4.5 GEOLOGY/SOILS AND MINERAL RESOURCES

This section of the EIR describes existing geology, soils, mineral resources and seismic conditions for the Granada Hills–Knollwood and Sylmar Community Plan Areas (CPAs) and analyzes how implementation of the Granada Hills–Knollwood Community Plan and implementing ordinance and the Sylmar Community Plan and implementing ordinances (proposed plans) could affect or be affected by geologic and soils conditions. No comment letters specifically addressing seismic, soils, or mineral resources were received in response to the Notice of Preparation (NOP) circulated for the proposed plans.

Baseline information for the analysis was compiled from a review of geologic maps and reports prepared by the California Geological Survey (CGS) and Division of Oil, Gas, and Geothermal Resources (DOGGR), 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 Granada Hills–Knollwood and Sylmar CPAs. Additional sources of information included the City of Los Angeles General Plan Framework, the City's development ordinances, and environmental documents prepared for projects in the vicinity of the Granada Hills–Knollwood and Sylmar CPAs. Full reference list entries for all cited materials are provided in Section 4.5.5 (References). A regulatory framework is also provided in this section describing applicable agencies and regulations related to geology/soils and mineral resources.

4.5.1 Environmental Setting

Regional Geologic Setting

The Granada Hills–Knollwood CPA is located in the northern portion of the San Fernando Valley, which is an elongated valley, roughly 22 miles long in an east/west direction and generally approximately 9 miles wide in a north/south direction, although stretching to 12 miles wide at its widest point. Situated within the Transverse Ranges geomorphic province of California, the San Fernando Valley is bounded by the San Gabriel and Santa Susana Mountains to the north, the Santa Monica Mountains to the south, the Verdugo Mountains to the east, and the Simi Hills to the west. Geomorphic provinces are large natural regions, dominated by similar rocks or geologic structures. The Sylmar CPA abuts the Granada Hills–Knollwood CPA to the northeast and is similarly within the Transverse Ranges geomorphic province of California.

The Transverse Ranges geomorphic province is composed of several mountain ranges oriented in an east/west direction and extending over 320 miles from the Mojave and Colorado Desert Provinces to Point Arguello at the Pacific Ocean. Included within the Transverse Ranges are portions of Riverside, San Bernardino, Los Angeles, and Ventura Counties. Acting as a northern boundary, the Transverse Ranges truncate the northwest trending structural grain of the Peninsular Ranges geomorphic province, which is composed of multiple mountain ranges and valleys extending southward 775 miles past the US-Mexico border. The Peninsular Ranges geomorphic province is the largest province in North America.

Southern California is seismically active, being situated at the convergence of the North American and Pacific tectonic plates. Earthquakes along the San Andreas Fault relieve convergent plate stress in the form of right lateral strike slip offsets. The Transverse Ranges work as a block causing the San Andreas Fault to bend or kink, producing compressional stresses that are manifest as reverse, thrust, and right lateral faults. Faulting associated with the compressional forces creates earthquakes and is primarily responsible for the mountain building, basin development, and regional upwarping found in this area. As rocks are folded and faulted within the rising mountain ranges, landsliding and erosion transport sediment or alluvium into the San Fernando Valley, creating a deep sedimentary basin.

Mountain ranges surrounding the CPAs contain rocks varying in age from the Pre- Cambrian eon to the Tertiary period and younger sedimentary and volcanic rocks that range from Tertiary period to Quaternary period. As ages of the rocks vary greatly, so does the composition of the rocks surrounding the valley: from igneous and metamorphic crystalline complexes to marine and nonmarine sediments. Thus, the sediments within the CPAs vary greatly, both in composition and grain size.

Holocene to Pleistocene alluvial and older elevated alluvial soils[43] comprise the majority of geologic material exposed at the surface of the CPAs. Quaternary-age Saugus formation exposures are present. Prior to construction of flood control dams and channels, the floor of the CPAs was composed of a series of coalescing alluvial fans with seasonal streams shifting position throughout the area. Erosion of the surrounding mountains has resulted in deposition of unconsolidated sediments in low-lying areas by rivers such as the Los Angeles River and its major tributaries (Burbank Western Channel, Pacoima Wash, Tujunga Wash, and Verdugo Wash in the San Fernando Valley; and the Arroyo Seco, Compton Creek, and Rio Hondo south of the Glendale Narrows). The nonhilly portions of the Granada Hills–Knollwood and Sylmar CPAs are underlain by these alluvial materials, which include coarse-grained sands and gravels, predominantly carried into the valley from the crystalline complexes of the San Gabriel Mountains. Development throughout the CPAs has disturbed the majority of near-surface alluvial materials.

Topography and Physiography

The City of Los Angeles contains many landforms that reflect recent geologic folding and faulting. Four major landform types are represented in the Los Angeles area: high mountains (the San Gabriel Mountains and smaller ranges), broad valleys (San Fernando and San Gabriel Valleys which are separated from the coastal plain by low hills), low hills, and the coastal plain. Three major groups of rocks are represented within the Los Angeles Basin and San Fernando Valley: older igneous and metamorphic bedrock (100 to 75 million years old), older sedimentary rocks (about 65 to 15 million years old) and younger sedimentary rocks (15 to 1 million years old). Igneous rocks are formed when materials such as lava or magma cool and solidify, and metamorphic rocks are formed when the chemical and mineral composition of a rock is changed through the forces of heat or pressure. Sedimentary rocks are formed through the accumulation of mineral and organic materials at the earth's surface and within bodies of water. The sedimentary rock layers within the Los Angeles Basin and San Fernando Valley contain shale, siltstone, sandstone, and conglomerates, as well as some inter-bedded volcanic rocks. Over 22 million years ago, the Los Angeles Basin and San Fernando Valley were a deep marine basin formed by tectonic forces between the North American and Pacific plates. Since that time, over 5 miles of marine and non-marine sedimentary rock, as well as igneous rocks, have filled the basin. During the last 2 million years,

[43] Alluvium is an accumulation of stream-deposited sediments, including sands, silts, clays, or gravels.

defined by the Pleistocene and Holocene epochs, the Los Angeles Basin and San Fernando Valley and surrounding mountain ranges have been uplifted to form the present-day landscape. Erosion of the surrounding mountains has resulted in disposition of unconsolidated sediments in low-lying areas by rivers, such as the Los Angeles River.

Granada Hills–Knollwood is located in the northern San Fernando Valley, which is generally flat but slopes gently to the south. Portions of Granada Hills–Knollwood are in the foothills, where there are steeper slopes and pronounced elevation changes. Although the majority of Granada Hills–Knollwood is developed with urban land, probably the most striking feature is its large crown of undeveloped, open space in its northern region.

Topographically, the terrain of the central portion of Sylmar is largely flat, with a gentle south slope into the San Fernando Valley. The northwestern, northern and northeastern portions of the CPA rise into hillsides and mountainous areas. Sylmar is a semirural community framed by open space on the northern and eastern borders of the CPA.

Regional and Local Faults

The entire Southern California area is considered a seismically active region. 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. Surface rupture almost always follows preexisting faults, which are zones of weakness. Rupture may occur suddenly during an earthquake or slowly in the form of a fault creep. Sudden displacements are more damaging to structures because they are accompanied by shaking.[44]

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 the last 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 for most purposes, except for some critical structures. Table 4.5-1 (Major Named Faults Considered Active in Southern California) provides a summary of major named active faults in Southern California.

As shown on Figure 4.5-1 (Known Active Faults), there are several faults considered to be active within the CPAs: the Santa Susana Fault Zone, the San Fernando Fault Zone, the San Gabriel Fault, and the Mission Hills Fault. Each of these generally trends west to east or west to northeast. In addition, the southern segment of the San Andreas Fault runs north/south to the east of the Sylmar CPA and is a known active fault. 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. However, quakes along the unmapped faults, such as the blind thrust fault associated with the Northridge earthquake, are increasingly becoming the focus of study and concern. The concept of blind thrust faults has been recognized only recently by seismologists. The effect of such faults may dominate the geology of the Los Angeles basin and San Fernando Valley in a way not previously understood. In addition, not all

[44] California Geological Survey, Regional Geologic Hazards and Mapping Program, Alquist-Priolo Earthquake Fault Zones (2011), http://www.consrv.ca.gov/CGS/rghm/ap/Pages/index.aspx.

earthquakes result in surface rupture. For example, the Loma Prieta Earthquake of 1989 caused major damage in the San Francisco Bay Area, but the movement deep in the earth did not break through to the surface.

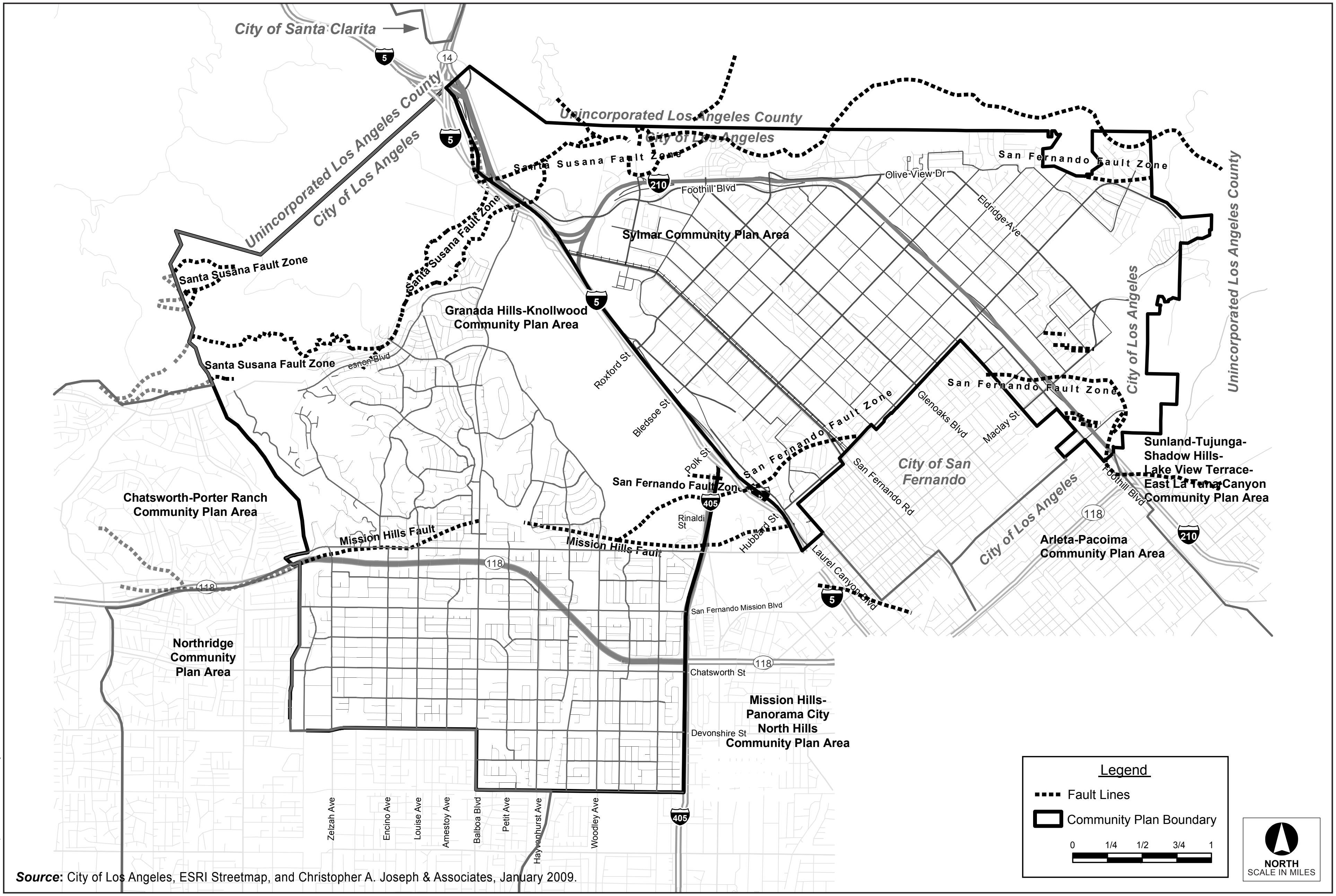
Table 4.5-1 Major Named Faults Considered Active in Southern California

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
Northridge Thrust	6.5–7.5	3.5–6.0	Thrust	1994
Newport-Inglewood Zone	6.0-7.4	0.6	Right lateral	1933
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			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: Southern California Earthquake Data Center, Fault Index (2011), http://www.data.scec.org/fault_index/.

Alquist-Priolo Earthquake Fault Zones

The purpose of the Alquist-Priolo Earthquake Fault Zones Act is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. The law requires the State Geologist to establish regulatory zones (known as Earthquake Fault Zones [EFZs]) around the surface traces of active faults and to issue appropriate maps. The zones vary in width, but average about 0.25 mile wide. For the purposes of the Act, an active fault is one that has ruptured in the last 11,000 years.



Source: City of Los Angeles, ESRI Streetmap, and Christopher A. Joseph & Associates, January 2009.

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Figure 4.5-1
Known Active Faults

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Before a project can be permitted within an EFZ, 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). Figure 4.5-2a (Alquist-Priolo Fault Zones [Granada Hills–Knollwood CPA]) and Figure 4.5-2b (Alquist-Priolo Fault Zones [Sylmar CPA]) show the locations of Alquist-Priolo EFZs within both CPAs. Alquist-Priolo EFZs have been mapped for the Santa Susana and San Fernando Fault Zone within the northern portion of both CPAs, and the San Fernando Fault Zone within the southern portion of the Sylmar CPA.

The EFZ in the northern portion of the Sylmar CPA is largely designated for Single-Family Residential uses, with smaller areas designated Open Space and Public Facilities (i.e., Los Angeles County Olive View-UCLA Medical Center). No changes are proposed by the proposed Sylmar Community Plan for much of this northern area. There are some areas in the southern area of the Sylmar CPA within this Alquist-Priolo EFZ where changes are proposed. The EFZ in the southern portion of the Sylmar CPA has more varied land uses, including Single-Family and Multiple-Family Residential, Commercial, Industrial, Open Space and Public Facilities. The Sylmar Community Plan focuses on redirecting growth into specific commercial centers, the Sylmar/San Fernando Transit-Oriented District, and the two proposed mixed-use corridors. A seismic event along either fault zone has the potential to cause surface ground rupture, thereby exposing people or structures to substantial geologic hazards, which could contribute to the risk of loss, injury, or death.

