APPENDIX C

DRAFT SAFETY ELEMENT UPDATE

This page intentionally left blank

Safety Element

City of Long Beach
Development Services Department,
Planning Bureau
General Plan

Long Beach General Plan

Safety Element

Long Beach Development Services Department, Planning Bureau

Adopted May 1975
Revised 2004
Updated 2022

CITY COUNCIL

Robert Garcia, Mayor

Mary Zendejas, District 1

Cindy Allen, District 2

Suzie Price, District 3

Daryl Supernaw, District 4

Stacy Mungo, District 5

Suely Saro, District 6

Roberto Uranga, District 7

Al Austin, District 8

Rex Richardson, District 9

CITY PLANNING COMMISSION

Dr. Joni Ricks-Oddie, Chair

Erick P Verduzco-Vega, Vice Chari

Alvaro J Castillo

Mark Christoffels

Josh LaFarga

Richard Lewis

Jane Templin

CITY PLANNING BUREAU

Oscar W. Orci, Director

Christopher Koontz, AICP, Deputy Director

Patricia Diefenderfer, AICP, Planning Bureau Manager

Alison Spindler-Ruiz, AICP, Advance Planning Officer

Alexis Oropeza, Current Planning Officer

This document is one of many which together comprise the comprehensive General Plan for the City of Long Beach, California. It not only complies with California legislation regulating the preparation of official planning documents, but also is expanded beyond the legislation to meet the special needs of Long Beach.

The General Plan is subdivided into a number of different subjects, entitled “elements.” Some elements are mandated by State law, while others are optional. The Long Beach General Plan will contain the following elements:

Open Space and Recreation*
Conservation*
Air Quality
Noise*
Public Safety*
Housing*
Mobility*
Local Coastal Program
Land Use*
Historic Preservation
Urban Design

Elements identified by a star (*) are mandated by State law.

All of the elements are intimately interrelated and, therefore, none should be viewed entirely alone without reference to other elements.

The elements will be prepared and issued sequentially, on a schedule determined by mandated deadlines, staff availability, informational needs, and other variables.

Inquiries regarding information contained in this document or related to the General Plan should be directed to the:

City Planning Bureau
411 West Ocean Blvd., 3rd Floor
Long Beach, California 90802
(562) 570-52237

TABLE OF CONTENTS

Tables

Plates

Acronyms and Abbreviations

SAFETY ELEMENT

CHAPTER 1.0

INTRODUCTION

1. INTRODUCTION

1.1 SCOPE AND PURPOSE OF SAFETY ELEMENT

The State of California requires a safety element as part of all city and county general plans (Government Code Section 65302.1). This Safety Element is being updated to address recent changes in State law. Government Code Section 65302 (g)(1) requires a safety element that protects "the community from any unreasonable risks associated with the effects of seismically induced surface rupture, ground shaking, ground failure, tsunami, seiche, and dam failure; slope instability leading to mudslides and landslides; subsidence; liquefaction; and other seismic hazards… flooding; and wildland and urban fires." In addition to policies that address relevant hazards, State law requires mapping of these hazards, including "mapping of known seismic and other geologic hazards." Furthermore, the City formerly had a separate Seismic Safety Element, in addition to the Public Safety Element. To reduce duplication and improve readability, the separate Seismic Safety Element has been rescinded and relevant information related to seismic issues has been incorporated into this updated Safety Element.

The goal of the Safety Element is to reduce the potential short- and long-term risk of death, injuries, property damage, and economic and social dislocation resulting from fires, floods, droughts, earthquakes, landslides, climate change, and other hazards. Other locally relevant safety issues, such as airport land use, emergency response, and hazardous materials spills, may also be included. The safety element must identify hazards and hazard abatement provisions to guide local decisions related to zoning, subdivisions, and entitlement permitting. The safety element should also contain hazard and risk reduction strategies complementary with those of the Local Hazard Mitigation Plan (LHMP). The LHMP may be incorporated into the Safety Element (Assembly Bill [AB] 2140 [2006], Government Code Section 65302.6).

Government Code Section 65302 requires amendment of the safety element to include analysis and policies regarding flood hazard and management information. In addition, the safety element must be updated to analyze risk and include policies for the protection of the community from any unreasonable risks associated with the effects of wildland and urban fires, and to address evacuation routes. Policies in a safety element should identify hazards and emergency response priorities, as well as mitigation through avoidance of hazards by new projects and reduction of risk in developed areas. The safety element must also assess the risks associated with climate change and develop resiliency and adaptation measures to reduce the risks associated with climate change impacts (Section 65302[g][4]).

1.2 LOCAL HAZARD MITIGATION PLAN

Local jurisdictional reimbursement for mitigation projects and cost recovery after a disaster is guided by Government Code Section 8685.9 (Assembly Bill 2140). In 2006, the State adopted Assembly Bill (AB) 2140, which added provisions specifying what is to be included in a Local Hazard Mitigation Plan (LHMP) and requiring a linkage between a local jurisdiction's LHMP and the safety element of their general plan. AB 2140 requires a jurisdiction to adopt the LHMP into the safety element of the general plan in order to be fully eligible for disaster relief funding under the California Disaster Assistance Act. AB 2140 can be met by either including the LHMP language specific to AB 2140 as part of the safety element or incorporating the LHMP by reference into the safety element of the general plan.

The City of Long Beach has a current LHMP (adopted in 2017), which includes an assessment of risk and vulnerability related to natural and other identified hazards and a comprehensive mitigation strategy that includes actions and projects designed to mitigate or reduce the impacts of those hazards and to increase community resiliency.

