hazard Reduction Act of 1977) was enacted to reduce the risks to life and property from earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards reduction program. Implementation of these requirements are regulated, monitored, and enforced at the state and local level.

National Pollutant Discharge Elimination System (NPDES) Phase I Permit. As authorized by the Clean Water Act of 1972, an NPDES Phase I Permit is prepared when a project is proposed on a site. As part of the NPDES permit, a Stormwater Pollution Prevention Plan (SWPPP) is prepared. The SWPPP includes a description of a project site or area, erosion and sediment controls, runoff water quality monitoring, means of waste disposal, implementation of approved local plans, control of post-construction sediment and erosion control measures and maintenance responsibilities, and non-stormwater management controls. Dischargers are required to inspect construction sites before and after storms to identify stormwater discharge from construction activity, and to identify and implement controls where necessary.

The City implements these requirements through its Standard Urban Stormwater Mitigation Plan (SUSMP), which addresses stormwater pollution from new construction and redevelopment projects. The SUSMP requirements contain a list of minimum Best Management Practices (BMPs) that must be employed to infiltrate or treat stormwater runoff, control peak flow discharge, and reduce the post-project discharge of pollutants from stormwater conveyance systems. Refer to Section 4.8, Hydrology and Water Quality, for additional information.

STATE

Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act). The Alquist-Priolo Act, which is codified in the Public Resources Code as Division 2, Chapter 7.5, provides policies and criteria to assist cities, counties, and State agencies in the development of structures for human occupancy across the fault trace of active faults.[7] The Alquist-Priolo Act was intended to provide the citizens of the State with increased safety and to minimize the loss of life during and immediately following earthquakes by facilitating seismic retrofitting to strengthen buildings, including historical buildings, against ground shaking. Before a project can be permitted within an Alquist-Priolo Earthquake Fault Zone, the City of Los Angeles requires a geologic investigation to demonstrate that proposed building(s) will not be constructed across active faults. If an active fault is found, a structure for human occupancy cannot be placed over the trace of the fault and must be set back from the fault (generally 50 feet).

Seismic Hazards Mapping Act. In order to address the effects of strong ground shaking, liquefaction, landslides, and other ground failures due to seismic events, the State of California passed the Seismic Hazards Mapping Act of 1990. Under the Seismic Hazards Mapping Act, which is codified the Public Resources Code (PRC), Chapter 7.8, Section 2690- 2699.6, the State Geologist is required to delineate "seismic hazard zones." Cities and counties must regulate certain development projects within these zones to ensure the geologic and soil conditions are investigated and appropriate mitigation measures, if any, are incorporated into development plans. The State Mining and Geology Board (SMGB) provides additional regulations and policies to assist municipalities in preparing the safety element of their general plan and

[7] A fault trace is the intersection of a geological fault with the ground surface, leaving a visible mark; also, the line commonly plotted on geologic maps to represent a fault. Source: U.S. Geological Survey- Earthquake Glossary.

encourage land use management policies and regulations to reduce and mitigate those hazards to protect public health and safety. Under PRC Section 2697, cities and counties shall require, prior to the approval of a project located in a seismic hazard zone, to prepare a geotechnical report defining and delineating any seismic hazard. The requirement for a report may be waived if city finds that no undue seismic hazard exists, based on information resulting from studies conducted on sites in the immediate vicinity of the project and of similar soil composition to the project site. Each city or county shall submit one copy of each geotechnical report, including mitigation measures, to the State Geologist within 30 days of its approval.

California Building Code (CBC). The CBC, found in California Code of Regulations (CCR) Title 24, is a compilation of the State building standards code, including seismic safety standards for new buildings. California requires compliance with the CBC. Each jurisdiction in California must adopt its own building code that incorporates the CBC. Local codes are permitted to be more stringent than the CBC (with limitations), but, at a minimum, are required to meet all state standards and enforce the regulations of the CBC. The CBC forms Part 2 of the California Building Standards Code, which is updated on a triennial basis. The current 2013 California Building Standards Code became effective January 1, 2014. The 2016 California Building Standards Code (Cal. Code Regs., Tit. 24) was published as of July 1, 2016, and will become effective January 1, 2017.