Seismicity

Earthquakes are caused by the violent and abrupt release of strain built up along faults. When a fault ruptures, energy spreads, sometimes unequally, in the form of seismic waves. Seismic waves are categorized into two groups, body waves and surface waves. Body waves travel through the crust and eventually reach the ground interface creating surface waves. Body waves and surface waves cause the ground to vibrate up and down and side to side at different frequencies depending on the frequency content of the earthquake rupture mechanism, the distance from the earthquake source, and the path and material through which the seismic waves spreads.

Earthquake Magnitude

Earthquakes are classified, based on the amount of energy released, using a logarithmic scale known as the Richter scale and the Moment Magnitude scale. Each whole number of Richter magnitude (M) represents a tenfold increase in the wave amplitude (earthquake size) generated by an earthquake, as well as a 3.16-fold increase in energy released. Thus, a magnitude 6.3 earthquake is ten times larger than a magnitude 5.3 earthquake and releases 31.6 times more energy. In contrast, a magnitude 7.3 event is 100 times larger than an M 5.3, and releases 1,000 times more energy. One limitation of the Richter Magnitude scale is that it has an upper limit at which large earthquakes appear to have about the same magnitude. As a result, the moment magnitude scale (M), which does not have an upper magnitude, was introduced in 1979, and is used to characterize earthquakes greater than magnitude 3.5. Earthquakes of M 6.0 to 6.9 are classified as “moderate,” M 7.0 to 7.9 as “major,” and M 8.0 and larger as “great.”

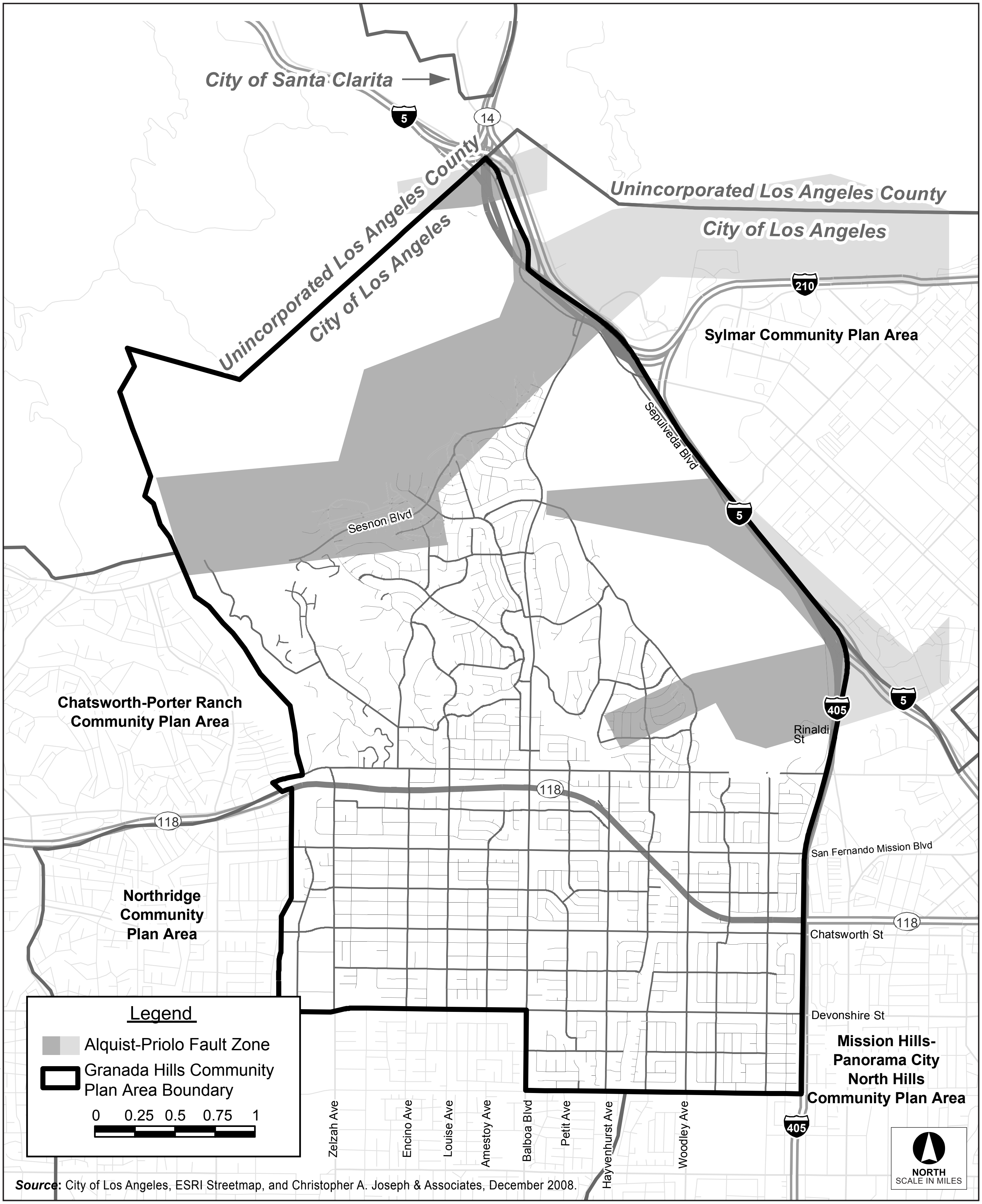

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Figure 4.5-2a

Alquist-Priolo Fault Zones (Granada Hills–Knollwood CPA)

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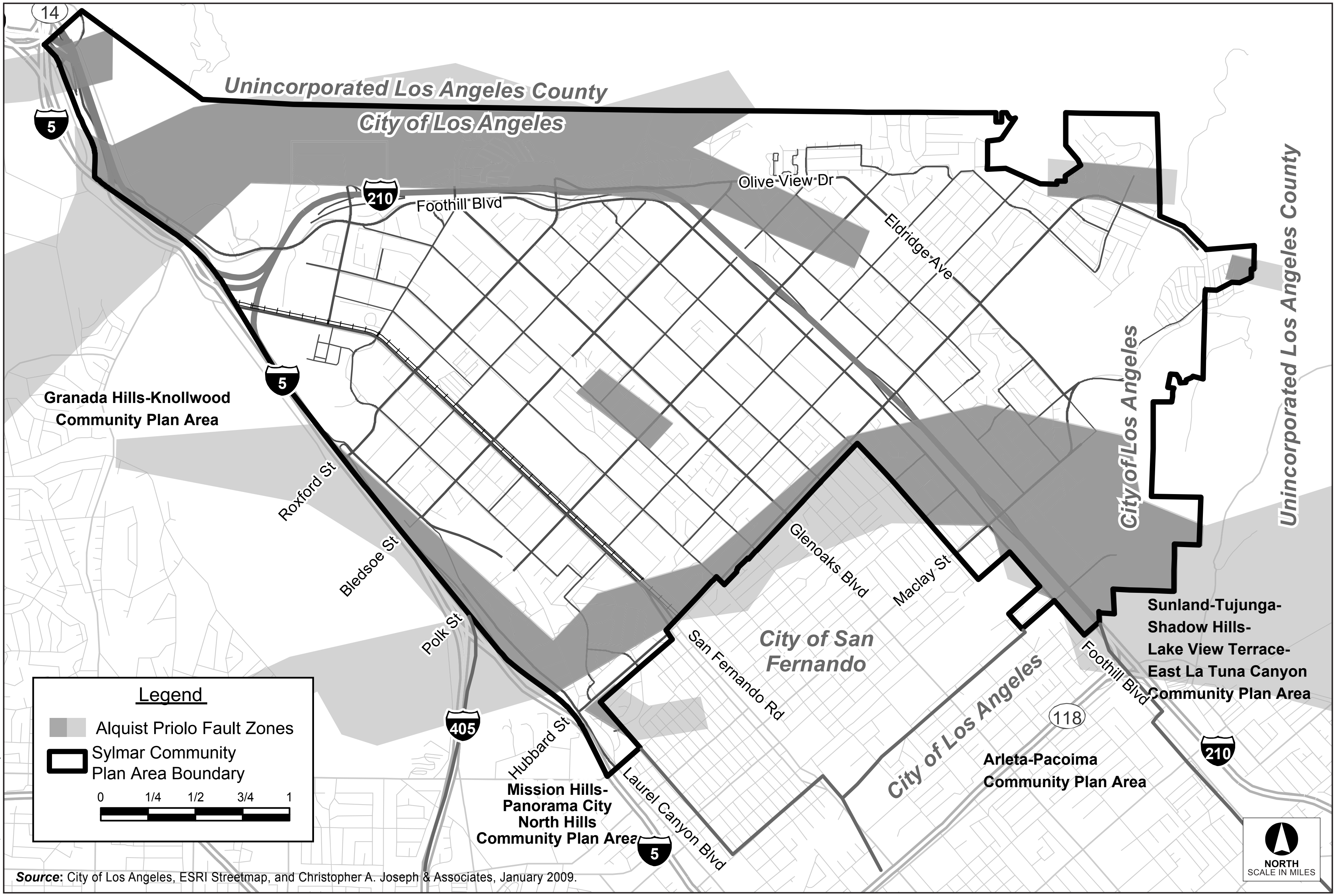

Source: City of Los Angeles, ESRI Streetmap, and Christopher A. Joseph & Associates, January 2009.

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Figure 4.5-2b

Alquist-Priolo Fault Zones (Sylmar CPA)

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The entire Southern California region is a seismically active region. With respect to the Sylmar and Granada Hills–Knollwood CPAs, the Northridge Thrust Fault is considered capable of generating an earthquake with a maximum magnitude of M 6.5 to 7.5, the San Andreas Fault a maximum magnitude of M 6.8 to 8.0, the San Fernando Fault M 6.0 to 6.8, and the San Gabriel Fault is unknown.

Earthquake Intensity

The Modified Mercalli Intensity Scale is a scale used for measuring the intensity of an earthquake. The scale quantifies the effects of an earthquake on the Earth's surface, humans, objects of nature, and man-made structures on a scale of I through XII, with I denoting a weak earthquake and XII one that causes almost complete destruction. Table 4.5-2 (Modified Mercalli Intensity Scale) provides abbreviated definitions of scale ratings. Although the scale is useful in describing earthquake effects for the general public, it is not employed by engineers when designing seismic-resistant structures (see the "California Building Code" section in Section 4.5.2 [Regulatory Framework], below).

Table 4.5-2 Modified Mercalli Intensity Scale

Scale Rating	*Description*
I	Not felt.
II	Felt by persons at rest, on upper floors, or favorably placed.
III	Felt indoors; hanging objects swing; vibration like passing of light trucks; duration estimated; may not be recognized as an earthquake.
IV	Hanging objects swing; vibration like passing of heavy truck or sensation of a jolt like a heavy ball striking the walls; standing automobiles rock; windows, dishes, doors rattle; wooden walls and frame may creak.
V	Felt outdoors; direction estimated; sleepers wakened; liquids disturbed' some spilled; small unstable objects displaced or upset; doors swing; shutters, pictures move; pendulum clocks stop, start, change rate.
VI	Felt by all; many frightened and run outdoors; persons walk unsteadily; windows, dishes, glassware broken; knickknacks, books, etc., off shelves; pictures off walls; furniture moved or overturned; weak plaster and masonry D cracked.
VII	Difficult to stand; noticed by drivers of automobiles; hanging objects quiver; furniture broken; weak chimneys broken at roof line; damage to masonry D, including cracks, fall of plaster, loose bricks, stones, tiles, and embraced parapets; small slides and caving in along sand or gravel banks; large bells ring.
VIII	Steering of automobiles affected; damage to masonry C, partial collapse; some damage to masonry B; none to masonry A; fall of stucco and some masonry walls; twisting, fall or chimneys, factory stacks, monuments, towers, elevated tanks; frame houses moved on foundations if not bolted down; loose panel walls thrown out; decayed piling broken off. Branches broken from trees; changes in flow or temperature of sprigs and wells; cracks in wet ground and on steep slopes.
IX	General panic; masonry D destroys; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged; general damage to foundations; frame structures, if not bolted, shifted off foundations; frames racked; serious damage to reservoirs; underground pipes broken; conspicuous cracks in ground and liquefaction.
X	Most masonry and frame structures destroyed with their foundations; some well built wooden structures and bridges destroyed; serious damage to dams, dikes, embankments; large landslides; water thrown out of banks of canals, rivers, lakes, etc.; sand and mud shifted horizontally on beaches and flat land; rails bent slightly.
XI	Rails bent greatly; underground pipelines completely out of service.
XII	Damage nearly total; large rock masses displaced; lines of sight and level distorted; objects thrown in the air.

SOURCE: Pre-Earthquake Planning for Post-Earthquake Rebuilding", Spangle, William E., 1987
Masonry A = Good workmanship and mortar, reinforced designed to resist lateral force
Masonry B = Good workmanship and mortar, reinforced
Masonry C = Good workmanship and mortar, unreinforced
Masonry D = Poor workmanship and mortar and weak materials, like adobe

Historic Seismicity

Seismic events present the most widespread threat of devastation to life and property. 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 temblors 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. The Long Beach earthquake ranks as one of the major disasters in the history of Southern California. The majority of the damage was suffered by structures that are now considered substandard in construction and/or were located on filled or saturated ground. The Sylmar earthquake, located in the San Fernando Valley, caused sufficient enough damage to lead to adoption of stringent building codes. The damage caused by the Whittier Narrows earthquake occurred in buildings constructed prior to the adoption of these more stringent building codes.

