5.5 GEOLOGY AND SOILS

This section of the Draft Environmental Impact Report (DEIR) evaluates the potential for implementation of the City of Industry General Plan Update to impact geological and soil resources in the City of Industry and its Sphere of Influence (SOI) (together referred to as the City). The analysis in this section is based in part on the following sources:

- *Limited Geotechnical Investigation, Feasibility-Level Report, LACSD Intermodal Facility Project,* KFM GeoScience, 2005
- *Geotechnical Investigation, Duck Farm, Phase 1A, City of Industry, California,* URS Corporation, 2010
- *Preliminary Geotechnical Investigation, Western Portion of the proposed Industry Business Center, west of Grand Avenue, North of State Route 60/57, City of Industry, California,* Leighton Consulting, Inc., 2007
- *Report of Geotechnical Conditions for use in Development Planning, Eastern Portion of the proposed Industry Business Center, east of Grand Avenue, North of State Route 60/57, City of Industry, California,* Leighton Consulting, Inc., 2007

5.5.1 Environmental Setting

Regulatory Background

California Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was signed into state law in 1972, as amended, primarily to mitigate the hazard of fault rupture by prohibiting the location of structures for human occupancy across the tract of an active fault. The Act requires the State Geologist to delineate Earthquake Fault Zones along faults that are “sufficiently active” and “well defined.” According to the State Geologist, an active fault is one that has had surface displacement within the Holocene Epoch (roughly the last 11,000 years). A potentially active fault is defined as any fault that has had surface displacement during Quaternary time (last 1,600,000 years) but not within the Holocene. An inactive fault is one that has been proven not to have moved in the last 11,000 years. The act also requires that cities and counties withhold development permits for sites within an Earthquake Fault Zone until geologic investigations demonstrate that the sites are not threatened by surface displacements from future faulting. Pursuant to this Act, structures for human occupancy are not allowed within 50 feet of the trace of an active fault.

Seismic Hazard Mapping Act

The Seismic Hazard Mapping Act was adopted by the state in 1990 to protect public safety from the effects of earthquake hazards apart from surface fault rupture, including strong ground shaking, liquefaction, seismically induced landslides, or other ground failure caused by earthquakes. The goal of the act is to minimize loss of life and property by identifying and mitigating seismic hazards. The California Geological Survey (CGS) prepares and provides local governments with seismic hazard zone maps that identify areas susceptible to amplified shaking, liquefaction, earthquake-induced landslides, and other ground failures. The seismic hazard zones delineated by the CGS are called “zones of required investigation” because site-specific geological investigations are required for construction projects within these areas.

2010 California Building Code

Current law states that every local agency enforcing building regulations, such as cities and counties, must adopt the provisions of the California Building Code (CBC) within 180 days of its publication. The publication date of the CBC is established by the California Building Standards Commission and the code is also known as Title 24, Part 2, of the California Code of Regulations. The most recent building standard adopted by the legislature and used throughout the state is the 2010 version of the CBC, often with local, more restrictive amendments that are based on local geographic, topographic, or climatic conditions. These codes provide minimum standards to protect property and public safety by regulating the design and construction of excavations, foundations, building frames, retaining walls, and other building elements to mitigate the effects of seismic shaking and adverse soil conditions. The CBC contains provisions for earthquake safety based on factors including occupancy type, the types of soil and rock onsite, and the strength of ground.

Natural Hazards Disclosure Act

The Natural Hazards Disclosure Act requires that sellers of real property and their agents provide prospective buyers with a Natural Hazard Disclosure Statement when the property being sold lies within one or more state-mapped hazard areas, including a Seismic Hazard Zone.

City of Industry Municipal Code

The City's Municipal Code has many existing regulations that mitigate potential safety concerns related to new construction. The City of Industry's Building Regulations are included in the City's Municipal Code as Chapter 15.04 (Building Code). The City has adopted by reference the most recent version of the CBC. Chapter 15.04 of the Municipal Code establishes rules and regulations to control excavation, grading, and earthwork construction (including fills). Chapter 16.60 (Soil Reports) establishes administrative requirements for issuance of permits, approval of plans, and inspection of grading construction at new subdivisions in accordance with the requirements for grading and excavation contained in the CBC as adopted and modified by City ordinance. Section 13.16.070 (Construction Activity Storm Water Measures) contains construction activity stormwater requirements to preserve water quality and prevent erosion in the City. Section 17.36.080 (Standard Conditions of Approval) outlines standard conditions that are applicable to development projects, including the requirement for project applicants to submit drainage and grading plans to the City Engineer for review and approval prior to issuance of a building permit

Regional Setting

Geologic Setting

California is divided into geomorphic provinces, which are distinctive, generally easy-to recognize natural regions in which the geologic record, types of landforms, pattern of landscape features, and climate are similar. The City is in the Peninsular Ranges Geomorphic Province, a series of mountain ranges separated by northwest-trending valleys, which characterizes the southwest portion of California. The trend of topography in this province is similar to the Coast Ranges, but the geology is more like the Sierra Nevada, with granitic rock intruding the older metamorphic rocks. Regional faults within the Peninsular Ranges province are oriented southeast to northwest. The Peninsular Ranges extend from the Los Angeles Basin to the Mexican border and are bounded on the east by the Colorado Desert, on the north by the Transverse Ranges, on the west by the Pacific Ocean, and on the south by the Mexican border. The chief mountain ranges in the province are the Santa Ana, San Jacinto, and Santa Rosa mountains.