Given the State's susceptibility to seismic events, the seismic standards within the CBC are among the strictest in the world. The CBC applies to all occupancies in the State, except where stricter standards have been adopted by local agencies. Chapter 16 of the CBC deals with structural design requirements governing seismically resistant construction (Section 1604), including (but not limited to) factors and coefficients used to establish seismic site class and seismic occupancy category for the soil/rock at the building location and the proposed building design (Sections 1613.5 through 1613.7). Chapter 18 includes (but is not limited to) the requirements for foundation and soil investigations (Section 1803); excavation, grading, and fill (Section 1804); allowable load-bearing values of soils (Section 1806); and the design of footings, foundations, and slope clearances (Sections 1808 and 1809), retaining walls (Section 1807), and pier, pile, driven, and cat-in-place foundation support systems (Section 1810). Chapter 33 includes (but is not limited to) requirements for safeguards at worksites to ensure stable excavations and cut or fill slopes (Section 3304).

CBC Appendix J applies to grading, excavation, and earthwork construction, and requires that no grading shall be performed without first having obtained a permit from the building official. Section J104.3 requires the preparation of a geotechnical report that contains at least the following:

- The nature and distribution of existing soils
- Conclusions and recommendations for grading procedures
- Soil design criteria for any structures or embankments required to accomplish the proposed grading
- Where necessary, slope stability studies, and recommendations and conclusions regarding site geology

LOCAL

City of Los Angeles General Plan Conservation and Safety Elements. The City's General Plan is a comprehensive, long-range declaration of purposes, policies and programs for the development of the City of Los Angeles. State law since 1975 has required city general plans to include a safety element, which addresses the issue of protection of its people from unreasonable risks associated with natural disasters, e.g., fires, floods, and earthquakes. The Safety Element of the General Plan contains policies that emphasize seismic safety issues because seismic events present the most widespread threat of devastation to life and property. Because soil erosion can result in the loss of valuable ground surface materials by depositing them into basins and the ocean, and also contributes to potential water quality degradation and reduced air quality, the Conservation Element of the General Plan contains policies to minimize impacts from erosion.

The Safety Element provides a contextual framework for understanding the relationship between hazard mitigation, response to a natural disaster, and initial recovery from a natural disaster. The policies of the Safety Element reflect the comprehensive scope of the City's Emergency Operations Organization (EOO),

which is tasked with integrating the City's emergency operations into a single operation. The Safety Element addresses the issues of protection of people from unreasonable risks associated with natural disasters, fires, floods, and earthquakes.

The intent of the Conservation Element is the conservation and preservation of natural resources. Policies of the Conservation Element address the effect of erosion on such natural resources as beaches, watersheds, and watercourses. Although the Conservation Element cites erosion of hillsides resulting in loss of natural watersheds and features, flooding and endangerment to structures and people as a continuing issues, it contains limited policies related to erosion and instead refers to the Los Angeles Municipal Code (LAMC) Sections 91.700 et seq. and Specific Plan for Management of Flood Hazards (Ordinance 172.081) for specific guidance.

Relevant objectives and policies of the Safety and Conservation Elements related to geology and soils are listed below in **Table 4.6-2**.

TABLE 4.6-2: RELEVANT GENERAL PLAN GEOLOGY AND SOILS OBJECTIVES AND POLICIES

Objective/Policy	Objective/Policy Description
SAFETY ELEMENT - HAZARD MITIGATION	
Policy 1.1.6	State and federal regulations. Assure compliance with applicable State and federal planning and development regulations, e.g., Alquist-Priolo Earthquake Fault Zoning Act, State Mapping Act and Cobey-Alquist Flood Plain Management Act.
CONSERVATION ELEMENT - EROSION	
Objective	Protect the coastline and watershed from erosion and inappropriate sedimentation that may or has resulted from human actions.
Policy 2	Continue to prevent or reduce erosion that will damage the watershed or beaches or will result in harmful sedimentation that might damage beaches or natural areas.

SOURCE: City of Los Angeles, *General Plan Safety Element,* 1996 and *Conservation Element*, 2001.

Los Angeles Municipal Code (LAMC). Compliance with the Building Code is mandatory for all development in the City. Chapter IX (Building Regulations), Article 1 (Building Code) sets forth the specific requirements of the CBC. Throughout the permitting, design, and construction phases of a building project, the Department of Building and Safety engineers and inspectors confirm that the requirements of the CBC pertaining specifically to geoseismic and soils conditions are being implemented by project architects, engineers, and contractors.