The Northridge earthquake, the most recent of these seismic episodes, occurred January 17, 1994, with a magnitude of 6.7, which produced strong ground motions over an extensive area. The Northridge earthquake was listed by seismologists as a moderate quake. Nevertheless, it was the most costly seismic event in the United States since the 1906 San Francisco earthquake, resulting in the loss of life, physical injury, psychological trauma, and property damage estimated in the billions of dollars. The earthquake occurred on a previously unrecognized blind thrust fault, and no surface rupture that can be unequivocally associated with the main shock has been identified. Analysis by the United States Geologic Survey (USGS) and Caltech indicates that the earthquake rupture initiated about 11 miles below the San Fernando Valley, and it is presumed that the rupture stopped about 3 miles below the surface.[45]

The Northridge earthquake was one of the most measured earthquakes in history due to extensive seismic instrumentation in buildings and on the ground throughout the region. The quake provided valuable data for evaluating existing standards and techniques, and improving hazard mitigation. Two weeks after the Northridge quake, a seismic retrofit tilt-up (concrete walls poured and tilted-up on the site) ordinance was adopted and made retroactive by the City of Los Angeles. Subsequently, the City adopted a series of ordinances which required retrofitting of certain existing structures (e.g., foundation anchoring of hillside dwellings) and for new construction, as well as an ordinance which required evaluation of structures by a structural engineer during the construction process.

Seismic Hazards

Besides surface rupture along a fault, the primary seismic hazard associated with earthquakes is groundshaking. Secondary hazards associated with seismic activity include liquefaction, differential settlement, and landsliding/slope stability. Tsunamis and seiches are generally associated with seismic activity, although, given the location of the CPAs, are not of concern in the area.

[45] City of Los Angeles, *City of Los Angeles Hazard Mitigation Plan* (2005), Chapter 3.

Groundshaking

The principal seismic hazard occurring as a result of an earthquake produced by local faults is strong ground shaking. The intensity of groundshaking 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 will be the effects. However, soil conditions can also amplify the earthquake shock waves. Generally, the shock waves remain unchanged in bedrock, 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. The City of Los Angeles Building Code includes regulations and requirements designed to reduce risks to life and property from groundshaking to the maximum extent feasible.

Liquefaction

Liquefaction involves the sudden loss of strength in saturated, cohesionless soils that are subjected to ground vibration and which results 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.

Figure 4.5-3a (Liquefaction Hazard Map [Granada Hills–Knollwood CPA]) and Figure 4.5-3b (Liquefaction Hazard Map [Sylmar CPA]) shows areas within the CPAs that are susceptible to liquefaction, as delimitated by the CGS. As shown, liquefaction-prone areas are primarily located in the hilly portions of the Sylmar CPA, east of the I-5 Freeway and generally west of San Fernando Road, in the general vicinity of Hubbard Street, the vicinity of the Pacoima Wash, and in the northern portion of the Granada Hills–Knollwood CPA, extending as far south as a few blocks south of Rinaldi Street. 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 which must remain functional following a local earthquake. The City of Los Angeles is responsible for ensuring proper studies are prepared in conjunction with development permitting, and that design and construction of projects include the appropriate features to reduce potential hazards to people and property from liquefaction.

Seismically Induced Settlement

The thick alluvial deposits which underlay portions of the CPAs would be subject to differential settlement due to the intense shaking associated with seismic events. This type of hazard results primarily in the 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. The City of Los Angeles Building Code includes regulations and requirements for

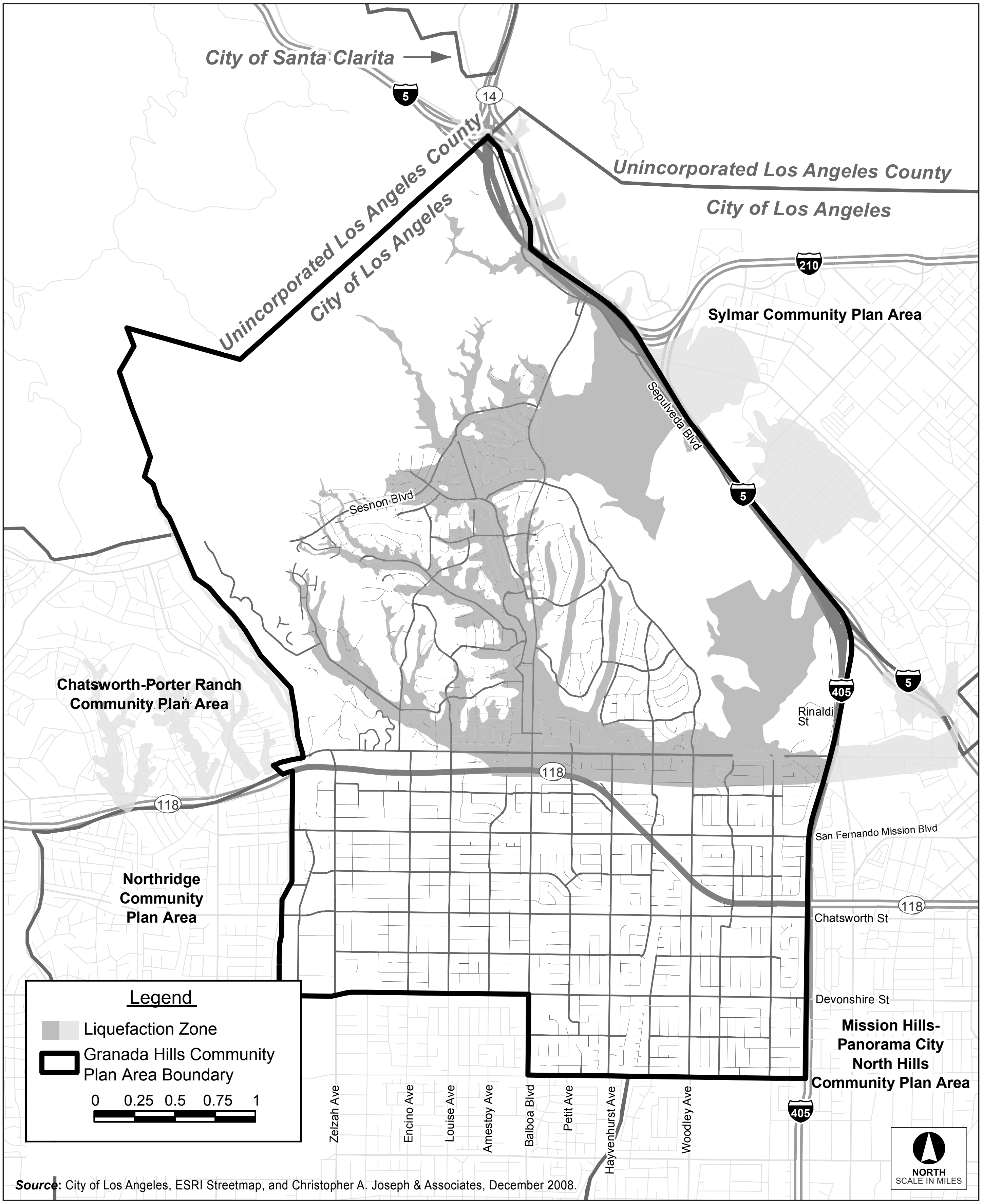

Figure 4.5-3a

Liquefaction Hazard Map (Granada Hills–Knollwood CPA)

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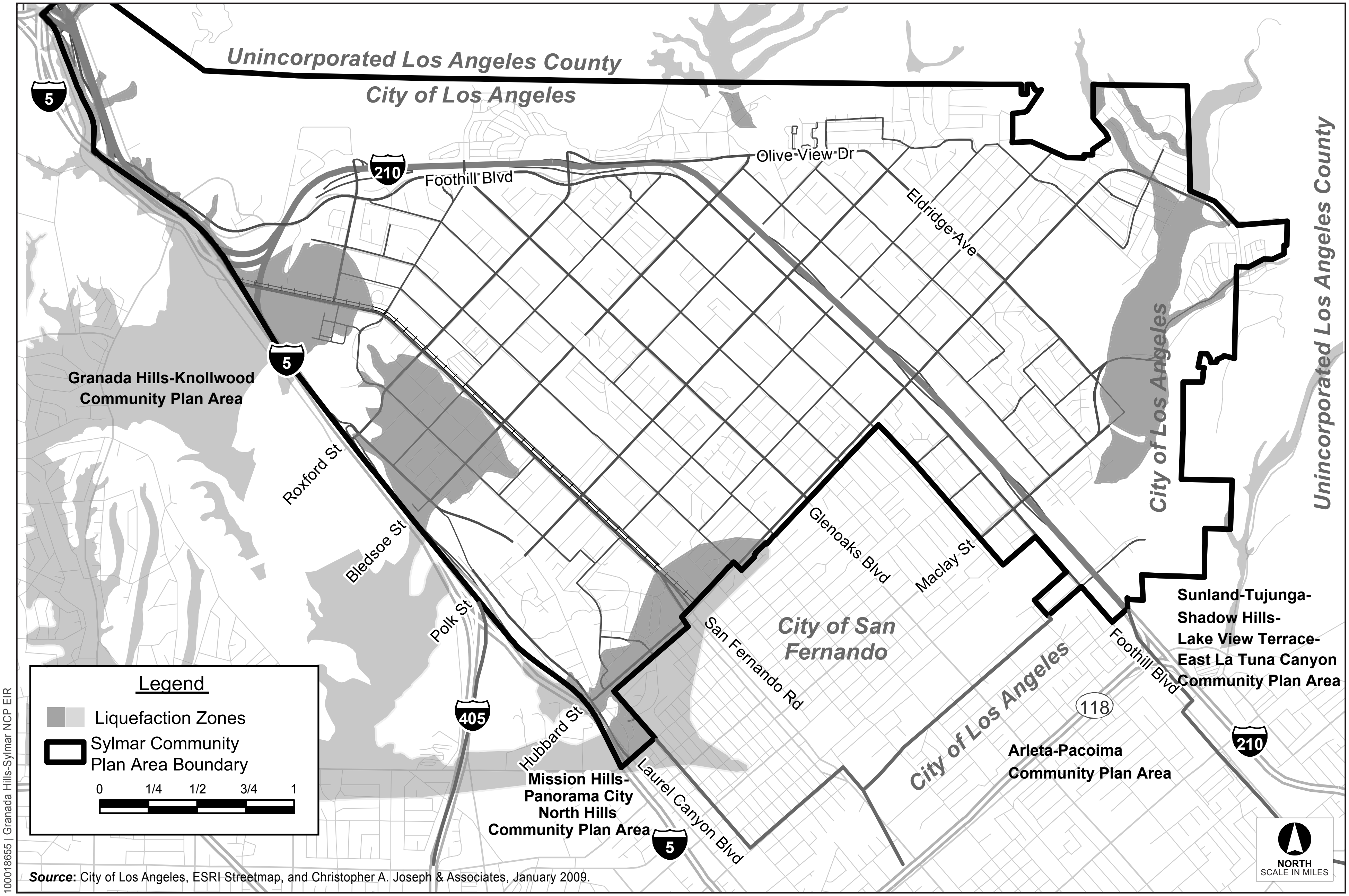

Figure 4.5-3b

Liquefaction Hazard Map (Sylmar CPA)

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geotechnical studies to identify locations that could be subject to design and construct buildings to minimize potential hazards from settlement.

Seismically Induced 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. As shown in Figure 4.5-4a (Landslide Hazards Map [Granada Hills–Knollwood CPA]) and Figure 4.5-4b (Landslide Hazards Map [Sylmar CPA]), areas identified as landslide zones are mainly the hills areas in the northern portions of the CPAs, where the CPAs abut the foothills of the Santa Susana and San Gabriel Mountains.

Soil and Groundwater Conditions

Soil Erosion

The factors contributing to soil erosion potential 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 steepness of the terrain.

As the northern portions of the CPAs are hilly and some areas remain undeveloped, the northern portions are subject to the forces of erosion, particularly wind and rain following a wildfire that has destroyed the protective hillside vegetation. In contrast, the southern portions of both CPAs are suburban in character. The terrain in these areas is relatively flat and much of it is covered by impermeable surfaces; hence, the potential for erosion here 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.

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. The Natural Resources Conservation Service (NRCS), which compiles and maps soils data throughout the U.S., does not have any mapping for the Granada Hills–Knollwood and Sylmar CPAs, so physical and chemical data that would indicate whether expansive soils are not readily available. However, the City of Los Angeles Building Code includes regulations and requirements for geotechnical studies to identify locations that could be underlain by expansive soils and to design and construct buildings to minimize potential hazards associated with these types of soils

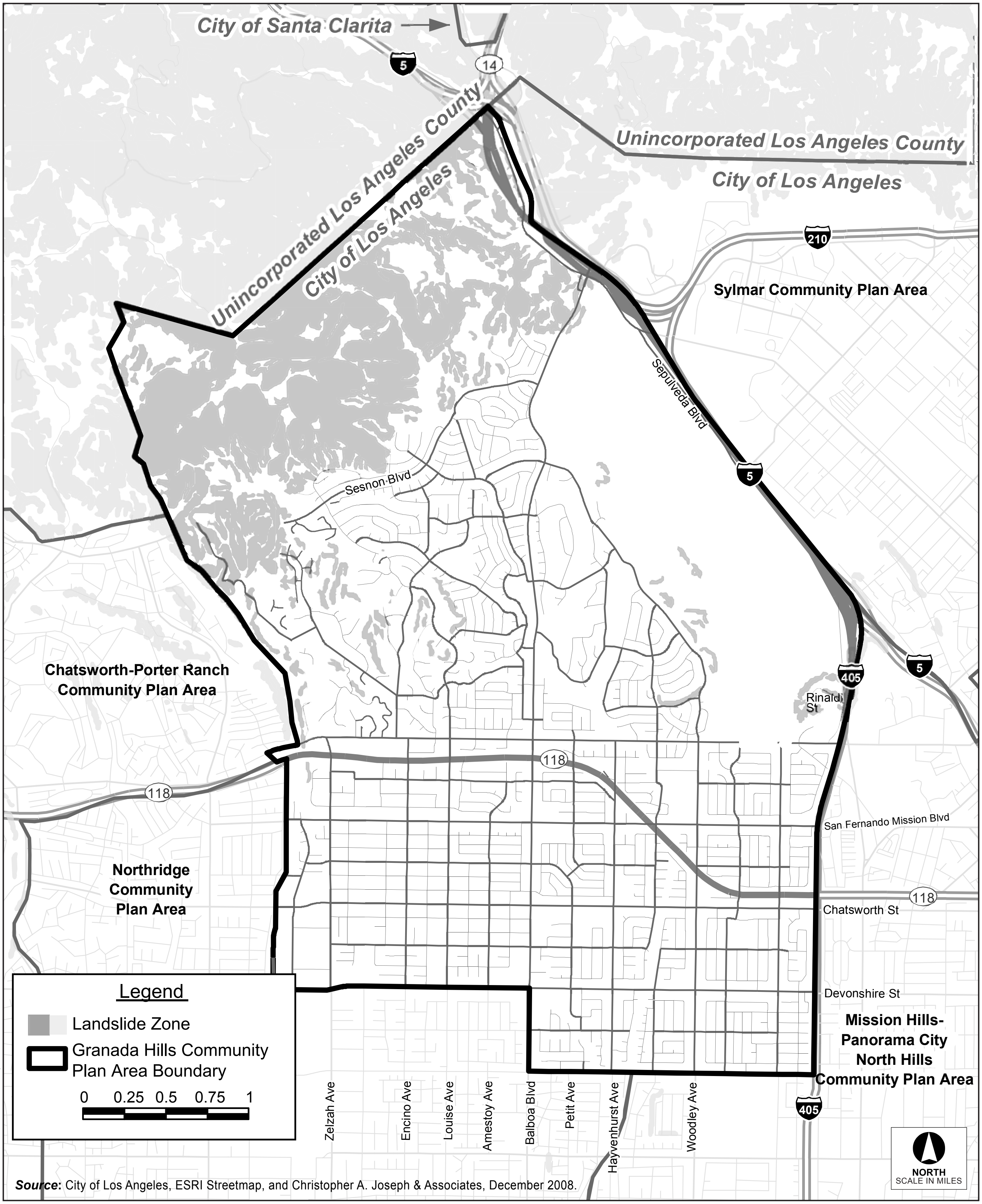

Figure 4.5-4a

Landslide Hazard Area Map (Granada Hills–Knollwood CPA)