More specifically, the City of Industry is primarily located along the eastern margin of the San Gabriel River Valley in the eastern Puente Hills, an east-to-west-trending range of hills that separates the Los Angeles Basin to the south from the San Gabriel Valley to the north. Uplift of the Puente Hills has exposed a thick sequence of tertiary marine sedimentary rocks of Miocene age. The predominantly siltstone bedrock has been deformed by folding and faulting as the Puente Hills uplifted. Most of Industry lies in the alluvial valley formed by San Jose Creek, which separates the Puente Hills on the south from the San Jose Hills to the north. Alluvium deposited by the San Gabriel River and San Jose Creek also overlie the bedrock beneath portions of the City, as shown in Figure 5-5-1, *Geology*.

The vacant IBC site in the eastern City limits consists of a series of rolling hills between two small valleys, the Puente Valley with San Jose Creek immediately to the north and the small valley formed by Diamond Bar Creek to the south. These hills are thought to be part of the Puente Hills Formation. Numerous landslides were present on the IBC site.

Faulting and Seismicity

Southern California has many earthquakes because it straddles the boundary between the North American and Pacific plates, and fault rupture accommodates their motion. Along most of California, the Pacific Plate is moving northwesterly (relative to the North American Plate) at about 50 millimeters/year. Therefore, many of the faults associated with the plate movement have a northwest trend and are characterized as strike-slip faults. On average, strike-slip faults are near vertical breaks in the rock. When a strike-slip fault ruptures, the rocks on either side of the fault slide horizontally past each other.

The State of California, under the guidelines of the Alquist-Priolo Earthquake Fault Zoning Act, classifies faults according to the following criteria:

- ***Active.*** Faults showing proven displacement of the ground surface within about the last 11,000 years (Holocene age) that are thought capable of producing earthquakes.

- ***Potentially Active.*** Faults showing evidence of movement within the last 1.6 million years, but do not been show conclusively whether or not they have moved in the last 11,000 years.

- ***Not Active.*** Faults that have conclusively not moved in the last 11,000 years.

No areas of the City are within an Alquist-Priolo Earthquake Fault Zone. However, similar to the rest of southern California, the City is in seismically active southern California. CGS requires that faults within 100 kilometers (approximately 62 miles) that could affect the project area be identified. Table 5.5-1 provides a list of some of the faults and fault systems within a 100-kilometer radius that are considered to contribute to the seismic exposure of the City. The estimated seismic characteristics of each fault are summarized in the Figure based on available published geologic and seismologic data. Many of these faults are also shown in Figure 5.5-2, *Regional Faults*.

Table 5.5-1
Faults and Fault Systems within 100 Kilometers of Industry

Fault Name	Approximate Distance (km)	Maximum Earthquake Magnitude (M_w)	Type of Fault
San Jose	2.2	6.5	Left Lateral – Reverse Oblique
Whittier–Elsinore	3.2	6.8	Strike Slip
Chino–Central Ave	7.8	6.7	Right Lateral – Reverse Oblique
Puente Hills Thrust System–Santa Fe Springs Segment	8	6.5	Reverse
Puente Hills Thrust System–Coyote Hills Segment	10	6.75	Reverse
Puente Hills Thrust System– Las Cienegas Segment	11	7.0	Reverse
Elysian Park Thrust	12	6.7	Reverse
Raymond	13.5	6.5	Left Lateral – Reverse Oblique
Sierra Madre	15	7.0	Reverse
Clamshell–Sawpit	18	6.5	Reverse
Verdugo	22	6.7	Reverse
Compton Thrust	22	6.8	Reverse
Hollywood	25	6.4	Left Lateral –Reverse Oblique
Newport–Inglewood (LA Basin)	26	6.9	Strike Slip
Cucamonga	31	7.0	Reverse
Santa Monica	35	6.6	Left Lateral – Reverse Oblique
Palos Verdes Hills	37	7.1	Strike Slip
San Gabriel	40	7.0	Strike Slip
Elsinore–Glen Ivy	44	6.8	Strike Slip
San Andreas–Mojave	49	7.1	Strike Slip
San Jacinto–San Bernardino	58	6.7	Strike Slip