The principal mechanism for mitigation of geologic hazards is the City Grading Code, the requirements of which are specified in Article 1, Division 70. Under the Grading Code, the Department of Building and Safety has the authority to withhold building permit issuance if a project cannot mitigate potential hazards to the project or which are associated with the project. The Grading Code periodically is revised to reflect new technology and improved standards and requirements.

THRESHOLDS OF SIGNIFICANCE

In 2015, the California Supreme Court in *CBIA v. BAAQMD*, held that CEQA generally does not require a lead agency to consider the impacts of the existing environment on the future residents or users of the project. On the other hand, if the project exacerbates a condition in the existing environment, the lead agency is required to analyze that impact of that exacerbated condition on future residents and users of the project (as well as other impacted individuals).

In accordance with Appendix G of the State CEQA Guidelines and the *CBIA v. BAAQMD* decision, the Proposed Plans would have a significant impact related to geology and soils if they result in any of the following impacts to future residents or users in the CPA:

- Exacerbate existing environmental conditions so as to increase the potential to expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - 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.
  - Strong seismic ground shaking
  - Seismic-related ground failure, including liquefaction
  - Landslides
- Result in substantial soil erosion or the loss of topsoil.
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse due to development exacerbating the existing environmental conditions.
- 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 due to development exacerbating the expansive soil conditions.
- Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

METHODOLOGY

Baseline information for the analysis was compiled from a review of published geologic maps and reports, as well as information compiled and evaluated by the City of Los Angeles in conjunction with its overall planning and hazard mitigation processes to identify geologic conditions and geologic hazards in the impact areas (for Geology and Soils, that is the CPAs).

Independent of the CEQA process, there is a comprehensive regulatory framework implemented at the state and City level to mitigate potential hazards associated with geologic and soils conditions. The design-controllable aspects of building foundation support, protection from seismic ground motion, and soil instability are governed by existing regulations. Compliance with these regulations is required, not optional. Compliance must be demonstrated by the project proponent to have been incorporated in the project's design before permits for project construction would be issued. The analysis presented herein assumes compliance with all applicable laws, regulations, and standards, as part of the initial CEQA baseline and future conditions.

The impact analysis for geology and soils was based on proposed land use designations under the Proposed Plans, the existing geologic conditions and hazards in the CPAs, and the thresholds of significance for geology and soils. This methodology does not depend on population nor employment data. The use of other population or employment baselines would not change the analysis since the policies and land uses of the Proposed Plans, on which this analysis is based, remain the same.

IMPACTS

Impact 4.6-1 Would implementation of the Proposed Plans exacerbate existing environmental conditions so as to increase the potential to expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving the 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? There would be no impact.

A review of the fault systems of Southern California revealed that no active or potentially active faults traverse the CPAs. **Figure 4.6-1** and **Table 4.6-2**, above, identify active and potentially active faults in the region and in the vicinity of the CPAs. Each of these generally trend northwest to southeast outside of the CPAs. According to the most recent Alquist-Priolo Earthquake Fault Zoning Map (2014), the CPAs are not located within an Alquist-Priolo Special Study Zone and Fault Rupture Study Area.[8]

No known faults traverse the CPAs and the Proposed Plans would not facilitate development on known faults. The Proposed Plans would not expose people to substantial risk of injury as a result of fault rupture. Therefore, there would be ***no impact*** related to the rupture of a known earthquake fault.

Mitigation Measures

No mitigation measures are required.

Level of Significance of Impacts after Mitigation

No impact would occur.

Impact 4.6-2 Would implementation of the Proposed Plans exacerbate existing environmental conditions so as to increase the potential to expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking? This impact is less than significant.

In light of the California Supreme Court ruling in *CBIA v. BAAQMD*, which held that CEQA generally does not require a lead agency to consider the impacts of the existing environment on the future residents or users of the project, the potential for substantial adverse effects on people or structures from strong seismic ground shaking from earthquakes is not an impact under CEQA. The type of development expected to occur under the Proposed Plans is typical of urban environments and would not involve mining operations, deep excavation into the Earth, or boring of large areas creating unstable seismic conditions or stresses in the Earth's crust. Furthermore, as discussed above, there are no active or potentially active faults that traverse the CPAs. Based on the above, future development under the Proposed Plans would not exacerbate seismic conditions in the CPAs, therefore impacts related to strong seismic ground shaking would be ***less than significant***.