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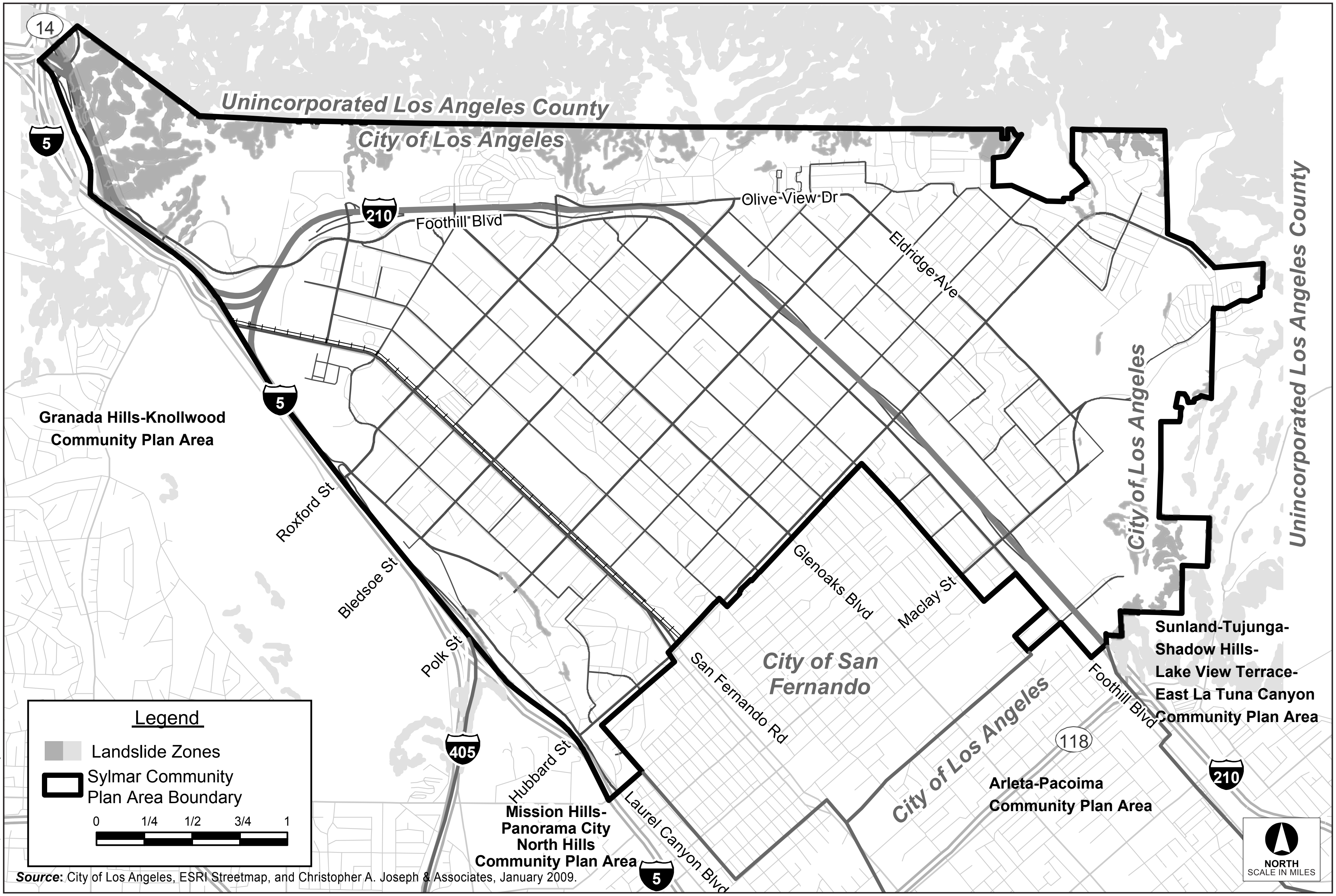

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Figure 4.5-4b

Landslide Hazard Area Map (Sylmar CPA)

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Groundwater

The CPAs are located within the geographic boundaries of the San Fernando Valley Groundwater Basin. The California Department of Water Resources (DWR) and Metropolitan Water District (MWD) monitor groundwater levels in the basin; however there are no reported data for the Granada Hills–Knollwood and Sylmar CPAs. In general, groundwater levels may be influenced by seasonal variations, precipitation, irrigation, soil/rock types, groundwater pumping, and other factors and are subject to fluctuations. Shallow perched[46] conditions may be present in places.

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. Areas identified as landslide zones are located along the northern and eastern edges of the Granada Hills–Knollwood CPA north of Rinaldi Street, with the largest area north and west of Sesnon Boulevard. However, smaller landslide prone areas are scattered throughout the hillsides north of Rinaldi Street. Smaller landslide-prone areas are also located in the southern portion of the Sylmar CPA east of the I-5 Freeway and north of Hubbard Street.

Subsidence

Subsidence is a phenomenon where the soils and other earth materials settle or compress, resulting in a lower ground surface elevation. When fill and native materials on a site are water saturated, there is a net decrease in the pore pressure, and contained water will allow the soil grains to pack closer together. This closer grain packing results in less volume and the lowering of the ground surface. Subsidence is generally predominant in coastal areas, where intrusion of seawater and a high water table combine to cause the phenomenon. There are no areas in the Granada Hills–Knollwood or Sylmar CPAs that are susceptible to subsidence.

Mineral Resources

This section of the EIR describes existing mineral resources conditions for the CPAs and analyzes the potential physical environmental effects related to mineral resources associated with implementation of the proposed Community Plans. The EIR evaluates the environmental impacts related to mineral resources based upon information from a variety of sources, including the City of Los Angeles General Plan and the City of Los Angeles Zone Information and Map Access System (ZIMAS), as well as previously published information from the U.S. Geological Survey and the CGS, formerly California Division of Mines and Geology (CDMG). A regulatory framework is also provided in this section describing applicable agencies and regulations related to minerals.

[46] "Perched" groundwater refers to a water table that is isolated from and higher than the regional water table.

As set forth in CEQA Guidelines Section 15125(a) the following Environmental Setting discussion describes the physical environmental conditions in the CPA at the time the environmental analysis commenced. It constitutes the baseline physical conditions by which the City of Los Angeles will determine whether a Mineral Resources impact is significant. Special emphasis is placed on environmental resources that are rare or unique to the CPA and that may be affected by the adoption and implementation of the proposed plans. Full reference-list entries for all cited materials are provided in Section 4.5.5.

Oil and Gas Production

Drilling for oil in Los Angeles began in 1896, when Edward Doheny discovered oil at Second Street and Glendale Boulevard. Subsequently, oil production became the primary mineral extraction activity in the City. Oil resources have been identified at twenty-three major oil-drilling areas or state-designated oil fields in Los Angeles, which in whole or part underlie the City.

Oil and gas seeps are common occurrences in many parts of California, including in and around the CPAs. Historically drilling for oil in this part of Los Angeles began in 1896. Much of the area south of the Santa Monica Mountains is underlain by gas and oil deposits. Oil resources have been identified at twenty-three major oil drilling areas or state-designated oil fields in Los Angeles, which in whole or part underlie the City. According to the Department of Conservation Division of Oil, Gas and Geothermal Resources, and the City of Los Angeles General Plan Safety Element, three production and reserve areas exists within the Granada Hills–Knollwood CPA: the Aliso Canyon Oil Field, the Mission Oil Field, and the Cheviot Hill Oil Field (Figure 4.5-5 [State-Designated Oil Fields]). There are no oil fields in the Sylmar CPA.

The Aliso Canyon Oil Field is located in the northwest portion of the Granada Hills–Knollwood CPA. Aliso Canyon Oil Field currently operates thirty-three wells, which produce an average of 10 barrels (bbl) of oil per day. The oil field produced 130,246 bbl of oil and condensate, and 62.6 million cubic feet (MMcf) of gas in 2006. As of December 31, 2007, the Aliso Canyon oil field is estimated to have approximately 5.375 million bbl (MMbbl) of oil reserves and 195 MMcf of gas reserves. Aliso Canyon oil field also operates gas storage facilities. The Cheviot Hills Oil Field is located in the north central portion of the Granada Hills–Knollwood CPA. This oil field currently has thirteen producing and nine shut-in wells. The wells produce an average of 12 bbl of oil per day. In 2006, the wells produced 57,831 bbl of oil and condensate, and 42.3 MMcf of gas. As of December 31, 2007, the Cheviot Hills Oil Field had an estimated reserve of 1.198 MMbbl of oil and 1.02 MMcf of gas. The Mission Oil Field is located in the southcentral area of the Granada Hills–Knollwood CPA; this field has been abandoned and is no longer in operation.

Surface Mining

Mining activities within the state are regulated by the Surface Mining and Reclamation Act (SMARA). The Act provides for the reclamation of mined lands and directs the State Geologist to classify (identify and map) the nonfuel mineral resources of the state to show where economically significant mineral deposits occur and where they are likely to occur based upon the best available scientific data. Based in guidelines adopted by the CGS, areas known as Mineral Resource Zones (MRZ) are classified according

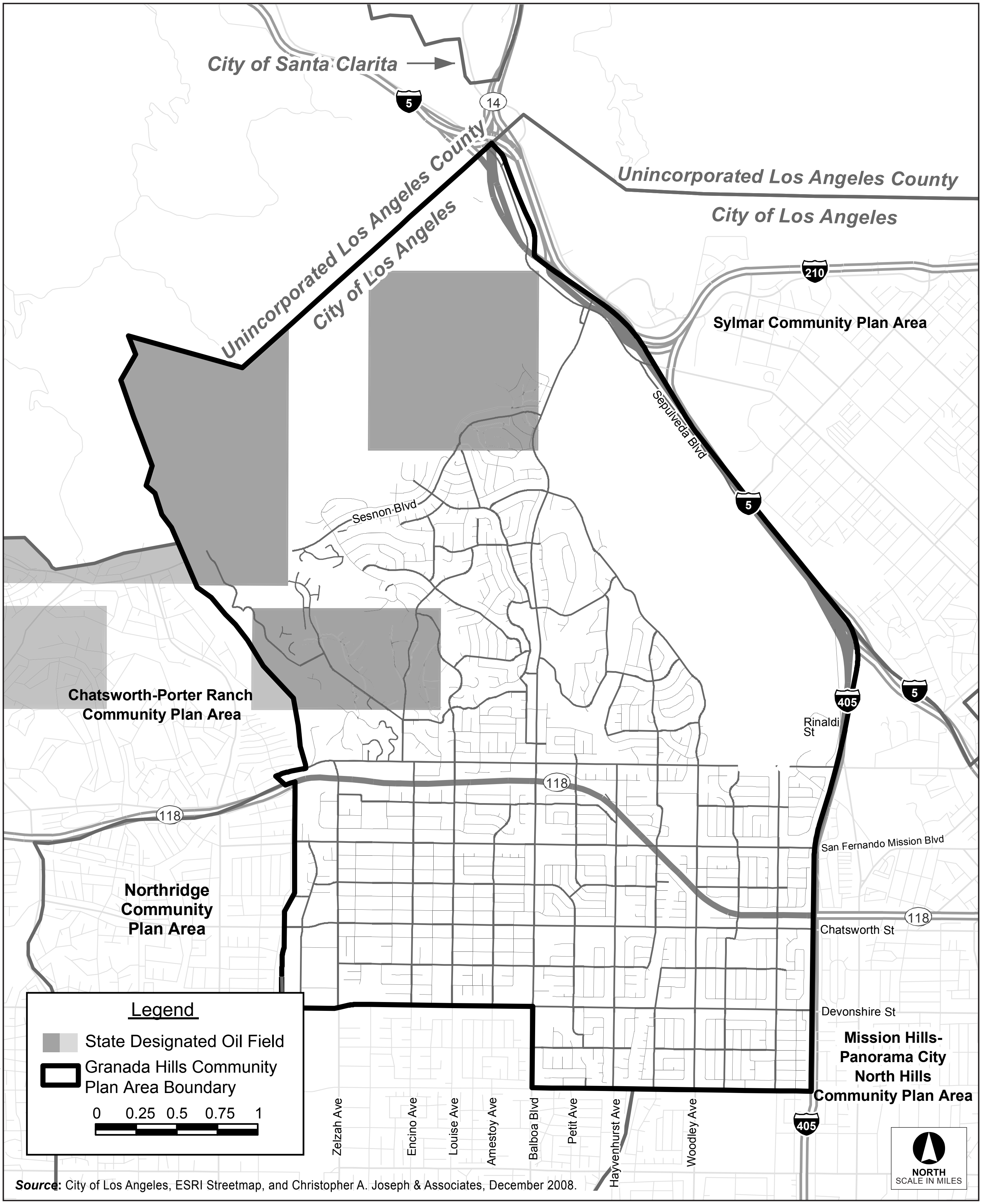

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Figure 4.5-5
State-Designated Oil Fields

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to the presence or absence of significant deposits, as defined below. These classifications indicate the potential for a specific area to contain significant mineral resources:

- MRZ-1: Areas where available geologic information indicates there is little or no likelihood for presence of significant mineral resources
- MRZ-2: Areas underlain by mineral deposits where geologic data indicate that significant measured or indicated resources are present or where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists
- MRZ-3: Areas containing known mineral occurrences of undetermined mineral resource significance
- MRZ-4: Areas of no known mineral occurrences where geologic information does not rule out the presence or absence of significant mineral resources.