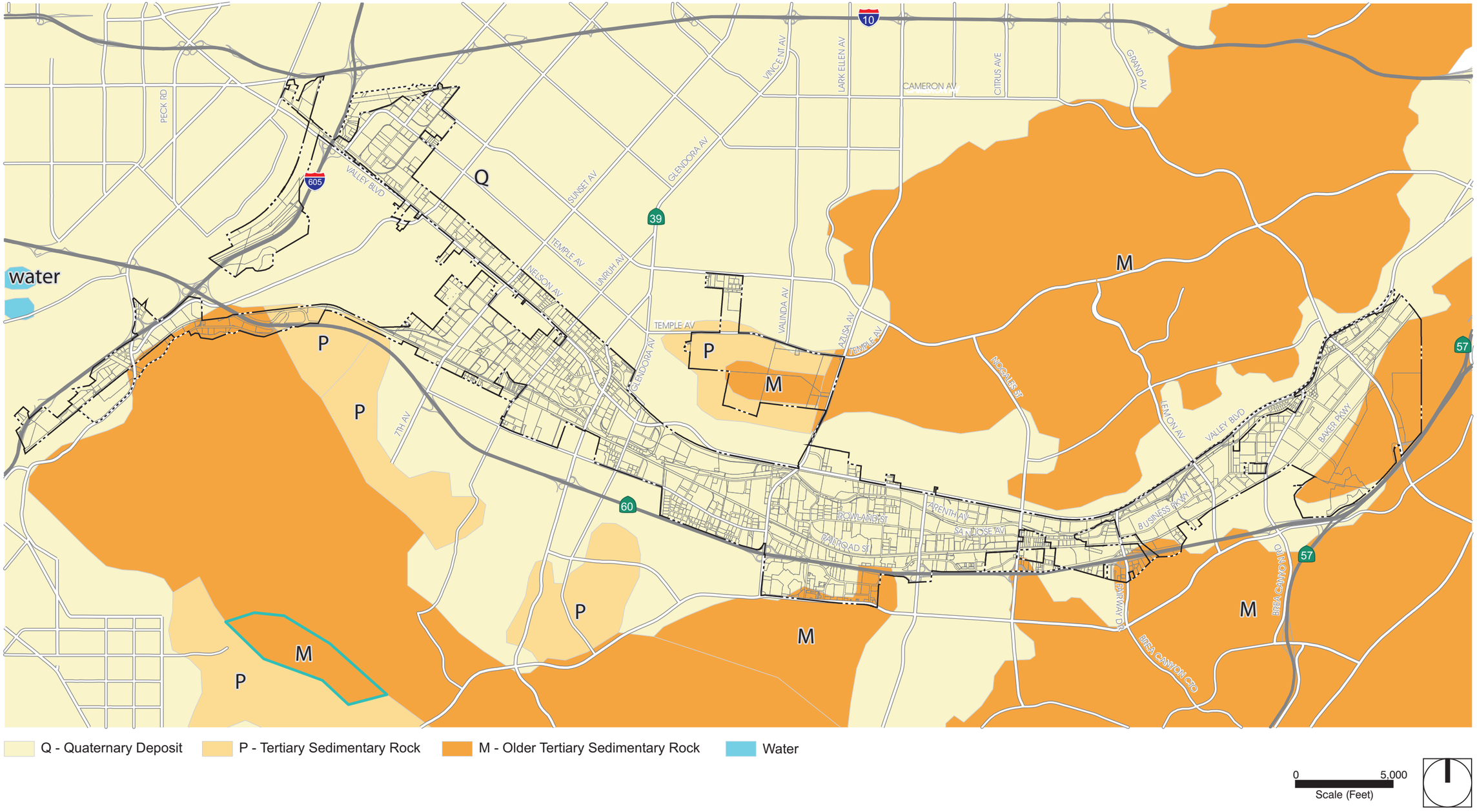
Source: KFM GeoScience 2005 (prepared for Puente Hills Intermodal Modal Facility Draft EIR). Measurements to the faults were taken from the Puente Hills Intermodal Facility site, which is in the western end of the City.

Geologic Hazards

Corrosive Soils

Corrosive soils contain chemical constituents that may cause damage to construction materials such as concrete and ferrous metals. One such constituent is water-soluble sulfate, which, if in high enough concentrations, can react with and damage concrete. Electrical resistivity, chloride content, and pH level are all indicators of the soil's tendency to corrode ferrous metals. Numerous geotechnical investigations within the City have encountered moderately corrosive soils, as classified by American Concrete Institute (ACI-318) Table 4.3.1, which is referenced in the 2010 CBC.

Geology


water
Q
P
M
PECK RD
VALLEY BLVD
SUNSET AV
GLENDORA AV
TEMPLE AV
NELSON AV
UNRUH AV
VINCENT AV
LARK ELLEN AV
CAMERON AV
CITRUS AVE
GRAND AV
VALINDA AV
AZUSA AV
NOGALES ST
LEMON AV
BAKER PKWY
BUSINESS PKWY
ROWLAND ST
RAILROAD ST
ARENTH AV
SAN JOSE AV
FAIRWAY DR
BREA CANYON RD
BREA CANYON CTO
7TH AV
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60
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Q - Quaternary Deposit
P - Tertiary Sedimentary Rock
M - Older Tertiary Sedimentary Rock
Water
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Scale (Feet)

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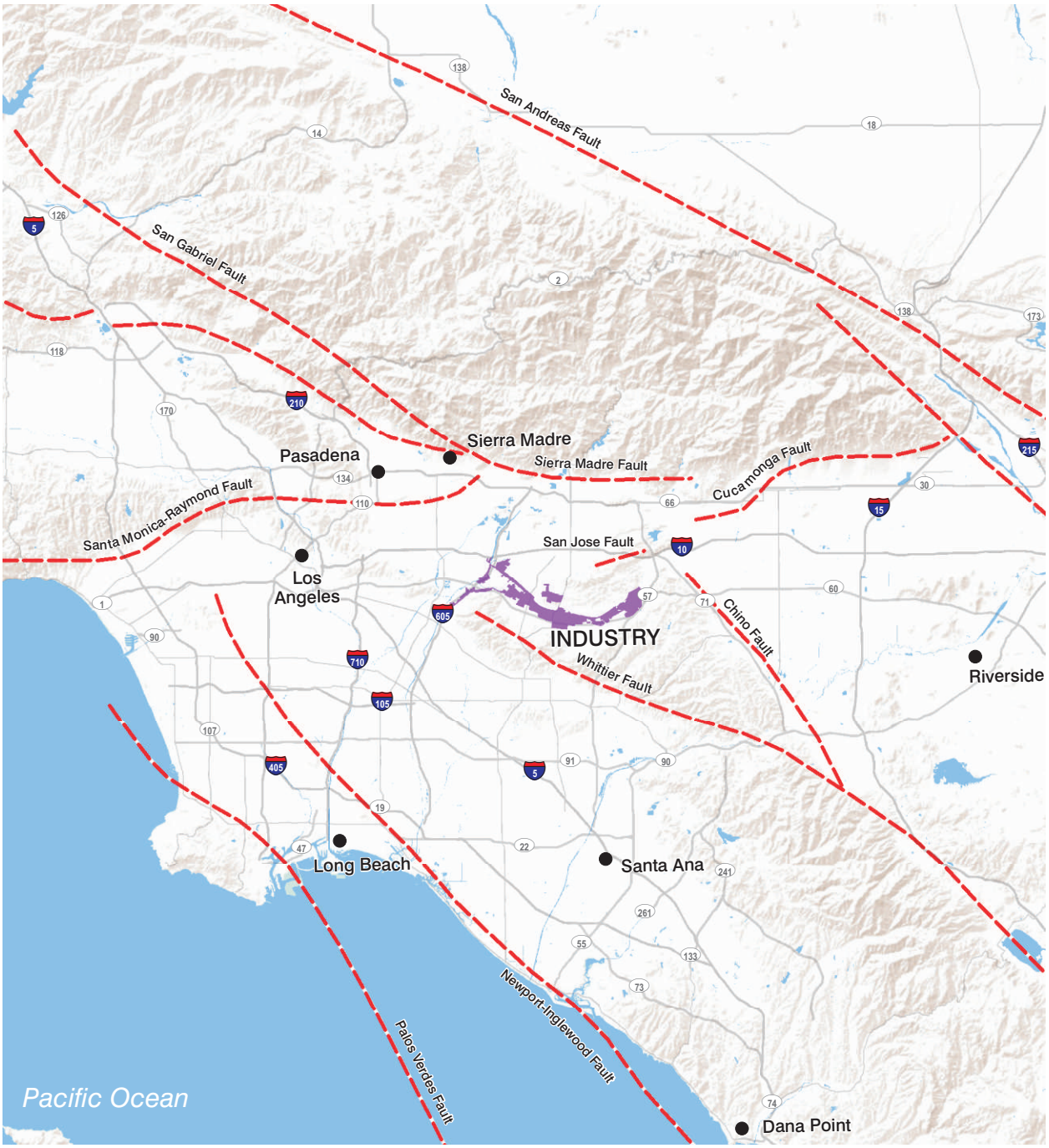
Regional Faults