The following information about seismic risk and building and seismic codes is provided for informational purposes.

The CPAs, like all communities in the City of Los Angeles, are in a seismically active region, and are subject to risk of damage to persons and property as a result of seismic ground shaking from earthquakes originating on one or more of the active faults in the region (**Table 4.6-2**). Statewide, scientists estimate a 99.7 percent probability of an M ≥ 6.7 earthquake occurring in California during the next 30 years. When compared to

[8]City of Los Angeles, *GeoHub*, http://geohub.lacity.org/datasets/7f6e322db1d24909a90a4ddc2bba8d28_0, February 18, 2016.

northern California, southern California has a greater chance of an M ≥ 6.7 earthquake. For larger events, the 30-year probability of an M ≥ 7.5 event is twice that of northern California (37 percent vs. 15 percent). For the principal faults in southern California (this would include the San Andreas, San Jacinto, and Elsinore faults), an earthquake on the southern part of the San Andreas has a 59 percent probability of generating a M ≥ 6.7 earthquake in the next 30 years (compared to 21 percent on the northern part of the fault).[9]

Building in California is strictly regulated by the CBC, as adopted and enforced by each jurisdiction, to reduce risks from seismic events to the maximum extent possible. The currently accepted design standards for seismically induced ground shaking-resistant construction are addressed in the CBC and the Los Angeles Building and Grading Codes. These guidelines are considered minimum standards for the design and construction of buildings and must be incorporated into any final project designs. Because the design and construction of new habitable structures would be in compliance with the CBC's recommended seismic design criteria, potential hazards associated with strong seismic ground shaking on new development in the CPAs would be reduced.

As discussed above, all future development would be required to meet the most current building and seismic codes. The City's plan check and permitting process ensures that all new construction adheres to adopted Building Code requirements and incorporates structural features and construction methods that meet seismic and geologic safety standards. Compliance with the CBC, the City Building Codes, and related applicable regulatory requirements would reduce the level of risk to future residents or users associated with strong seismic ground shaking on any particular site within the CPAs, compared to existing conditions. Therefore, impacts related to strong seismic ground shaking would be ***less than significant***.

Mitigation Measures

No mitigation measures are required.

Level of Significance of Impacts after Mitigation

Less than significant without mitigation.

Impact 4.6-3 Would implementation of the Proposed Plans exacerbate existing environmental conditions so as to increase the potential to expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction and/or landslides? This impact is less than significant.

In light of the California Supreme Court ruling in *CBIA v. BAAQMD*, which held that CEQA generally does not require a lead agency to consider the impacts of the existing environment on the future residents or users of the project, the potential for substantial adverse effects on people or structures from seismic-related hazards from earthquakes is not an impact under CEQA. The type of development expected to occur under the Proposed Plans is typical of urban environments and would not involve mining operations, deep excavation into the Earth, or boring of large areas creating unstable seismic conditions or stresses in the Earth's crust. Based on the above, future development under the Proposed Plans would not cause or exacerbate geologic hazards in the CPAs, therefore impacts related to seismic-related ground failure would be ***less than significant***.

The following information about liquefaction and landslides is provided for informational purposes.

Liquefaction. Liquefaction-prone areas cover a large, central portion of the CPAs as shown in **Figure 4.6-2** above. These areas are already developed with residential and commercial structures. The Proposed Plans

[9]It should be noted that conformance to the recommended seismic design criteria does not constitute any kind of guarantee or assurance that substantial structural damage or ground failure would not occur if a maximum magnitude earthquake occurred. The primary goal of seismic design is to protect life through prevention of structural collapse and not to avoid all damage.

would not directly increase liquefaction hazards because they would not affect seismic conditions or alter underlying soil or groundwater characteristics that govern liquefaction potential. However, the Proposed Plans would otherwise provide for development, which would increase the number of occupied structures in the CPAs that could, in turn, increase the number of people or structures that could be exposed to liquefaction and geologic hazards. In addition, because the Proposed Plans would allow increased floor area ratios in the CPAs from the existing environment, especially in AC-2D change areas that would allow greater height increases, this could increase the amount of occupied space in the CPAs.