Mineral resource zones (MRZ-2) in the City of Los Angeles are classified as significant due to their potential for sand and gravel extraction. According to the City of Los Angeles Planning Department's Areas Containing Significant Mineral Resources map, the Granada Hills–Knollwood CPA does not contain any land classified as MRZ-2. Therefore, the Granada Hills–Knollwood CPA is not underlain by mineral deposits where geologic data indicate that significant measured or indicated resources are present or where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists. However, the Sylmar CPA contains surficial deposits within the MRZ-2 classification as sand and gravel deposits with economic value. The deposits are located along the eastern and southeastern borders of the Sylmar CPA. Figure 4.5-6 (Sand and Gravel Deposits in the Sylmar CPA) displays the MRZ-2 zones within the Sylmar CPA.

4.5.2 Regulatory Framework

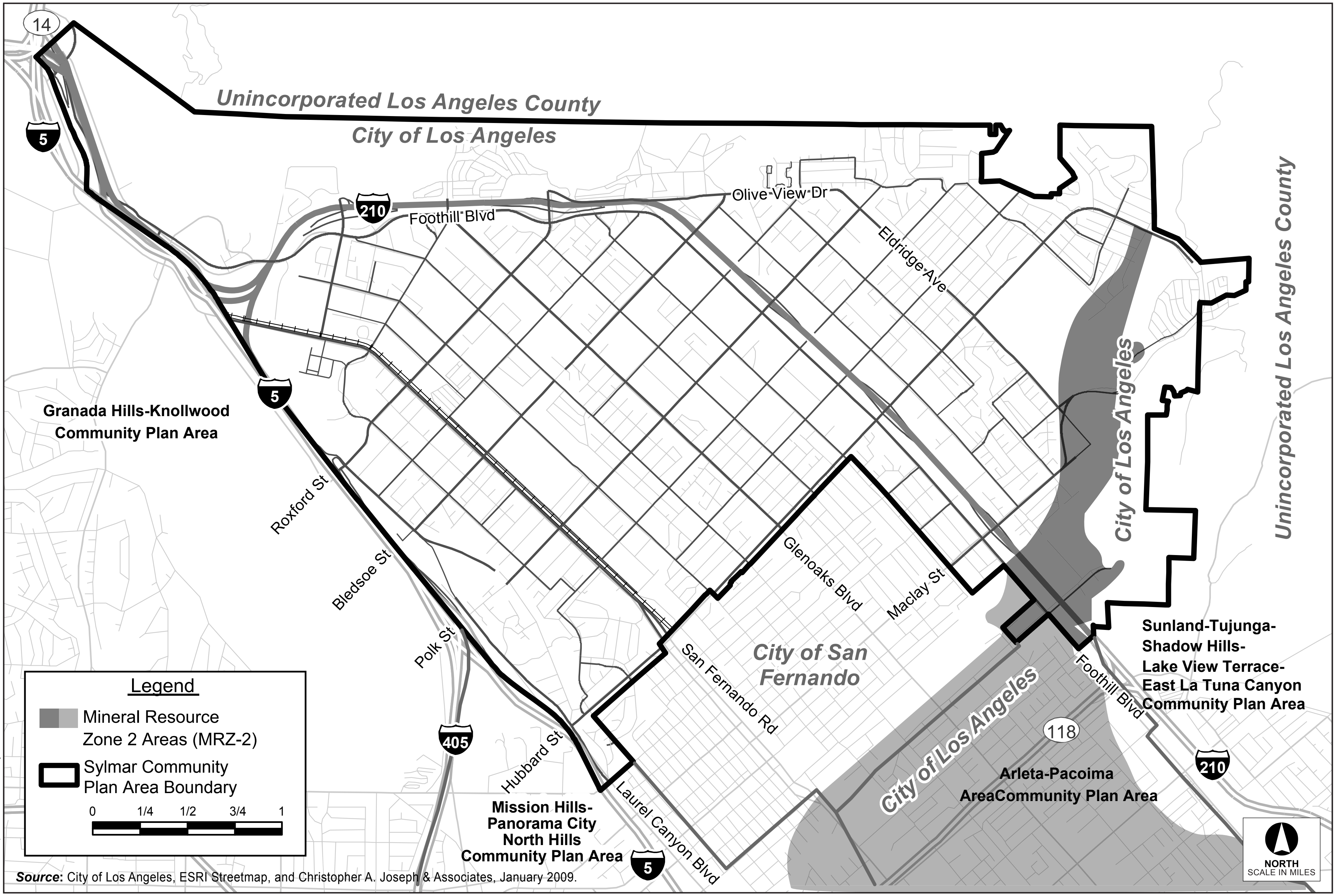
Federal

U.S. Code Title 42

Federal law codified in the U.S. Code Title 42, Chapter 86 (Earthquake Hazard Reduction Act of 1977) where 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. Key regulations and standards are summarized below.

National Pollutant Discharge Elimination System (NPDES) Phase I Permit

A National Pollutant Discharge Elimination System (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) prepared in compliance with an NPDES Permit. The SWPP 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 postconstruction sediment and erosion control measures and maintenance responsibilities, and nonstormwater 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.



Source: City of Los Angeles, ESRI Streetmap, and Christopher A. Joseph & Associates, January 2009.

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Figure 4.5-6

Sand and Gravel Deposits in the Sylmar CPA

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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/Water Quality) for additional information.

State

State Building Code

California Code of Regulations (CCR), Title 24, Part 2, the California Building Code (CBC), provides minimum standards for building design in the state. Until January 1, 2008, the CBC was based on the then current Uniform Building Code (UBC) and contained Additions, Amendments, and Repeals specific to building conditions and structural requirements of California. The 2010 CBC, effective January 1, 2011, is based on the current (2009) International Building Code (IBC)[47].Each jurisdiction in California may adopts its own building code based on the 2010 CBC. Local codes are permitted to be more stringent than the 2010 CBC, but, at a minimum, are required to meet all state standards and enforce the regulations of the 2010 CBC beginning January 1, 2011. 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). Appendix J of the CBC includes (but is not limited to) grading requirements for the design of excavations and fills (Sections J106 and J107) and for erosion control (Sections J109 and J110). Construction activities are subject to occupational safety standards for excavation, shoring, and trenching as specified in the Cal-OSHA regulations (CCR, Title 8).

The CBC is revised every 3 years. At the time of the NOP for the Proposed Plans were published in 2008, the 2007 CBC was in effect. However, the 2010 CBC is the current code. Effective January 2, 2011, California requires compliance with the 2010 CBC.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act became effective in 1991 to identify and map seismic hazard zones for the purpose of assisting cities and counties in preparing the safety elements of their general plans and to encourage land use management policies and regulations that reduce seismic hazards. The intent of this Act is to protect the public from the effects of strong groundshaking, liquefaction, landslides, ground

[47] California Building Standards Commission, *2010 California Building Code*, *California Code of Regulations*, Title 24, Part 2, Volumes 1 and 2 (effective January 1, 2011), http://publicecodes.citation.com/st/ca/st/b200v10/index.htm (accessed by G.J. Burwasser, PG7151, January 16, 2010).

failure, or other hazards caused by earthquakes. In addition, CGS's Special Publication 117, Guidelines for Evaluating and Mitigating Seismic Hazards in California, provides guidance for the evaluation and mitigation of earthquake-related hazards for projects in designated zones of required investigations.

Under this program, liquefaction and landslide hazard mapping has been prepared for the Community Plan Areas. As noted above, liquefaction and landslide hazard zones have been identified in the CPA.

Alquist-Priolo Earthquake Fault Zoning Act

In 1972, the Alquist-Priolo Special Studies Zone Act (now known as the Alquist-Priolo Earthquake Fault Zoning Act) was passed into law. The Act defines "active" and "potentially active" faults utilizing the same age criteria as that used by the CGS. However, the established policy is to zone active faults and only those potentially active faults that have a relatively high potential for ground rupture. Therefore, not all faults identified as "potentially active" by the CGS are zoned under the Alquist-Priolo Act.

Surface Mining Reclamation Act

The purpose of SMARA is to identify and protect areas containing regionally significant mineral resources from land uses that preclude mining. In doing so, SMARA *(a)* regulates surface mining operations to assure that adverse environmental effects are prevented or minimized; *(b)* requires reclamation of mined lands to a usable condition that is readily adaptable to alternative land uses; *(c)* produces and conserves minerals, and considers values relating to recreation, watershed, wildlife, range and forage, and aesthetic enjoyment; and *(d)* eliminates residual hazards to the public health and safety. Sections 2761(a) and (b) and 2790 of the SMARA provide for a mineral lands inventory process termed classification-designation. The CDMG and the State Mining and Geology Board are the state agencies responsible for administering this process. The primary objective of the process is to provide local agencies, such as cities and counties, with information on the location, need, and importance of minerals within their respective jurisdictions. It is also the intent of this process, through the adoption of General Plan mineral resource management policies, that this information could be considered in the future local land use planning decisions. Areas designated by the Mining and Geology Board as "regionally significant" are incorporated by regulation into Title 14, Division 2 of the CCR. Such designations require that a lead agency's land use decisions involving designated areas are made in accordance with its mineral resource management policies and that they consider the importance of the mineral resource to the region or the state as a whole and not just the lead agency's jurisdiction. Mining must comply with the SMARA through all phases of a project, including the reclamation process. The City is responsible for implementing the SMARA requirements, as they apply to Los Angeles. It does so primarily through land use controls and permit issuance and monitoring.

■ Local

City of Los Angeles General Plan

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, 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

Safety Element

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.

Conservation Element

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.

The Conservation Element of the General Plan contains policies to minimize impacts from mineral resource extraction that can result in the loss of valuable ground surface materials, potential odors, noise, hazardous spills, explosions, and fires.

Policies from the Safety Element and Conservation Element related to geology and soils are listed below In Table 4.5-3 (Safety and Conservation Elements Policies Related to Geology, Soils, and Minerals).

Table 4.5-3 General Plan Policies Related to Geology, Soils, and Minerals

Policy No.	*Policy*
SAFETY ELEMENT	
Hazard Mitigation	
Policy 1.1.2	Disruption reduction. Reduce, to the greatest extent feasible and within the resources available, potential critical facility, governmental functions, infrastructure and information resource disruption due to natural disaster.
Policy 1.1.3	Facility/systems maintenance. Provide redundancy (back-up) systems and strategies for continuation of adequate critical infrastructure systems and services so as to assure adequate circulation, communications, power, transportation, water and other services for emergency response in the event of disaster related systems disruptions.
Policy 1.1.5	Risk reduction. Reduce potential risk hazards due to natural disaster to the greatest extent feasible within the resources available, including provision of information and training.
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.
Emergency Response (Multi-Hazard)	
Policy 2.1.2	Health and environmental protection. Develop and implement procedures to protect the environment and public, including animal control and care, to the greatest extent feasible within the resources available, from potential health and safety hazards associated with hazard mitigation and disaster recovery efforts.

Table 4.5-3 General Plan Policies Related to Geology, Soils, and Minerals	
Policy No.	**Policy**
Policy 2.1.4	Interim procedures. Develop and implement pre-disaster plans for interim evacuation, sheltering and public aid for disaster victims displaced from homes and for disrupted businesses, within the resources available. Plans should include provisions to assist businesses which provide significant services to the public and plans for reestablishment of the financial viability of the City.
Policy 2.1.5	Response. Develop, implement, and continue to improve the City's ability to respond to emergency events.
Policy 2.1.7	Volunteers. Develop and implement, within the resources available, strategies for involving volunteers and civic organizations in emergency response activities.
Disaster Recovery (Multi-Hazard)	
Policy 3.1.2	Health/safety/environment. Develop and establish procedures for identification and abatement of physical and health hazards which may result from a disaster. Provisions shall include measures for protecting workers, the public, and the environment from contamination or other health and safety hazards associated with abatement, repair, and reconstruction programs.
Policy 3.1.3	Historic/cultural. Develop procedures which will encourage the protection and preservation of City-designated historic and cultural resources to the greatest extent feasible within the resources available during disaster recovery.
Policy 3.1.4	Interim services/systems. Develop and establish procedures prior to a disaster for immediate reestablishment and maintenance of damaged or interrupted essential infrastructure systems and services so as to provide communications, circulation, power, transportation, water and other necessities for movement of goods, provision of services and restoration of the economic and social life of the City and its environs pending permanent restoration of the damaged systems.
Policy 3.1.5	Restoration. Develop and establish prior to a disaster short- and long-term procedures for securing financial and other assistance, expediting assistance and permit processing and coordinating inspection and permitting activities so as to facilitate the rapid demolition of hazards and the repair, restoration and rebuilding, to a comparable or a better condition, those parts of the private and public sectors which were damaged or disrupted as a result of the disaster.
CONSERVATION ELEMENT	
Mineral Resources Policy 1	Continue to implement the provisions of the California Surface Mining and Reclamation Act (Public Resources Code Section 2710 et seq.) so as to establish extraction operations at appropriate sites; to minimize operation impacts on adjacent uses, ecologically important areas (e.g., the Tujunga Wash) and groundwater; to protect the public health and safety; and to require appropriate restoration, reclamation and reuse of closed sites.
Mineral Resources Policy 2	Continue to encourage the reuse of sand and gravel products, such as concrete, and of alternative materials use in order to reduce the demand for extraction of natural sand and gravel.
Erosion 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: Los Angeles Department of City Planning, *General Plan of the City of Los Angeles*, Safety Element (adopted November 26, 1996); Los Angeles Department of City Planning, *General Plan of the City of Los Angeles*, Conservation Element (adopted September 26, 2001).