Regional Faults

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Scale (Miles)

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Ground Subsidence

Ground subsidence is the gradual settling or sinking of the ground surface with little or no horizontal movement, and most often results from human activities such as the extraction of oil, gas, or groundwater. Effects of subsidence include fissures, sinkholes, depressions, and disruption of surface drainage.

Although two abandoned oil fields (the Lapworth and Rowland Oil Fields) and one active oil field (Walnut Oil Field) are located within the City limits, subsidence resulting from oil and gas extraction is not expected to be an issue for the City due to the relatively small amount of oil extracted and relatively small areas of the oil fields. In addition, the City is above the Puente Basin area of the San Gabriel Valley Groundwater Basin. The Puente Basin is relatively shallow and excessive water is not pumped from it, as the basin is adjudicated. Therefore, although the City may be theoretically susceptible to ground subsidence, given the current conditions, subsidence is not expected to significantly impact the City.

Collapsible Soils

When collapsible soils become saturated, their grains rearrange and lose cohesion, causing rapid, substantial settlement under relatively light loads. Soils prone to collapse are generally young, deposited by flash floods or wind. Increased surface water infiltration, such as from irrigation or a rise in the groundwater table, combined with the weight of a building can cause rapid settlement and cracking of foundations and walls.

Compressible Soils

Compressible soils are typically unconsolidated, low-density Holocene sediments that may compress under the weight of structures and fill soil. The young sediments underlying the City are generally dry and loose in the upper few feet, and therefore are susceptible to compression. Areas that have been intensely farmed are especially susceptible to compression. Much of the City has historically been developed for agriculture, but very little of that exists in the present.

Expansive Soils

Soils containing expansive clay minerals can shrink or swell substantially as the moisture content decreases or increases. Structures built on these soils may experience shifting, cracking, and breaking damage as soils shrink and subside or expand. The near-surface sediments in the City are composed primarily of clay, silt and sand. Silts and sands are usually nonexpansive or have very low expansion potential, while clays are recognized as expansive soils.

Erosion

Erosion is the movement of rock and soil due to water, wind, and gravity. Soil erosion may be a slow process that continues relatively unnoticed, or it may occur quickly, causing serious loss of topsoil. The rate and magnitude of soil erosion by water is controlled by rainfall intensity and runoff, soil texture and cohesion, slope gradient and length, and vegetation cover. The young alluvial sediment underlying the City is generally poorly consolidated and very susceptible to erosion. Grading during the construction process temporarily increases the potential for erosion by removing protective vegetation, changing natural drainage patterns, and constructing slopes.

Seismic Hazards

Earthquake Faults, Including Information on Historic Earthquakes

Historic earthquakes in the project area include the 1857 Fort Tejon earthquake (magnitude 7.9) on the San Andreas Fault, the 1933 Long Beach earthquake (magnitude 6.3) along the Newport-Inglewood Fault Zone, the 1987 Whittier Narrows earthquake (magnitude 5.9) on the Elysian Thrust Fault, the 1992 Landers earthquake (magnitude 7.4), the 1994 Northridge earthquake (magnitude 6.6), and the 2008 Chino Hills earthquake (magnitude 5.5).

Surface (Fault) Rupture

There are no Alquist-Priolo Earthquake Fault Zones in the City. The Walnut Creek Fault, a Quaternary Fault, partially runs through central-western Industry, but no recent activity has been documented (CGS 2010). Quaternary Faults have evidence of activity in the past 1.6 million years but not in the last 700,000 years. The Walnut Creek Fault is not identified as an Alquist-Priolo earthquake fault and does not pose a substantial risk to life and property. The closest Alquist-Priolo faults are the Whittier Fault, which runs east–west approximately 3.2 kilometers south of the City; the San Jose Fault, which runs east–west approximately 2.2 kilometers north of the City; and the Chino Fault, which runs northwest–southeast approximately 7.8 kilometers east of the City (CGS 2010). There are no Alquist-Priolo Fault Zones in the City and there is no substantial risk from earthquake fault rupture.