Under the provisions of California state law and the City's Building Code, all new construction in liquefaction-prone areas would be required to prepare a geotechnical report. Additionally, for sites with mapped maximum considered earthquake spectral response, as determined by Section 1613 of the CBC, a liquefaction potential study of the site shall be provided, and the recommendations (including structural and foundation design features) incorporated in grading and construction plans. Compliance with the recommendations of the geotechnical report, as well as the City's Building Code and Grading Code, would reduce the liquefaction-related hazards. This impact is ***less than significant***.

Landslides. It is the City's standard practice to require the preparation, review, and approval of geotechnical reports for new developments in landslide susceptible areas. However, the CPAs are relatively flat and do not contain any major hills or land forms. Additionally, there are no areas within the CPAs identified as landslide zone areas on the Seismic Hazards Zone Maps of the California Department of Conservation, Division of Mines and Geology. This impact is ***less than significant***

In summary, compliance with the City's Building and Grading Codes and the requirements of the geotechnical reports would help to minimize the potential risk of loss, injury, or death due to liquefaction and landslides for future residents and users within the CPAs. Moreover, future development under the Proposed Plans would not cause or exacerbate geologic hazards in the CPAs, and therefore impacts related to seismic-related ground failure, including liquefaction and/or landslides, are considered to be ***less than significant***.

Mitigation Measures

No mitigation measures are required.

Level of Significance of Impacts after Mitigation

Less than significant without mitigation.

Impact 4.6-4 Would implementation of the Proposed Plans result in substantial soil erosion or the loss of topsoil? This impact is less than significant.

Soil erosion and sedimentation are naturally occurring processes. The agents of soil erosion are water and wind, each contributing a significant amount of soil loss. Sedimentation is the phenomenon of sediment or gravel accumulating. The effects of erosion are intensified with an increase in slope (as water moves faster, it gains momentum to carry more debris), the narrowing of runoff channels (which increases the velocity of water), and by the removal of groundcover (which leaves the soil exposed to erosive forces). The potential for soil erosion can be accelerated and increased by human activities such as grading and cut-and-fill methods, particularly on steep slopes. Erosion can result in the loss of valuable ground surface materials, depositing them into basins and the ocean, and can result in the reduction in air quality due to wind-carried dust.

Grading for most structures that would be a reasonably foreseeable effect of the project is expected to be minimal, consisting of grading for foundations, building pads, and utility trenches in areas that are already developed. Excavations for utility trenches and foundations typically involve less than 5 feet of change in ground surface elevations. Most pad grading typically would be less than two feet deep. Nonetheless, deeper excavations could accompany the emplacement of underground facilities.

All earthwork and grading activities require grading permits from the Department of Building and Safety that include requirements and standards designed to limit potential impacts to acceptable levels. All on-site grading and site preparation must comply with applicable provisions of Chapter IX, Division 70 of the LAMC, which addresses grading, excavations, and fills, and the recommendations of a site-specific geotechnical report. The City requires the preparation of a site-specific geotechnical report to evaluate soils issues.

Because one of the major effects associated with grading is sedimentation in receiving waters, erosion control standards are set by the Regional Water Quality Control Board (RWQCB) through administration of the NPDES permit process for storm drainage discharge. The NPDES permit requires implementation of nonpoint source control of stormwater runoff through the application of a number of BMPs. These BMPs are meant to reduce the amount of constituents, including eroded sediment, that enter streams and other water bodies. A SWPPP, as required by the RWQCB, is required to describe the stormwater BMPs (structural and operational measures) that would control the quality and quantity of stormwater runoff. Erosion and sedimentation issues are addressed more fully in Section 4.9, Hydrology and Water Quality. All new development permitted under the Proposed Plans would be required to comply with the state NPDES permit process, the City's standard grading and building permit requirements, and the application of BMPs. Therefore, impacts related to soil erosion or loss of topsoil would be ***less than significant***.

Mitigation Measures

No mitigation measures are required.

Level of Significance of Impacts after Mitigation

Less than significant under the Proposed Plans without mitigation.