City of Los Angeles Municipal Code

Compliance with the City Building Code is mandatory for all development in the City. Chapter IX (Building Regulations), Article 1 (Building Code) sets forth the specific requirements. Throughout the permitting, design, and construction phases of a building project, the Department of Building and Safety engineers and inspections 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 Chapter IX (Building Regulations), Article 1 (Building Code), Division 70. A unique feature of the Grading Code is requirement that professional geologists supervise hillside grading. 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 improve standards and requirements.

In 1929 the Building and Safety Department began to compile and correlate data on soil conditions for distribution to realtors, builders, and prospective property buyers. In 1952, hillside grading provisions were added to the Building Code. Los Angeles was the first city in the nation to have such provisions.

The storms of 1957/58 caused extensive damage in hillside areas and led to adoption of the 1963 Grading Code. It was the first such legislation in the nation and served as a model for other jurisdictions. A unique feature of the Grading Code was a requirement that professional geologists supervise hillside grading.

Chapter IX (Building Regulations), Article 1 (Building Code), Division 88 (Special Provision for Existing Buildings) of the Municipal Code (Ord. No. 171,939) establishes standards for seismically unreinforced masonry bearing wall buildings constructed before 1934. It identifies which types of buildings are subject to the requirements, but specifically notes that the provisions of the division are minimum standards for structural seismic resistance established primarily to reduce the risk of loss of life or injury and will not necessarily prevent loss of life or injury to prevent earthquake damage to an existing building that complies with those standards.

The Los Angeles Municipal Code also contains voluntary standards to help reduce earthquake hazard risks. For example, Division 94 of the California Building Code seeks to promote public safety and welfare by reducing the risk of death or injury that may result from the effects of earthquakes on existing hillside buildings constructed on or into slopes in excess of one unit vertical in three units horizontal (33.3 percent slope). Such buildings have been recognized as life hazardous as a result of partial or complete collapse that occurred during the Northridge Earthquake. This division provides voluntary retrofit standards under which buildings shall be permitted to be structurally analyzed and retrofitted. When fully followed, these standards strengthen the portion of the structure that is most vulnerable to earthquake damage. Division 91 similarly addresses wood-frame buildings.

The primary purpose of zoning is to segregate uses that are thought to be incompatible; in practice, zoning is used as a permitting system to prevent new development from harming existing residents or businesses and to preserve the "character" of a community. With respect to geology hazards, the City of Los Angeles implements zoning ordinances to ensure safe construction practices.

The CPAs are located within the jurisdiction of the City of Los Angeles and is, therefore, subject to the applicable land use and zoning requirements of the Los Angeles Municipal Code (LAMC). The City of Los Angeles Municipal Code Section 13.00 identifies Supplemental Use Districts designed to regulate uses which cannot adequately be provided for in the Zoning Code. Section 13.01 "O" Oil Drilling Districts, identifies provisions for districts where the drilling of oil wells or the production from the wells of oil, gases, or other hydrocarbon substances is permitted.

City of Los Angeles Local Hazard Mitigation Plan (LHMP)

The City approved its Local Hazard Mitigation Plan (LHMP) in 2005. The plan identifies potential natural and human-caused hazards, and potential scenarios and estimated losses, addresses existing and proposed mitigation policies, programs and projects, and response programs. With regard to earth resources, the LHMP identifies earthquake as a high-risk hazard, but landslides/mudslides and tsunamis are considered low-risk hazards.

Oil Drilling District Procedures

The Oil Drilling District procedures adopted in 1948, as amended in 1971 to include offshore drilling, set forth provisions for monitoring and imposing mitigation measures to prevent significant subsidence relative to oils and gas extraction and mining activities. The districts are established as overlay zones and are administered by the City Planning Department with the assistance of other City agencies. The City Oil Administrator of the Office of the City Administrative Officer is responsible for monitoring oil extraction activities and has the authority to recommend additional mitigation measures to the Planning Commission after an Oil Drilling District is established. The Planning Department, Office of Zoning Administration issues and administers oil drilling permits and may impose additional mitigation measures, as deemed necessary, after a permit has been granted, such as measures to address subsidence.

Proposed Plan Policies

Table 4.5-4 (Proposed Granada Hills–Knollwood Community Plan Policies Related to Geology, Soils, and Minerals) and Table 4.5-5 (Proposed Sylmar Community Plan Policies Related to Geology, Soils, and Minerals) list proposed plan policies that are applicable to issues of geology, soils, and minerals. There is one specific mineral resource policy in the Granada Hills–Knollwood Community Plan pertaining to oil drilling, and the tables include land use policies that aim to prevent development from occurring in areas that may contain natural resources, including minerals.

Table 4.5-4 Proposed Granada Hills–Knollwood Community Plan Policies Related to Geology, Soils, and Minerals

Policy No.	Policy
Land Use	
Policy LU4.1	Hillside Density. Limit the intensity and density in hillside areas to that which can be reasonably accommodated by infrastructure and natural topography. Notwithstanding any land use designation maps to the contrary, all projects with average natural slopes in excess of 15 percent, including Tract Maps and Parcel Maps, shall be limited to the minimum density housing category for the purposes of enforcing the slope density formula of LAMC Sections 17.05C and 17.50E.
Policy LU4.3	Topography Preservation. Use the natural topography as the primary criteria to determine the placement and/or alignment of houses
Policy LU4.4	Slope Preservation and Grading. Cluster houses on those portions of undeveloped hillside areas that have less than a 15 percent slope in order to retain the steeper slopes in their natural state or in a natural park-like setting, minimize the amount of grading and the alteration of the natural topography, and provide more open space opportunities for recreation and equestrian use. The density pattern indicated in the Plan may be adjusted to facilitate development on the more level portions of the terrain provided that the total number of dwelling units indicated in any development is not increased over that allowed by the Plan based on the net area of development.

Table 4.5-4 Proposed Granada Hills–Knollwood Community Plan Policies Related to Geology, Soils, and Minerals

Policy No.	Policy
Policy LU4.5	Mountain Viewshed Protection. Design development near ridgelines so as to avoid breaking the mountain silhouette of a significant ridgeline. Discourage building and grading on ridgelines to protect ridges and environmentally sensitive areas, and to prevent erosion associated with development and visual interruption of the ridge profile.
Policy LU4.7	Landscaping. Incorporate landscaping that supports slope stability and provides fire protection.
Policy LU5.2	Permeable Surfaces. Increase areas of permeability by minimizing driveway and curb cut widths, limiting driveway paving to the width required to access a garage, and utilizing permeable surfaces on driveways, walkways, trails, and outdoor spaces in order to capture, infiltrate, and store water underground.
Policy LU8.2	Agricultural Lot and Open Space Preservation. Maintain a minimum lot size of two acres (87,120 square feet) in all designated minimum residential areas, especially adjacent to the Open Space areas north of Sesnon.
Community Facilities and Infrastructure	
Policy CF6.1	Conservation. Preserve passive and visual open space that provides wildlife habitat and corridors, wetlands, watersheds, groundwater recharge areas, and other natural resource areas.
Policy CF6.2	Protection. Protect significant open space resources and environmentally sensitive areas from environmental hazards and incompatible land uses.
Policy CF6.3	Grading. Minimize the grading of natural terrain to permit development in hillside areas and the foothills correspond to densities designated by this Community Plan, the geological stability of the area, and compatibility with adjoining land uses.
Policy CF6.4	Natural Drainage. Minimize the alteration of natural drainage patterns, canyons, and water courses, except where improvements are necessary to protect life and property.
Policy CF6.5	Development Restrictions. Restrict development on areas of known geologic hazard, unstable soil conditions or landslides.
Policy CF6.6	Ecologically Sensitive Areas. Coordinate with the County of Los Angeles in identifying significant ecological areas featuring ecological or scenic resources that should be preserved and protected within state reserves, preserves, parks, or natural wildlife refuges.
Policy CF6.7	Open Space Integration. Integrate the use of open space with public facilities in higher density areas, and adjacent to reservoirs, land reclamation sites, spreading grounds, power line rights-of-way and flood control channels.
Policy CF7.1	Oil Drilling Mitigation. Promote safety and protection of surrounding neighborhoods and the environment from potential impacts of oil drilling, such as noise, hazard, spills, and visual blight.

Consistency Analysis

The proposed plans focus future growth in the CPAs in transit-oriented areas and along established commercial corridors. Policies are included in both Community Plans to protect hillsides and open space, and no development is proposed in open space areas. Community facilities and infrastructure are required by law to be constructed in accordance with Los Angeles Building Code design requirements for structures. Minimum requirements for protection from seismic and geologic/soils hazards, including foundation support and structural design, are specified in the Los Angeles Building Code. Minimum grading requirements, including erosion control, excavation stability, and fill material acceptability are specified in the Los Angeles Building Code. Ongoing compliance, which is monitored and enforced by the City of Los Angeles, will continue to ensure consistency with the proposed policies. Neither of the proposed plans includes new hillside development. Therefore, the proposed plans would be consistent with the General Plan.

Table 4.5-5	Proposed Sylmar Community Plan Policies Related to Geology, Soils, and Minerals
Policy No.	***Policy***
Land Use	
Policy LU6.1	Hillside Density. Limit the intensity and density in hillside areas to that which can be reasonably accommodated by infrastructure and natural topography. Notwithstanding any land use designation maps to the contrary, all projects with average natural slopes in excess of 15 percent, including Tract Maps and Parcel Maps, shall be limited to the minimum density housing category for the purposes of enforcing the slope density formula of LAMC Sections 17.05C and 17.50E.
Policy LU6.3	Slope Preservation and Grading. Cluster houses on those portions of undeveloped hillside areas that have less than a 15 percent slope in order to retain the steeper slopes in their natural state or in a natural park-like setting, minimize the amount of grading and the alteration of the natural topography, and provide more open space opportunities for recreation and equestrian use. The density pattern indicated in the Community Plan may be adjusted to facilitate development on the more level portions of the terrain provided that the total number of dwelling units indicated in any development is not increased over that allowed by the Community Plan based on the net area of development.
Policy LU6.5	Mountain Viewshed Protection. Design development near ridgelines so that is does not break the mountain silhouette of a significant ridgeline. Discourage building and grading on ridgelines to protect ridges and environmentally sensitive areas, and to prevent erosion associated with development and visual interruption of the ridge profile.
Policy LU6.8	Landscaping. Incorporate landscaping that supports slope stability and provides fire protection.
Policy LU7.2	Permeable Surfaces. Increase areas of permeability by minimizing driveway and curb cut widths, limiting driveway paving to the width required to access a garage, and utilizing permeable surfaces on driveways, walkways, trails, and outdoor spaces in order to capture, infiltrate, and store water underground.
Policy 4.3	Agricultural Lot and Open Space Preservation. Maintain a minimum lot size of one acre in all designated Minimum residential areas, especially adjacent to the foothills, the Pacoima Wash, and other open space areas and natural resources.
Community Facilities and Infrastructure	
Policy CF6.1	Conservation. Preserve passive and visual open space that provides wildlife habitat and corridors, wetlands, watersheds, groundwater recharge areas, and other natural resource areas.
Policy CF6.2	Protection. Protect significant open space resources and environmentally sensitive areas from environmental hazards and incompatible land uses.
Policy CF6.3	Grading. Minimize the grading of natural terrain to permit development in hillside areas and the foothills correspond to densities designated by this Community Plan, the geological stability of the area, and compatibility with adjoining land uses.
Policy CF6.4	Natural Drainage. Minimize the alteration of natural drainage patterns, canyons, and water courses, except where improvements are necessary to protect life and property.
Policy CF6.5	Development Restrictions. Restrict development on areas of known geologic hazard, unstable soil conditions or landslides.
Policy CF6.6	Ecologically Sensitive Areas. Coordinate with the County of Los Angeles in identifying significant ecological areas featuring ecological or scenic resources that should be preserved and protected within state reserves, preserves, parks, or natural wildlife refuges.
Policy CF6.7	Open Space Integration. Integrate the use of open space with public facilities in higher density areas, and adjacent to reservoirs, land reclamation sites, spreading grounds, power line rights-of-way and flood control channels.

4.5.3 Project Impacts and Mitigation

Analytic Method

The proposed plans are the adoption of the Granada Hills–Knollwood and Sylmar Community Plans and implementing ordinances. Such actions would not have a direct effect related to geologic and soils conditions, but development that is likely to occur as a result of the proposed plans could be subject to geologic or soils hazards. 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 CPAs. As noted below, site-specific geotechnical evaluations would be prepared as required by the City, which would identify special geotechnical concerns and necessary design and construction specifications.

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 as well as regular oil and surface mining. The design-controllable aspects of building foundation support, protection from seismic ground motion, and soil instability are governed by existing regulations. Gravel mining operations throughout the state are subject to the SMARA. The purpose of SMARA is to identify and protect areas containing regionally significant mineral resources from land uses that preclude mining. In doing so, SMARA *(a)* regulates surface mining operations to assure that adverse environmental effects are prevented or minimized; *(b)* requires reclamation of mined lands to a usable condition that is readily adaptable to alternative land uses; *(c)* produces and conserves minerals, and considers values relating to recreation, watershed, wildlife, range and forage, and aesthetic enjoyment; and *(d)* eliminates residual hazards to the public health and safety. Mining must comply with SMARA through all phases of a project, including the reclamation process. 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.

The Los Angeles CEQA Thresholds Guide (2006) sets forth guidance for the determination of significance of geology/soils and mineral resources impacts. This guidance is based on Appendix G of the CEQA Guidelines and provides specific criteria to be considered when making a significance determination. In some cases, the Thresholds Guide includes quantitative thresholds. For purposes of this analysis, Thresholds Guide criteria are used, supplemented by the thresholds identified in Appendix G, where appropriate.