Strong Seismic Ground Shaking

As is the case for all of southern California, the City is susceptible to seismic ground shaking due to the active faults running through the entire region. The most likely source of strong ground shaking within the City would be a major earthquake along the following faults, which are classified as active with strong seismic capabilities. Figure 5.5-2, *Regional Faults*, depicts the proximity of these faults to the City.

- ***San Andreas Fault.*** The San Andreas Fault is the most well-known fault in California. This fault is considered to dominate the seismic hazard for central and southern California. Its activity is known from historical earthquakes and from many fault studies that have shown that the San Andreas offsets, or displaces, recently deposited sediments. The San Andreas Fault has been mapped from Cape Mendocino in northern California to an area near the Mexican border, a distance of approximately 1,006 kilometers. The closest segment of the San Andreas Fault to the City is the Mojave segment, which is approximately 49 kilometers to the northeast. As shown in Table 5.5-1, this segment is thought capable of producing a maximum moment magnitude of 7.1.

- ***Puente Hills Blind Thrust Fault.*** The Puente Hills Blind Thrust Fault is an approximately 43-kilometer fault that does not reach the ground surface; hence it is considered “blind”. Subsurface cross-sections of this and other similar faults under the Los Angeles Basin suggest a connection of these faults with a sub-horizontal master thrust fault at great depth below the land surface. An earthquake on this fault, rupturing the entire length of the fault, could result in a maximum moment magnitude of 7.0, although earthquakes on individual segments would have lower maximum moment magnitudes, as shown in Table 5.5-1.

- ***San Jose Fault.*** The San Jose Fault is an 18- to 22-kilometer fault that branches southwestward from the Cucamonga-Sierra Madre Fault Zone in the Upland area and continues southwest along the southern boundary of the San Jose Hills. The fault trends approximately 2.2 kilometers north of the City. This fault was originally mapped based on a water barrier to the northeast of the City. An earthquake on this fault, rupturing the entire length of the fault, could result in a maximum moment magnitude of 6.5, as shown in Table 5.5-1.

- ***Whittier Fault***. The Whittier Fault is the northwestward extension of the Elsinore Fault, a 241-kilometer fault that reaches from Los Angeles to northern Baja California, Mexico. The Whittier segment is approximately 40 kilometers long and extends from the Whittier Narrows section of the San Gabriel River southeastward along the southern margin of the Puente and Chino Hills to the Santa Ana River. Although no major earthquakes have been attributed to the Whittier Fault, studies completed by several investigators, most of which included trenching, have documented movement on this fault in the last 11,000 years. The closest section of this fault lies approximately 3.2 kilometers from the City. A maximum moment magnitude of 6.8 has been estimated for this fault, as shown in Table 5.5-1.

- ***Chino Fault***. The Chino Fault, approximately 7.8 kilometers from the City, is the northward extension of the Elsinore Fault, north of the Puente Hills. Offset drainages, fault scarps, and trench excavations show that this is an active fault with predominantly right-lateral strike-slip motion. Based on its area, the Chino Fault is estimated to be capable of generating a maximum earthquake of 6.7, as shown in Table 5.5-1.

- ***Sierra Madre-Cucamonga Fault***. The Sierra Madre Fault Zone includes several fault segments that flank the southern margin of the San Gabriel Mountains and are responsible for uplifting the mountains as a result of north–south compression of this part of southern California. The San Fernando segment of the Sierra Madre Fault, near the City of Sylmar, caused the 6.6-magnitude San Fernando earthquake in 1971. The closest segment of the Sierra Madre Fault to the City is about 15 kilometers to the northeast. This fault segment has an estimated maximum moment magnitude of 7.0, as shown in Table 5.5-1. The Cucamonga segment of the Sierra Madre Fault system is 7.0 kilometers to the northeast. This fault has a higher slip rate than the Sierra Madre segment and ruptures more frequently than the adjacent Sierra Madre segment to the west. As shown in Table 5.5-1, the Cucamonga segment is thought capable of producing a maximum moment magnitude of 7.0.

Seismically-Induced Slope Failure

Landslides are movements of relatively large landmasses, either as nearly intact bedrock blocks, or as jumbled mixes of bedrock blocks, fragments, debris, and soils. Landslide materials are commonly porous and very weathered in the upper portions and along the margins of the slide. They may also have open fractures and joints. Slope failures occur most often during or after periods of intense rainfall or in response to strong seismic shaking. Areas of high topographic relief, such as steep canyon walls, are most likely to be impacted by rockfalls, rockslides, and soil slips, and to a lesser degree, landslides. As shown on the State of California Seismic Hazard Zone Map for the Baldwin Park Quadrangle, portions of the Industry Hills Golf Club area are within the Zone of Required Investigation for Earthquake-Induced Landslides (CGS 1999b). Additionally, as shown on the State of California Seismic Hazard Zone Map for the San Dimas Quadrangle, portions of the area of the IBC site are within the Zone of Required Investigation for Earthquake-Induced Landslides (CGS 1999b). Areas susceptible to seismically induced slope failure are shown in Figure 5.5-3, *Liquefaction and Landslide Hazard Zones*.

Liquefaction and Related Ground Failure

Liquefaction is a process whereby strong earthquake shaking causes sediment layers that are saturated with groundwater to lose strength and behave as a fluid. This subsurface process can lead to near-surface or surface ground failure that can result in property damage and structural failure. If surface ground failure does occur, it is usually expressed as lateral spreading, flow failures, ground oscillation, and/or general loss of bearing strength. Sand boils (injections of fluidized sediment) can commonly accompany these different types of failure.