Impact 4.6-5 Would implementation of the Proposed Plans result in development 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, or collapse caused in whole or in part by the project's exacerbation of the existing conditions? This impact is less than significant.

Landslide. A landslide is a mass downslope movement of earth materials under the influence of gravity, and includes a variety of forms including rockfalls, debris slides, mudflows, block slides, soil slides, slumps, and creeps. Landslides are usually associated with steep canyons and hillsides, but can originate on or move down slopes on gentle slopes in areas underlain by saturated, sandy materials. In addition to being triggered by earthquakes, landslides can be caused by increased water content, excessive surface loading, or alteration of existing slopes by man or nature. The potential for landslides in the CPAs is minimal due to the area's relatively flat topography and absence of major hills or land forms. Additionally, there are no areas within or near the CPAs identified as landslide zone areas on the Seismic Hazards Zone Maps of the California Department of Conservation, Division of Mines and Geology. This impact is ***less than significant***.

Lateral Spreading. Lateral spreading is a phenomenon where large blocks of intact soil move downslope in a rapid fluid-like flow movement, primarily as a result of liquefaction. The mass moves toward an unconfined area, such as a descending slope or stream-cut bluff, and can occur on slope gradients as gentle as one degree. Lateral spreading often occurs along riverbanks and shorelines where loose, saturated sandy soils are commonly encountered, as well as in liquefaction-prone areas. Lateral spreading could also occur in unsupported walls of pits excavated in the existing fill or loose alluvium. Pursuant to Section 1613 of the CBC, projects located in liquefaction zones shall incorporate seismic design features into grading and construction plans. Furthermore, compliance with the recommendations of the geotechnical report, as well as the City's Building Code and Grading Code, would reduce lateral spreading and other liquefaction-related hazards and thus would minimize the potential risk of loss, injury, or death due to lateral spreading to ***less than significant***.

Subsidence or Collapse. Subsidence is a localized mass movement that involves the gradual downward settling of or sinking of the Earth's surface, resulting from the extraction of mineral resources, subsurface oil, groundwater, or other subsurface liquids, such as natural gas. Collapse is an abrupt depression of the ground cover that is clearly visible to the naked eye which is also principally caused by the extraction of subsurface liquids or mining of mineral resources. There are currently no subsurface oil extraction facilities in the Southeast Los Angeles CPA. In the South Los Angeles CPA, there are currently three operational oil drilling facilities. Subsurface drilling has been taking place in the CPA for over five decades with no incidence of subsidence or collapse. Additionally, no mining activities or extraction of mineral resources occur within or near the CPAs. Therefore, impacts related to subsidence or collapse are ***less than significant***.

Development in the CPAs permitted under the Proposed Plans potentially having significant impacts would be subject to preparation of a geotechnical report as required by state and City building codes. As stated above, all on-site grading and site preparation must comply with the applicable provisions of Chapter IX, Division 70, of the Los Angeles Municipal Code, which addresses grading, excavations, and fills, and the recommendations of the Geotechnical Report. These guidelines are considered minimum standards for design and construction of buildings and must be incorporated into any final project designs. Compliance with the recommendations of the geotechnical report and the City's Building and Grading Codes is reasonably expected to be sufficient to reduce soil instability-related hazards. Compliance with the City's Codes that implement the CBC, in combination with the City's standard grading and building permit requirements and the application of BMPs, would help to minimize impacts from unstable soils. Therefore, impacts related to unstable soils would be ***less than significant***.

Mitigation Measures

No mitigation measures are required.

Level of Significance of Impacts after Mitigation

Less than significant under the Proposed Plans without mitigation.

Impact 4.6-6 Would implementation of the Proposed Plans result in development located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property due to development exacerbating the expansive soil conditions? This impact is less than significant.

Expansive soils are typically associated with fine-grained clayey soils that have the potential to shrink and swell with repeated changes in the moisture content. The ability of clayey soil to change volume can result in uplift or cracking to foundation elements or other rigid structures such as slabs-on-grade, rigid pavements, sidewalks, or other slabs or hardscape founded on these soils. Expansive soils may be present within the CPAs. These locations are unknown; however, the existence of expansive soils would be uncovered in the geotechnical report required by state and City building codes.