Thresholds of Significance

Implementation of the proposed plans may have a significant adverse impact on geology/soils or mineral resources if it would:

- Cause or accelerate geologic hazards that would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury 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
  - Strong seismic groundshaking
  - Seismic-related ground failure, including liquefaction and landslides
  - Expansive soils
  - Location on or adjacent to unstable geologic units or soils, 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
- Cause or accelerate instability from erosion so as to result in a geologic hazard to other properties; or accelerate natural processes of wind and water erosion and sedimentation, resulting in sediment runoff or deposition which would not be contained or controlled on site
- Destroy, permanently cover or materially and adversely modify one or more distinct and prominent geologic or topographic features would be. Such features may include, but are not limited to, hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, and wetlands
- Result in the permanent loss of, or loss of access to, a mineral resource that is located in a MRZ-2 or other known or potential mineral resource area, or result in the permanent loss of, or loss of access to, a mineral resource that is of regional or statewide significance, or is noted in the Conservation Element as being of local importance
- Be located on 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

Implementation of the proposed plans may have a significant adverse impact on mineral resources if it would do any of the following:

- Result in the permanent loss of, or loss of access to, a mineral resource that is located in a MRZ-2 or other known or potential mineral resource area, or result in the permanent loss of, or loss of access to, a mineral resource that is of regional or statewide significance, or is noted in the Conservation Element as being of local importance

Effects Found Not to Be Significant

It is the City's policy that all new development must be connected to a public sewerage system. All portions of the CPAs are either currently being served by a public sewerage system and the proposed plans do not propose any development in areas not served by sewer service. There would be ***no impact*** because no new development in the CPAs would utilize septic tanks.

As there are no oil fields in the Sylmar CPA, there would be ***no impact*** related to development under the Sylmar Community Plan. Similarly, there are no areas designated as MRZ-2 zones in the Granada Hills–Knollwood CPA, and there would be ***no impact*** from development under the Granada Hills–Knollwood Community Plan to mineral resources.

Less-Than-Significant Impacts

Impact 4.5-1 **The Granada Hills–Knollwood and Sylmar Community Plan areas are in an area where active faults are present, but implementation of the proposed plans would not cause or accelerate geologic hazards that would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury by exposing people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault. Compliance with existing CBC and City of Los Angeles Building Code regulations would ensure this impact remains *less than significant*.**

Because the proposed plans are implementation of policy documents, it would not directly cause or accelerate geologic hazards related to fault rupture. To the extent the proposed plans would facilitate or accommodate future development, such development, in and of itself, would not directly cause fault rupture. However, growth within the CPAs would increase the number of people and structures that could be exposed to seismic hazards such as fault rupture.

Figure 4.5-2a (Alquist-Priolo Fault Zones [Granada Hills–Knollwood CPA]) shows the locations of Alquist-Priolo EFZs within the Granada Hills–Knollwood CPA. The EFZ in the northern portion of the Granada Hills–Knollwood CPA is within an area dedicated to open space, and the proposed plan does not propose future development in this area. Similarly, the EFZ located on the eastern portion of the Granada Hills–Knollwood CPA is primarily occupied by the Los Angeles DWP facilities and would not be subject to future development under the proposed plan.

Figure 4.5-2b (Alquist-Priolo Fault Zones [Sylmar CPA]) shows the locations of these zones within the Sylmar CPA. EFZs have been mapped for the Santa Susana and San Fernando Fault Zone within the northern portion of the Sylmar CPA, and the San Fernando Fault Zone within the southern portion of the Sylmar CPA. The EFZ in the northern portion of the Sylmar CPA is largely designated for Single-Family Residential uses, with smaller areas designated Open Space and Public Facilities (i.e., Los Angeles County Olive View-UCLA Medical Center). No changes are proposed by the proposed plan for much of this northern area in Sylmar. There are some areas in the southern area of the Sylmar CPA within this Alquist-Priolo EFZ where changes are proposed. The EFZ in the southern portion of the Sylmar CPA has more varied land uses including Single-Family and Multiple-Family Residential, Commercial, Industrial, Open Space, and Public Facilities. The proposed plan focuses on redirecting growth into specific commercial centers, near the Sylmar/San Fernando Metrolink station, and the two mixed-use corridors. A seismic event along a fault zone, regardless of whether it is classified by the state as an EFZ, could have the potential to cause surface ground rupture, thereby exposing people or structures in the Sylmar CPA to substantial geologic hazards, which could contribute to the risk of loss, injury, or death.

While the proposed plans would permit construction of habitable structures in the CPAs, if a fault becomes classified by the state as an EFZ, if the results of a study prepared to meet Safety Element fault rupture study areas indicate a hazard, or if a previously unknown fault zone became apparent, the City's standard regulatory procedures would ensure that no buildings would be approved or constructed across an active fault, thereby reducing the potential risk of loss, injury, or death due to surface fault rupture.

Compliance with the CBC, City's Codes, and applicable regulatory requirements would ensure that the proposed plan and all development therein would not cause or accelerate geologic hazards that would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury as a result of fault rupture. This impact would be ***less than significant***.

Impact 4.5-2 **Implementation of the proposed plans would not cause or accelerate geologic hazards which would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury from strong seismic groundshaking. Compliance with existing CBC and City of Los Angeles Building Code regulations would ensure this impact remains *less than significant*.**

Seismic groundshaking is the direct result of movement along a fault. As explained in Impact 4.5-1, the proposed plans would not directly cause or accelerate fault movement or rupture and, similarly, would not directly result in strong seismic groundshaking. However, the CPAs (like all communities in the City of Los Angeles) is in a seismically active region, and development under the proposed plans would expose people and property to groundshaking from earthquakes originating on one or more of the active faults in the region (see Table 4.5-1) during the planning horizon of the proposed plan.

Statewide, scientists estimate a 99.7 percent probability of an $M \geq 6.7$ earthquake occurring in California during the next 30 years. When compared to northern California, southern California has a greater chance of an $M \geq 6.7$ earthquake. For larger events, the 30-year probability of an $M \geq 7.5$ 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 $M \geq 6.7$ earthquake in the next 30 years (compared to 21 percent on the northern part of the fault).[48]

The proposed plans would facilitate development of new housing, particularly along established commercial corridors, and identified mixed-use corridors and transit-oriented districts in the CPAs. In addition, the Floor Area Ratio (FAR) would be increased in some areas near the Sylmar/San Fernando Metrolink station, allowing for increases in density. Population and the number of dwelling units could increase under the proposed plans, thereby increasing the number of people and structures in the CPAs exposed to geologic hazards, including strong seismic groundshaking.

Currently accepted design standards for seismically induced groundshaking-resistant construction are addressed in the 2010 CBC and the City of Los Angeles Building and Grading Codes. These guidelines are considered minimum standards for design and construction of buildings and must be incorporated

[48] 2007 Working Group on California Earthquake Probabilities, The Uniform California Earthquake Rupture Forecast, Version 2 (UCERF 2): U.S. Geological Survey Open-File Report 2007-1437 and California Geological Survey Special Report 203 (2008), http://pubs.usgs.gov/of/2007/1091/.

into any final project designs.[49] Because design and construction of new habitable structures in compliance with the CBC's recommended seismic design criteria would achieve an "acceptable level" of risk, as defined by the State of California, potential hazards associated with strong seismic groundshaking on new development in the CPAs would be reduced.

Compliance with the CBC, City's Codes and related applicable regulatory requirements, which would be within the jurisdiction of the City to ensure and monitor, would ensure that the proposed plans and all development therein would not cause or accelerate geologic hazards that would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury as result of strong seismic groundshaking. This impact would be ***less than significant***.

Unreinforced Masonry Buildings

Unreinforced masonry buildings or buildings constructed on unreinforced brick foundations, which could have been constructed before building codes were adopted, are particularly susceptible to earthquake damage. Some newer buildings constructed before earthquake-resistant provisions were included in the building codes, could also be damaged during an earthquake. Wood-frame buildings one or two stories high (e.g., single-family dwellings) are generally considered to be the structurally resistant to earthquake damage, but older buildings (e.g., built prior to 1960) can also be affected because of the manner in which the frames were attached to the foundations.

Anticipated development under the proposed plan and implementing ordinances is expected to involve some amount of renovation, restoration, and/or reuse of existing buildings. Building occupants, visitors, or workers could be exposed to potential hazards from falling debris or structural failure as a result of an earthquake if the buildings do not meet current seismic safety standards. To address potential hazards associated with older buildings that may present seismic safety hazards, in conjunction with building permit approvals, the City is required to ensure implementation the provisions of its Code for the Seismic Retrofit of Hazardous Unreinforced Masonry Bearing Wall Buildings (Building Code, Division 88) and Tilt-Up Concrete Wall Buildings (Division 91). On a voluntary basis, owner/occupants also can retrofit older structures using standards established in Divisions 92 and 93, and existing structures that may be susceptible to earthquake-induced landslide hazard can also be retrofitted on a voluntary basis (Division 94). The City also provides standards, on a voluntary basis, for existing concrete buildings and tilt-ups (Divisions 95 and 96).

Compliance with adopted Building Code requirements, which would be ensured by the City during application processing and permitting, would reduce the potential hazards associated with existing buildings. Impacts would be ***less than significant***.

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[49] 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. During a major earthquake, a building may be damaged beyond repair yet not collapse. Based on this goal, it is concluded that design and construction of structures in the CPA in accordance with the recommended seismic design criteria (i.e., peak horizontal ground acceleration) would achieve an "acceptable level" of risk as defined by CCR Title 14, Section 3721(a).

Impact 4.5-3 **Implementation of the proposed plans would not cause or accelerate geologic hazards that would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury involving seismic-related ground failure, including liquefaction and/or landslides. Compliance with existing CBC and City of Los Angeles Building Code regulations would ensure this impact remains *less than significant*.**

Liquefaction

As shown in Figure 4.5-3a (Liquefaction Hazard Map [Granada Hills–Knollwood CPA]) and Figure4.5-3b (Liquefaction Hazard Map [Sylmar CPA]), liquefaction-prone areas are primarily in the northern portion of the Granada Hills–Knollwood CPA, extending as far south as a few blocks south of Rinaldi Street and limited to the northern hilly portions of the Sylmar CPA, east of the I-5 Freeway and generally west of San Fernando Road, in the general vicinity of Hubbard Street, and near the Pacoima Wash.

The proposed plans would not directly increase liquefaction hazards because it 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 as described in the existing Community Plans. This 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 plan would increase the FAR in some sub-planning areas in Sylmar, this could increase the amount of occupied space.

It is a state and city requirement for preparation, review, and approval of geotechnical reports for new developments in liquefaction-prone areas. Compliance with the recommendations of the geotechnical report, the City's Building and Grading Codes, as well as with any specific requirements established by the Department of Public Works and/or the City Engineer would reduce the liquefaction-related hazards. Compliance with the CBC, City's Codes, and applicable regulatory requirements described above would ensure that the potential risk of loss, injury, or death due to liquefaction would be ***less than significant***.

Earthquake-Induced Settlement

Settlement or subsidence of the ground surface can be accelerated and accentuated by earthquakes. During an earthquake, settlement can occur as a result of the relatively rapid rearrangement, compaction, and settling of subsurface materials (particularly loose, uncompacted, and variable sandy sediments). Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different rates). Localized differential settlements up to two-thirds of the total sediments anticipated must be assumed until more precise predictions of differential settlements can be made. Implementation of the applicable City's Codes and regulatory requirements pertaining to seismic hazards described above would ensure that the potential risk of loss, injury, or death due to settlement is ***less than significant***.

Landslides

As shown in Figure 4.5-4a (Landslide Hazards Map [Granada Hills–Knollwood CPA]) and Figure 4.5-4b (Landslide Hazards Map [Sylmar CPA]), earthquake-induced landslide hazards zones are areas are located along the northern and eastern edges of the Granada Hills–Knollwood CPA north of Rinaldi Street, with the largest area north and west of Sesnon Boulevard and in the southern portion of the Sylmar CPA east of the I-5 Freeway and north of Hubbard Street. Most of the landslide-prone areas are located in areas where the proposed plans do not propose significant changes. Regardless, some seismically induced landslide-prone areas could be redeveloped or developed with new structures under the proposed plans. Landslides in those areas would have the potential to expose people and structures in the CPAs to landslides and other geologic hazards, resulting in increased risk of loss, injury, or death.

It is the City's standard practice to require the preparation, review, and approval of geotechnical reports for new developments in landslide susceptible areas. Compliance with the recommendations of the geotechnical report, the City's Building and Grading Codes, as well as with any specific requirements established by the Department of Public Works and/or the City Engineer would mitigate landslide-related hazards. This impact would be ***less than significant***.

Impact 4.5-4 Implementation of the proposed plans would not create substantial risks to life or property as a result of expansive soils. Compliance with existing CBC and City of Los Angeles Building Code regulations would ensure this impact is *less than significant*.

The proposed plans would primarily result in General Plan Amendments and zone changes to create consistency between General Plan Framework (Framework) land use designations, zone changes to set development standards, design standards and guidelines, and ordinances to protect historic resources and single-family residential uses. Buildings could be constructed in the CPAs on 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, the City's Building and Grading Codes, as well as with any specific requirements established by the Department of Public Works and/or the City Engineer are typically sufficient to mitigate expansive soil-related hazards.

Therefore, implementation of the City's Codes and regulatory requirements, in combination with the City's standard grading and building permit requirements and the application of Best Management Practices, would reduce impacts from expansive soils would be ***less than significant***.

Impact 4.5-5 Implementation of the proposed plans could result in development in areas subject to potential geologic hazards or unstable soils and potentially result in on- or off-site landslide, lateral spreading, subsidence, or collapse. Compliance with existing CBC and City of Los Angeles Building Code regulations would ensure this impact remains *less than significant*.

The proposed plans would primarily create consistency between Framework land use designations, zone changes to set development standards, design standards and guidelines, and ordinances to protect historic resources and single-family residential uses. It is anticipated this would result in the construction of new buildings in the plan areas. These buildings could be constructed on areas that are potentially unstable and could potentially be subject to hazards from landslides, lateral spreading, subsidence, settlement, or collapse, if not properly sited, designed, and constructed.

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. It is 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, increased water content, excessive surface loading, or alteration of existing slopes by man or nature can cause landslides.

Lateral spreading is a phenomenon where large blocks of intact, nonliquefied soil move downslope riding on a liquefied substrate of large extent. 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.