In order to determine a region's susceptibility to liquefaction, three major factors must be analyzed. These include:

- The intensity and duration of ground shaking.
- The age and textural characteristic of the alluvial sediments: Generally, the younger, less well compacted sediments tend to have a higher susceptibility to liquefaction. Textural characteristics also play a dominant role in determining liquefaction susceptibility. Sand and silty sands deposited in river channels and floodplains tend to be more susceptible to liquefaction and floodplains tend to be more susceptible to liquefaction than coarser or finer grained alluvial materials.
- The depth to the groundwater. Groundwater saturation of sediments is required in order for earthquake-induced liquefaction to occur. In general, groundwater depths shallower than 10 feet to the surface can cause the highest liquefaction susceptibility.

Research and historical data indicate that loose, granular materials at depths of less than 50 feet with silt and clay contents of less than 30 percent saturated by relatively shallow groundwater table are most susceptible to liquefaction. These geological conditions are typical in parts of southern California, including the City, and in valley regions and alluviated floodplains.

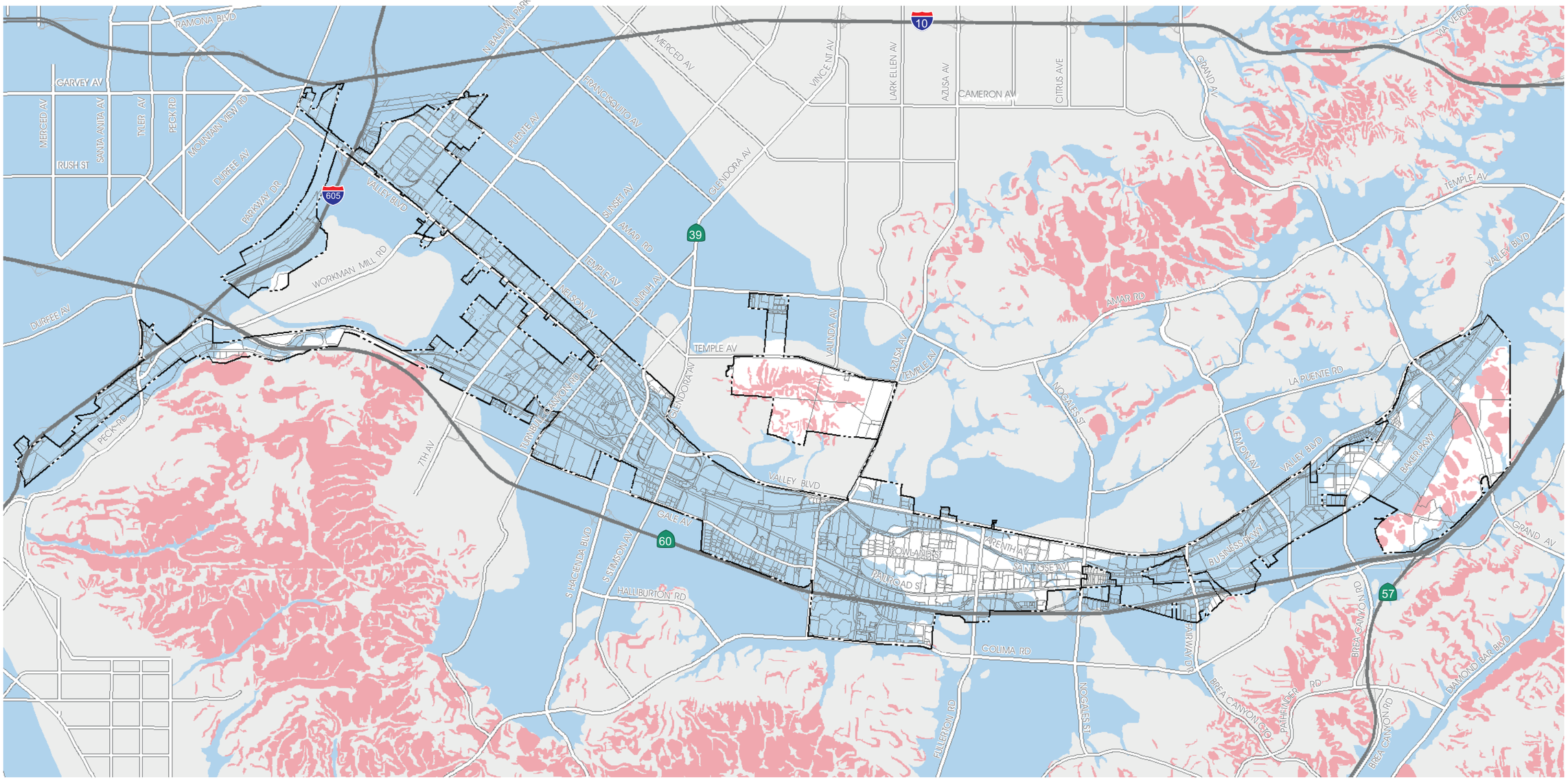
In 1990, the California Legislature passed the Seismic Hazards Mapping Act, requiring CGS to prepare new Seismic Hazard Zone Maps showing areas where earthquake-induced liquefaction or landslides have historically occurred, or where there is a high potential for such occurrences. The majority of the City is within the Zone of Required Investigation for Liquefaction, as shown on CGS's Seismic Hazard Zone Maps for the Baldwin Park, El Monte, La Habra, San Dimas, and Yorba Linda Quadrangles (CGS 2011). Areas of liquefaction susceptibility are shown in Figure 5.5-3, *Liquefaction and Landslide Hazard Zones*.

Hazardous Buildings (Unreinforced Masonry)

The principal threat in an earthquake is not limited to ground shaking, fault rupture or liquefaction, but the damage that the earthquake causes to buildings that house people or an essential function. Continuing advances in engineering design and building code standards over the past decade have greatly reduced the potential for collapse in an earthquake of most of our new buildings. However, many buildings were built in past decades, before some of the earthquake design standards were incorporated into the building code. Several specific building types are a particular concern in this regard, including: Unreinforced Masonry Buildings, Precast Concrete Tilt-up Buildings, Soft-Story Buildings, and Nonductile Concrete Frame Buildings.