As with seismic ground shaking impacts, the geographic context for analysis of impacts on development from unstable soil conditions, including landslides, liquefaction, subsidence, collapse, or expansive, unstable, or corrosive soils generally is site-specific. Development is required to undergo analysis of geological and soil conditions applicable to the specific individual project, and restrictions on development would be applied in the event that geological or soil conditions pose a risk to safety as a result of site-specific geologic or soils instability, subsidence, collapse, and/or expansive soil.

Future development under the Proposed Plans could be constructed in areas of expansive soils. The City requires, as a standard practice, the preparation, review, and approval of geotechnical reports for new developments. All earthwork and grading activities require grading permits from the Department of Building and Safety that would include requirements and standards designed to limit potential expansive soil impacts to acceptable levels. All on-site grading and site preparation must comply with applicable provisions of

Chapter IX, Division 70, of the Los Angeles Municipal Code, which addresses grading, excavations, and fills, and the recommendations of the geotechnical report. Compliance with the recommendations of the geotechnical report, as well as the City's Building and Grading Codes, are reasonably expected to be sufficient to reduce impacts from expansive soil-related hazards. Because development facilitated by the Proposed Plans would be required to implement such appropriate design and construction measures, impacts related to expansive soils would be ***less than significant***.

Mitigation Measures

No mitigation measures are required.

Level of Significance of Impacts after Mitigation

Less than significant under the Proposed Plans without mitigation.

Impact 4.6-7 Would implementation of the Proposed Plans result in development on soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water? No impact would occur.

It is the City's policy that all new development must be connected to a public sewerage system. All portions of the CPAs are currently being served by a public sewerage system. The Proposed Plans do not propose any development in areas not served by sewer service. New development in the CPAs would not utilize septic tanks. Therefore, there would be ***no impacts*** related to construction on soils incapable of adequately supporting septic tanks.

Mitigation Measures

No mitigation measures are required.

Level of Significance of Impacts after Mitigation

No impacts would occur under the Proposed Plans.

CUMULATIVE IMPACTS

The geographic context for the analysis of cumulative impacts resulting from geologic hazards is generally site-specific because each individual building site within the two CPAs has a different set of geologic considerations that would be subject to specific site-development and construction standards. Given the site-specific nature of geologic impacts it is not anticipated that the Proposed Plans would contribute to a cumulatively considerable increase in risk associated with geologic hazards.

Seismic-related Impacts. Impacts related to ground shaking and seismic-related ground failure would occur at individual building sites. These effects are site-specific, and impacts would not be compounded by additional development. New buildings in the City are required to be sited and designed in accordance with appropriate geotechnical and seismic guidelines and recommendations, consistent with the requirements of the Building Code. Therefore, although there is risk from seismic events inherent in all development in seismically active areas in the state of California, compliance with applicable regulations reduces this risk because those regulations have been formulated to preserve public safety. Individual projects that could be developed as a result of the Proposed Plans would comply with the provisions of all applicable codes and regulations and current seismic safety design guidelines. Therefore, seismic-related impacts as a result of the implementation of the Proposed Plans would be less than significant and would not be cumulatively considerable.

Soils and Geologic-related Impacts. Development in the CPAs and other projects in the vicinity of the CPAs could expose soil surfaces and further alter soil conditions. However, development under the Proposed Plans and other projects in the area are required to conform to the provisions of applicable federal, state, and local laws and ordinances pertaining to erosion and sedimentation control. This includes the City's SUSMP requirements, which implement the federal and state NPDES program regulations (refer to Section 4.9, Hydrology and Water Quality). Because the Proposed Plans would be in compliance with applicable NPDES permit requirements, and would implement and maintain the BMPs required by individual project SWPPPs, the Proposed Plans would not make a cumulatively considerable contribution to impacts related to soil erosion. The geographic context for analysis of impacts from unstable soil conditions, including landslides, liquefaction, subsidence, collapse, or expansive, unstable, or corrosive soils is generally site-specific. Development is required to undergo analysis of geological and soil conditions applicable to the specific individual project, and restrictions on development would be applied in the event that geological or soil conditions pose a risk to safety as a result of site-specific geologic or soils instability. Because development facilitated by the Proposed Plans would be required to implement appropriate design and construction measures, soils or geologic-related impacts would be less than significant and would not be cumulatively considerable.

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