Settlement is the gradual downward movement of an engineered structure (e.g., a building) caused by the compaction of the unconsolidated material below the foundation. The risk of soils collapse and settlement would be highest in areas containing fill. Lateral spreading and collapse could occur in unsupported walls of pits excavated in the existing fill or loose alluvium. During an earthquake, settlement can occur as a result of the relatively rapid rearrangement, compaction, and settling of subsurface materials (particularly loose, uncompacted, and variable sandy sediments). Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different rates). Localized differential settlements up to two-thirds of the total settlements anticipated must be assumed until more precise predictions of differential settlements can be made. Implementation of the applicable City's Codes and regulatory requirements pertaining to seismic hazards described above would ensure that the potential risk of loss, injury, or death due to settlement would be ***less than significant***.

The principal tool for mitigation of geologic hazards is the City Grading Code, the requirements of which are specified in Chapter IX (Building Regulations), Article 1 (Building Code), 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. For example, 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, the City's Building and Grading Codes, as well as with any specific requirements established by the Department of Public Works and/or the City Engineer are typically sufficient to mitigate soil instability-related hazards.

Implementation of the City's Codes that implement the CBC in combination with the City's standard grading and building permit requirements, implementation of standard City mitigation measures, and the application of Best Management Practices would reduce impacts from unstable soils to ***less than significant***.

Impact 4.5-6 Implementation of the proposed plans would not cause or accelerate instability from erosion so as to result in a geologic hazard to other properties, or accelerate natural processes of wind and water erosion and sedimentation, resulting in sediment runoff or deposition that would not be contained or controlled on site. Compliance with existing state water quality protection regulations and the CBC and City of Los Angeles Building Code regulations would ensure this impact remains *less than significant*.

Soil erosion is a naturally occurring process. The agents of soil erosion are water and wind, each contributing a significant amount of soil loss. 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. Erosion, especially water erosion, can damage the watershed and contribute to hillside instability and flooding. Following brush fires, the threat of erosion is great due to loss of ground cover. When completed, surface improvements, such as buildings and paved roads, decrease the potential for erosion, but can increase the rate and volume of runoff containing sediment that can clog drainages and cause flooding, slope instability, and exacerbate erosion potential by diverting water flow.

Implementation of the proposed plans would facilitate new construction. 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, access roads, 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 road and pad grading typically would be less than two feet deep. Nonetheless, deeper excavations could accompany the emplacement of underground facilities in the flatlands or road cuts in the uplands.

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 Los Angeles Municipal Code, 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.

The proposed plans would also incorporate the City's proposed Baseline Hillside Ordinance requirements that, among other controls, would include proposed grading regulations. The proposed regulations establish a new limit that uses a base quantity of grading plus a percentage of the lot size, with a maximum value that would be based on the property's zoning. It would also limit the amount of export/import. An indirect outcome of the Baseline Hillside Ordinance is that it could help reduce soil erosion potential in hillside areas, where erosional effects would be most likely to occur.

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 Best Management Practices (BMPs). These BMPs are meant to reduce the amount of constituents, including eroded sediment, that enter streams and other water bodies. An 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 4.8.

Compliance with state NPDES permit, City Codes, and applicable regulatory requirements, in combination with the City's standard grading and building permit requirements and the application of Best Management Practices, would ensure that potential impacts from erosion would be ***less than significant***.

Impact 4.5-7 **Implementation of the proposed plans would not destroy, permanently cover or materially and adversely modify one or more distinct and prominent geologic or topographic features such as hilltops, ridges, hill slopes, canyons, ravines, rock outcrops, water bodies, streambeds and wetlands. This impact would be *less than significant*.**

The proposed plans would primarily create consistency between Framework land use designations, zone changes to set development standards, design standards and guidelines, and ordinances to protect historic resources and single-family residential uses. Development in most of the hilly areas would be minimal because the areas not designated as Open Space are designated as Single-Family Residential and Public Facilities, which would not involve extensive land alteration. Many of the land use changes would remove zoning that allows develop of hillsides and, thus, would conserve hillsides, historic resources, and single-family residential uses. Because it would otherwise continue to allow the development of the CPAs as envisioned by the existing Community Plans, development in most of the hilly areas would be minimal because the areas not designated Open Space would not involve extensive, if any, land alteration.

The southern portions of the Granada Hills–Knollwood and Sylmar CPAs are generally flat, in contrast, the more northerly portions of the CPAs tend to have more pronounced elevation changes and steeper slopes, with hills, ridges, canyons, ravines, and other topographic features. Most of these hilly areas are designated as Open Space and the proposed plans do not propose any changes in those areas. While some other hilly areas in the CPAs are developed with existing structures or could be developed with new structures under the proposed plans, Community Plans' policies would protect the hillsides and avoid substantial landform alteration. For these reasons, implementation of the proposed plans would not destroy, permanently cover, or materially and adversely modify distinct and prominent geologic or topographic features. This impact would be ***less than significant***.

Impact 4.5-8 **Implementation of the proposed plans would not result in the loss of, or loss of access to, a mineral resource located in an MRZ-2 zone or other known or potential mineral resource area, or result in the permanent loss of, or loss of access to, a mineral resource of regional or statewide significance. The impact would be *less than significant*.**

Granada Hills–Knollwood

Oil and Gas Production

As shown in Figure 4.5-5 (State Designated Oil Fields), state-designated oil fields are located within the northern portion of the Granada Hills–Knollwood CPA. Much of this area is zoned as Open Space and would remain so, as few changes are proposed by the Granada Hills–Knollwood proposed plan. There are some areas within the state designated oil fields where proposed plan land use changes are proposed. These areas are largely developed with single-family homes and changes proposed by the proposed plan would either limit hillside development or create consistency between the Framework land use designations and the proposed plan and would not restrict the extraction of oil from these areas. However, some development could occur within the state-designated oil fields and result in the potential to result in the loss of availability of a known and/or locally important mineral resource.

Policies in the Granada Hills–Knollwood Community Plan as well as existing Safety and Conservation Element policies would minimize potential impacts associated with the loss of a known and/or locally important mineral resource. These policies include Conservation Element Policies 1 and 2 under Sand and Gravel resources; Policies 1, 2, and 3 under Oil and Gas resources; and proposed plan policy CF7.1. Policies in the General Plan seek to implement the provisions of the SMARA (Public Resources Code Sections 2710 et seq.) so as to establish extraction operations at appropriate sites; to minimize operation impacts on adjacent uses, ecologically important areas (e.g., the Tujunga Wash) and ground water; to protect the public health and safety; and require appropriate restoration, reclamation and reuse of closed sites. Policies in the proposed plan include conserving and enhancing natural amenities; minimizing grading and infringing on natural topography; and protecting hillside properties for private and public recreational uses. These policies would minimize development in areas in the CPA near and overlying state-designated oil fields and would not interfere with the extraction of oil and gas resources. Additionally, City policies to allow and regulate are described in Section 13.01 of the LAMC, which identifies provisions for districts where production of oil and gas is permitted and how it shall be undertaken.

Implementation of the City's Codes, regulatory requirements, proposed Community Plan policies, and existing policies described above would ensure that this impact would be ***less than significant***, and no additional mitigation measures are required.

Sylmar

Surface Mining

As shown in Figure 4.5-6 (Sand and Gravel Deposits), significant mineral resource deposits are located within the eastern portion of the Sylmar CPA. Much of this area is currently zoned Open Space and Public Facilities and some smaller portions are zoned Industrial and Single-Family Residential. Most of the MRZ-2 zone would be unchanged by the Sylmar proposed plan; however there are some areas within the MRZ-2 zone where land use changes are proposed. A small section at the north end of the MRZ-2 zone has been targeted as an area for open space conservation. This change would enhance conservation of any significant mineral resources located in the Sylmar CPA. Another small section of the Sylmar CPA, west of the MRZ-2 zone near the intersection of Maclay Street and Eldridge Avenue, is proposed as an area to expand single family housing options in the Sylmar CPA. This section of the Sylmar CPA is currently designated as Single-Family Residential; therefore, no changes in land use would occur. Changes proposed by the Sylmar proposed plan within the MRZ-2 zone are minor and would either limit development by conserving open space or create consistency between the Framework land use designations and the proposed plan would not restrict the extraction of surface minerals from these areas. However, as stated above, some residential development could occur within the MRZ-2 zone and potentially result in the loss of availability of a known and/or locally important mineral resource.

Policies in the Sylmar Community Plan, as well as existing Conservation Element policies, would minimize potential impacts associated with the loss of a known and/or locally important mineral resource. These policies include Conservation Element Policies 1 and 2 under Sand and Gravel Resources. Policies in the General Plan seek to implement the provisions of the SMARA (Public Resources Code Sections 2710 et seq.) so as to establish extraction operations at appropriate sites; to minimize operation impacts on adjacent uses, ecologically important areas (e.g., the Tujunga and Pacoima Wash) and groundwater; to protect the public health and safety; and require appropriate restoration, reclamation and reuse of closed sites. Policies in the Sylmar Community Plan include conserving and enhancing natural amenities; preserving environmentally sensitive areas; restricting development in sensitive areas; improving and increasing public opens spaces, such as the Pacoima Wash; and protecting natural resources, such as the Pacoima Wash by limiting development. These policies would minimize development in areas of the Sylmar CPA near and overlying MRZ-2 zones and would not interfere with the extraction of mineral resources.

Implementation of the City's Codes, regulatory requirements, Community Plan policies, and existing policies described above would ensure that this impact would be ***less than significant***, and no additional mitigation measures are required.

Mitigation Measures

Development under the proposed plans would comply with all local, state, and federal regulations pertaining to geological hazards. In addition, discretionary projects are subject to environmental review and mitigation measures are applied as part of the conditions of approval for the project. As such, no mitigation is required.

Level of Significance After Mitigation

Compliance with all local, state, and federal regulations would ensure that all impacts related to geology/soils are ***less than significant***.

4.5.4 Cumulative Impacts

The geographic context for the analysis of cumulative impacts resulting from geologic hazards is generally site-specific, because each project site has a different set of geologic considerations that would be subject to specific site-development and construction standards. Soil and geologic conditions are site-specific. As such, the potential for cumulative impacts to occur is geographically limited for many geology and soils impact analyses; however, variations from a site-specific cumulative context are identified, where they occur.

In common with the rest of California, Los Angeles is in a seismically active area and is subject to risk of damage to persons and property as a result of seismic groundshaking. Given the risk from seismic activity associated with all development in seismically active areas, this impact would be significant if it were not mitigated by building code requirements. Building in California is strictly regulated by the CBC, as adopted and enforces by each jurisdiction, to reduce risks from seismic events to the maximum extent possible. Impacts associated with potential geologic hazards related to fault rupture would occur at individual building sites and would be related to the site's location relative to fault zones, the composition of the site's soil, and the structural strength of a particular building. Portions of the CPAs are in an Alquist-Priolo fault zone, as noted. Cumulative development would not result in an increase in safety hazards, and special studies would be required for any projects within an AP zone.

Because the City of Los Angeles uses and enforces the requirements of the CBC as part of its Building Code, new buildings and facilities in the City are required to be sited and designed in accordance with the most current geotechnical and seismic guidelines and recommendations. In addition, development that could occur as a result of the proposed plans would implement all necessary design features recommended by the site-specific geotechnical studies to reduce the risk from seismic activity, unstable slopes, and soil limitations. With adherence to the California Building Code and related plans, regulations, and design and engineering guidelines and practices, the project would not make a cumulatively considerable contribution to any potential cumulative impact arising from fault rupture. The proposed plans cumulative impacts would be ***less than significant***.

Impacts associated with potential geologic hazards related to groundshaking 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 and facilities 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. Because individual projects that could be developed as a result of the proposed plans and implementing ordinances would comply with the provisions of all applicable codes and regulations and because its building plans would conform to the most current seismic safety design guidelines, the proposed plans would not make a cumulatively considerable contribution to any potential cumulative impacts arising out of strong seismic groundshaking, and the cumulative impact would be ***less than significant***.

The construction phase of individual development projects facilitated by the proposed plans and implementing ordinances could expose soil to erosion by wind or water. Development of other cumulative projects in the vicinity of the CPAs could similarly expose soil surfaces and further alter soil conditions. To minimize the potential for cumulative impacts that could cause erosion, the project and cumulative projects in the adjacent area are required to conform to the provisions of applicable federal, state, County, and City 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 4.8). 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 project would not make a cumulatively considerable contribution to any potential cumulative impact related to soil erosion, and the cumulative impact would be ***less than significant***.

As with seismic groundshaking 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. Because development facilitated by the proposed plans would also be required to implement appropriate design and construction measures, the project would not make a cumulatively considerable contribution to any potential cumulative impacts, and the cumulative impact of the proposed plans would be ***less than significant***.

Cumulative projects, depending on where they are located, could substantially change site topography and/or unique geologic or physical features at their respective sites. In certain situations this could be a potentially significant impact, particularly if a large number of cumulative projects were to change topography or unique geologic features. However, the proposed plans would not substantially change site topography or affect unique geologic features, and would have no impact on such features. Therefore, the proposed plans would not make a cumulatively considerable contribution, and the cumulative impact related to prominent geologic or topographic features would be ***less than significant***.

The geographic context for the analysis of cumulative impacts to mineral resources is generally site-specific. As such, the potential for cumulative impacts to occur is geographically limited. Cumulative development within the City of Los Angeles could interfere with the availability of a locally important mineral resource. It could also occur within areas designated by the state, or a local general plan, specific plan or other land use plan as areas containing mineral resources that are of local and/or state importance. Because urban uses, such as residential and commercial development, would generally be considered inconsistent with mineral extraction activities, development of these uses in the vicinity of mineral resource sites could hinder or preclude mineral extraction activities. Therefore, cumulative development within the region could result in the loss of availability of some mineral resources, which would be considered a potentially significant cumulative impact. However, existing Safety and Conservation Element policies would minimize potential impacts associated with the loss of a known and/or locally important mineral resource. The proposed plans would not result in loss of, or loss of access to, a mineral resource. Therefore, the project's contribution to the cumulative loss of available mineral resources or of a known mineral resource that would be of value to the region and/or the residents of the state would not be cumulatively considerable. Impacts would be ***less than significant***.

4.5.5 References

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