Per Senate Bill 547, local jurisdictions are required to enact structural hazard reduction programs by (a) inventorying pre-1943 unreinforced masonry buildings, and (b) developing mitigation programs to correct the structural hazards. The City inventoried unreinforced masonry buildings (URM) in the City and reported to the State Seismic Safety Commission in 2004 that there was one URM in the City. As of 2004, this historically significant building (likely the Workman Adobe) was unoccupied and was out to bid for seismic retrofitting.

Liquefaction and Landslide Hazard Zones



Potential Seismic Landslide Zone

Potential Seismic Liquefaction Zones

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Scale (Feet)

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5.5.2 Thresholds of Significance

According to Appendix G of the CEQA Guidelines, a project would normally have a significant effect on the environment if the project would:

G-1 Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault. (Refer to Division of Mines and Geology Special Publication 42.)

ii) Strong seismic ground shaking.

iii) Seismic-related ground failure, including liquefaction.

iv) Landslides.

G-2 Result in substantial soil erosion or the loss of topsoil.

G-3 Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.

G-4 Be located on expansive soil, as defined in Table 18-1B of the Uniform Building Code (1994), creating substantial risks to life or property.

G-5 Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

The Initial Study, included as Appendix A, substantiates that impacts associated with the following thresholds would be less than significant: G-1i and G-5. These impacts will not be addressed in the following analysis.

5.5.3 Environmental Impacts

The following impact analysis addresses thresholds of significance for which the Initial Study disclosed potentially significant impacts. The applicable thresholds are identified in brackets after the impact statement.

IMPACT 5.5-1: RESIDENTS, WORKERS AND VISITORS OF THE CITY COULD BE SUBJECTED TO SEISMIC-RELATED HAZARDS SUCH AS GROUND SHAKING, LIQUEFACTION, AND SEISMICALLY INDUCED SETTLEMENT. [THRESHOLD G-1ii, 1iii AND 1iv])

Impact Analysis:

Strong Seismic Ground Shaking

The San Gabriel Valley and vicinity contains a number of known earthquake faults, which are described above in Table 5.5-1 and shown in Figure 5.5-2, *Regional Faults*. Of the faults listed, the southern section of the San Andreas Fault is estimated to be capable of generating the greatest magnitude earthquake, M_w 7.1. The most intense peak horizontal ground acceleration that any of these faults is estimated to be capable of generating in the City is approximately 0.42 g, by the Puente Hills Blind Thrust Fault, which passes south of the City.

However, seismic shaking is a risk throughout southern California, and the City is not at greater risk of seismic activity or impacts than other areas. Additionally, the state regulates development in California through a variety of tools that reduce hazards from earthquakes and other geologic hazards. The 2010 California Building Code (CBC; California Code of Regulations, Title 24, Part 2) contains provisions to safeguard against major structural failures or loss of life caused by earthquakes or other geologic hazards. The City of Industry's Building Regulations are included in the City's Municipal Code as Chapter 15.04 (Building Code). The City has adopted by reference the most recent version of the CBC. Projects considered for approval under the General Plan Update would be required to adhere to the provisions of the CBC, which are imposed on project developments by the City and County of Los Angeles during the building plan check and development review process. Compliance with the requirements of the CBC for structural safety during a seismic event would reduce hazards from strong seismic ground shaking.

Under the policies of the Land Use and Resource Management Elements, the City would also take the following actions to reduce seismic impacts of potential developments:

- Require that all new habitable structures be designed in accordance with the most recent California Building Code adopted by the City, including provisions regarding lateral forces and grading. (S1-1)
- Conform to state law regarding unreinforced masonry structures. (S1-2)
- Cooperate and coordinate with public and quasi-public agencies to assure seismically strengthened or relocated facilities and other appropriate measures to safeguard water, electricity, natural gas, and other transmission and distribution systems. (S1-3)

Liquefaction

All three factors that contribute to susceptibility to liquefaction are present or potentially present in various areas of the City: potential for strong earthquakes; young, loose unconsolidated sediments; and shallow groundwater depths. Additionally, as shown in Figure 5.5-3, *Liquefaction and Landslide Hazard Zones*, the majority of the City is within an area of liquefaction susceptibility. Projects considered for approval under the General Plan Update could subject persons or structures to potentially significant hazards arising from liquefaction.

However, while the City is within a liquefaction zone, projects considered for approval under the General Plan Update would not result in increased risk of or exposure to liquefaction or other seismic-related ground failures. Individual development projects would be required to adhere to existing building and grading codes. These codes contain provisions for soil preparation to minimize hazards from liquefaction and other seismic-related ground failures. For example, Chapter 15.04 (Building Code) of the City's Municipal Code establishes rules and regulations to control excavation, grading, and earthwork construction (including fills).

Additionally, as standard procedure by the City and Los Angeles County, grading and soil compaction requires the preparation of site-specific grading plans, soils and geotechnical reports (which must address liquefaction, subsidence, and other potential soil stability hazards), and hydrology studies, which are required to be submitted to and reviewed and approved by the City and county prior to the commencement of any grading activities. Submittal of these technical plans and studies would ensure that hazards arising from liquefaction and other seismic ground failure would not occur, as they would be prepared in accordance with grading and engineering standards outlined in the most current CBC.

Seismically Induced Settlement

Most of the City is underlain by young, unconsolidated alluvial deposits and artificial fill that may be susceptible to seismically induced settlement. Implementation of the General Plan Update could indirectly increase the numbers of persons and structures in the City that could be subjected to earthquake-related hazards. However, projects developed pursuant to the General Plan Update would be required to meet the most current seismic safety requirements of the CBC. For example, Chapter 16 of the CBC contains requirements for design and construction of structures to resist loads, including earthquake loads. Chapter 18 contains requirements for excavation, grading, and fill; load-bearing values of soils; and foundations, footings, and piles. Compliance with these requirements would ensure that there would not be substantial impacts related to ground shaking, liquefaction, or seismic settlement. Additionally, General Plan Policy S1-1 requires that all new habitable structures be designed in accordance with the most recent California Building Code adopted by the City, including provisions regarding lateral forces and grading.

IMPACT 5.5-2: HAZARDS ARISING FROM GROUND SUBSIDENCE, COMPRESSIBLE SOILS, EXPANSIVE SOILS, AND EROSION EXIST OR COULD EXIST IN THE CITY. [THRESHOLDS G-2, G-3, AND G-4]

Impact Analysis: Soils hazards related to earthquakes, such as liquefaction and induced settlement, are addressed above under Impact 5.5-1.

Ground Subsidence and Compressible and Expansive Soils

The thick alluvial deposits composing the Puente Basin may be susceptible to compaction, with resulting subsidence at the surface, in the event of rapid groundwater withdrawal. Surface subsidence of up to 2.5 feet and ground fissuring from groundwater extraction have been reported in the City. Additionally, the young sediments underlying the City are generally dry and loose in the upper few feet, and therefore are susceptible to compression. Much of the City has historically been intensively farmed, and is therefore susceptible to compression. Furthermore, expansive soils are possible in the City where there is clay. Development projects considered for approval under the General Plan Update could expose structures or persons to potentially significant hazards from ground subsidence or compressed or expansive soils.

However, individual development projects would be required to adhere to existing building and grading codes. These codes contain provisions for soil preparation to minimize hazards from unstable and expansive soils. For example, Chapter 15.04 (Building Code) of the City's Municipal Code establishes rules and regulations to control excavation, grading, and earthwork construction (including fills). Additionally, as standard procedure by the City of Industry and Los Angeles County, grading and soil compaction requires the preparation of site-specific grading plans, soils and geotechnical reports (which must address liquefaction, subsidence, and other potential soil stability hazards), and hydrology studies, which are required to be submitted to and reviewed and approved by the City and county prior to the commencement of any grading activities. Submittal of these technical plans and studies would ensure that hazards arising from unstable and expansive soils would not occur, as they would be prepared in accordance with grading and engineering standards outlined in the most current CBC. After compliance with existing regulations, risks arising from unstable and expansive soils would not be significant.

Under the policies of the Land Use and Resource Management Elements, the City would also take the following actions to reduce unstable and expansive soil impacts of potential developments:

- Require that all new habitable structures be designed in accordance with the most recent California Building Code adopted by the City, including provisions regarding lateral forces and grading. (S1-1)

- Conform to state law regarding unreinforced masonry structures. (S1-2)

Erosion

The young alluvial sediment underlying the City is generally poorly consolidated, and very susceptible to erosion. Grading temporarily increases the potential for erosion by removing protective vegetation, changing natural drainage patterns, and constructing slopes. Common means of soil erosion from construction sites include water, wind, and being tracked offsite by vehicles.

However, compliance with the CBC and review of grading plans for individual projects by the City Engineer (as required by Section 17.36.080 [Standard Conditions of Approval] of the City's Municipal Code) would ensure that no significant impacts would occur. In addition, construction activities on project sites larger than one acre would be subject to the National Pollution Discharge Elimination System (NPDES) requirements. Under the NPDES, a Storm Water Pollution Prevention Plan (SWPPP) would be required along with best management practices (BMPs) designed to prevent erosion and siltation during a project's construction phase. Individual project applicants would also be required to adhere to the applicable provisions outlined in Chapter 13.16 (Storm Water and Urban Runoff Pollution Control) of the City's Municipal Code. For example, Section 13.16.070 (Construction Activity Storm Water Measures) contains construction activity stormwater requirements to preserve water quality and prevent erosion in the City.

Adherence to NPDES requirements, the SWPPP and related BMPs, and the City's stormwater and urban runoff pollution regulations would ensure that no significant impacts would occur.

5.5.4 Relevant General Plan Policies

The following are relevant policies of the General Plan Update that are designed to reduce potential geologic hazards to future development in Industry. Policy number references are provided in parentheses.

Safety Element

- Require that all new habitable structures be designed in accordance with the most recent California Building Code adopted by the City, including provisions regarding lateral forces and grading (S1-1).

- Conform to state law regarding unreinforced masonry structures (S1-2).

- Cooperate and coordinate with public and quasi-public agencies to assure seismically strengthened or relocated facilities and other appropriate measures to safeguard water, electricity, natural gas, and other transmission and distribution systems (S1-3).

5.5.5 Existing Regulations

State

- 2010 California Building Code (Title 24, California Code of Regulations, Part 2)

City of Industry Municipal Code

- Title 13 (Water and Sewers), Chapter 13.16 (Storm Water and Urban Runoff Pollution Control), Section 13.16.070 (Construction Activity Storm Water Measures)
- Title 15 (Buildings and Construction), Chapter 15.04 (Building Code)
- Title 16 (Subdivisions), Chapter 16.60 (Soil Reports)
- Title 17 (Zoning), Chapter 17.36 (Design Review), Section 17.36.080 (Standards Conditions of Approval)

5.5.6 Level of Significance Before Mitigation

Upon implementation of regulatory requirements and compliance with the General Plan Update policies, the following impacts would be less than significant: 5.5-1 and 5.5-2.

5.5.7 Mitigation Measures

No mitigation measures are required.

5.5.8 Level of Significance After Mitigation

No significant impacts have been identified and no significant and unavoidable impacts would occur.

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