To meet the requirements of AB 2140, the City of Long Beach hereby adopts and incorporates by reference the most current LHMP as part of this Safety Element to the General Plan, which should be consulted when addressing known hazards to ensure the general health and safety of people within Long Beach. The most recent LHMP can be found on the City's website.

1.3 CLIMATE CHANGE RESILIENCY

SB 379 (2015) amended Government Code Section 65302 to require that if a jurisdiction has not already adopted a LHMP that addresses climate change, the safety element must be revised to include climate adaptation and applicable resiliency strategies. State law also requires communities to create a set of adaptation and resilience goals, policies, and objectives related to climate change for the protection of the community (Government Code Section 65302[g][4][B]). Finally, State law requires local agencies to create a set of feasible implementation measures designed to carry out the identified goals, policies, and objectives related to climate change (Government Code Section 65302[g][4][C]).

The City's Climate Action and Adaptation Plan (CAAP) addresses adaptation and resiliency, as well as climate mitigation. The CAAP provides policies, programs, practices, and incentives for Long Beach residents and businesses to reduce the City's greenhouse gas (GHG) footprint and ensure the community and physical assets are better protected from the impacts of climate change.

To meet the requirements of SB 379, the City of Long Beach hereby adopts and incorporates by reference the most current CAAP as part of this Safety Element to the General Plan, which should be consulted when addressing climate change within Long Beach. The most recent CAAP can be found on the City's website.

1.4 SAFETY ELEMENT ORGANIZATION

This Safety Element is organized according to general subject areas that are based primarily on the legislative safety element requirements and the Governor's Office of Planning and Research General Plan Guidelines. Though they are interrelated, each of these subject areas is discussed in a separate chapter of the Safety Element, as summarized below. Each topic area chapter of this Safety Element also contains related goals, policies, and implementation measures.

Chapter 2: Seismic and Geologic Hazards

The geologic and seismic history of the City of Long Beach is summarized, and geologic and seismic data (such as formations, fault zones, seismic ground shaking potential, and liquefaction and landslide hazard zones) are shown in exhibits. The following geologic and seismic hazards are addressed: earthquakes, strong seismic ground shaking, liquefaction, landslides, erosion, and unstable soils.

Chapter 3: Flooding

This chapter discusses known flood hazards and presents flood hazard zones. Local flood hazard areas known to the City are presented and discussed. This chapter also discusses areas subject to inundation in the event of the failure of levees and floodwalls, tsunamis, and dam failure inundation areas.

Chapter 4: Wildland and Urban Fires

This chapter presents information related to the City of Long Beach Fire Department, including fire stations and equipment, as well as established fire hazard zones, water supply requirements for fire-fighting efforts, minimum road widths and clearances around structures for access by emergency vehicles.

Chapter 5: Climate Change Adaptation and Resilience

This chapter summarizes material covered in the City's Climate Action and Adaptation Plan (2020) and its relationship to Public Safety.

Chapter 6: Hazardous Materials

This chapter addresses hazardous materials, including industry, major underground natural gas and fuel lines, and transportation-related activities.

Chapter 7: Disaster Operations

The City's Department of Disaster Preparedness and Emergency Communications directs the planning, coordination, and management activities for disaster preparedness, mitigation, response, and recovery. This chapter of the Safety Element summarizes these activities, including evacuation routes and areas with only one point of ingress or egress.

Chapter 8: Implementation Strategies

This chapter discusses the implementation strategies to achieve the goals and programs presented in the Safety Element. These implementation strategies are regularly updated through the Local Hazard Mitigation Plan (LHMP).

CHAPTER 2.0

SEISMIC AND GEOLOGIC HAZARDS

2. SEISMIC AND GEOLOGIC HAZARDS

2.1 GENERAL GEOLOGY

The city of Long Beach is located on the coastal margin of the Los Angeles Basin, which is underlain by over 15,000 feet of stratified sedimentary rocks of marine origin. The central portion of Long Beach has been elevated by regional uplift and local folding and faulting.

The Harbor and Naples areas are comprised of artificial fill, which generally consists of fine sand and silt. The areas now occupied by the Los Angeles and San Gabriel Rivers represent filled channels, which were cut deeply into the marine sediments by ancestral rivers during the lower sea level stand of the last ice age (in Late Pleistocene time). Over the last 10,000 to 15,000 years, the rivers have filled these channels to their present level with relatively unconsolidated sand, silt, and gravel. The northeastern portion of the city consists of Miocene and Pleistocene-age rock formations that are covered by a thin layer of sandy and clayey alluvial materials. The centrally located terrace area of Long Beach is underlain by over 15,000 feet of stratified sedimentary rocks of marine origin. This deep marine section is composed of interbedded units of sandstone, siltstone, and shale ranging in age from Miocene to late Pleistocene. Plate 1 shows the geologic formations in the City of Long Beach (Saucedo et al. 2016).

The above-mentioned subsurface geologic conditions reflect the physiographic features within the city of Long Beach, which can be separated into six areas:

1. The row of low hills extending from Bixby Knolls southeasterly to Seal Beach and including Signal and Reservoir Hills;
2. The broad, slightly elevated marine terrace lying south of this row of hills;
3. The Los Angeles River flood plain, known as the Dominguez Gap, lying along the western side of Long Beach;
4. The San Gabriel River flood plain and channel, known as the Alamitos Gap, in the northeasterly portion of the city;

5. The alluvial plain lying to the north of Bixby Knolls and Signal Hill; and
6. The coastal area including the sea bluffs, beach, and barrier bars across the gap areas.

The latter area along the seaward portions of the gap areas has been highly modified by dredging and landfill operations associated with construction of recreational and harbor facilities. The gap areas are of particular concern, because the large landfill areas combined with the shallow groundwater conditions result in a liquefaction hazard.

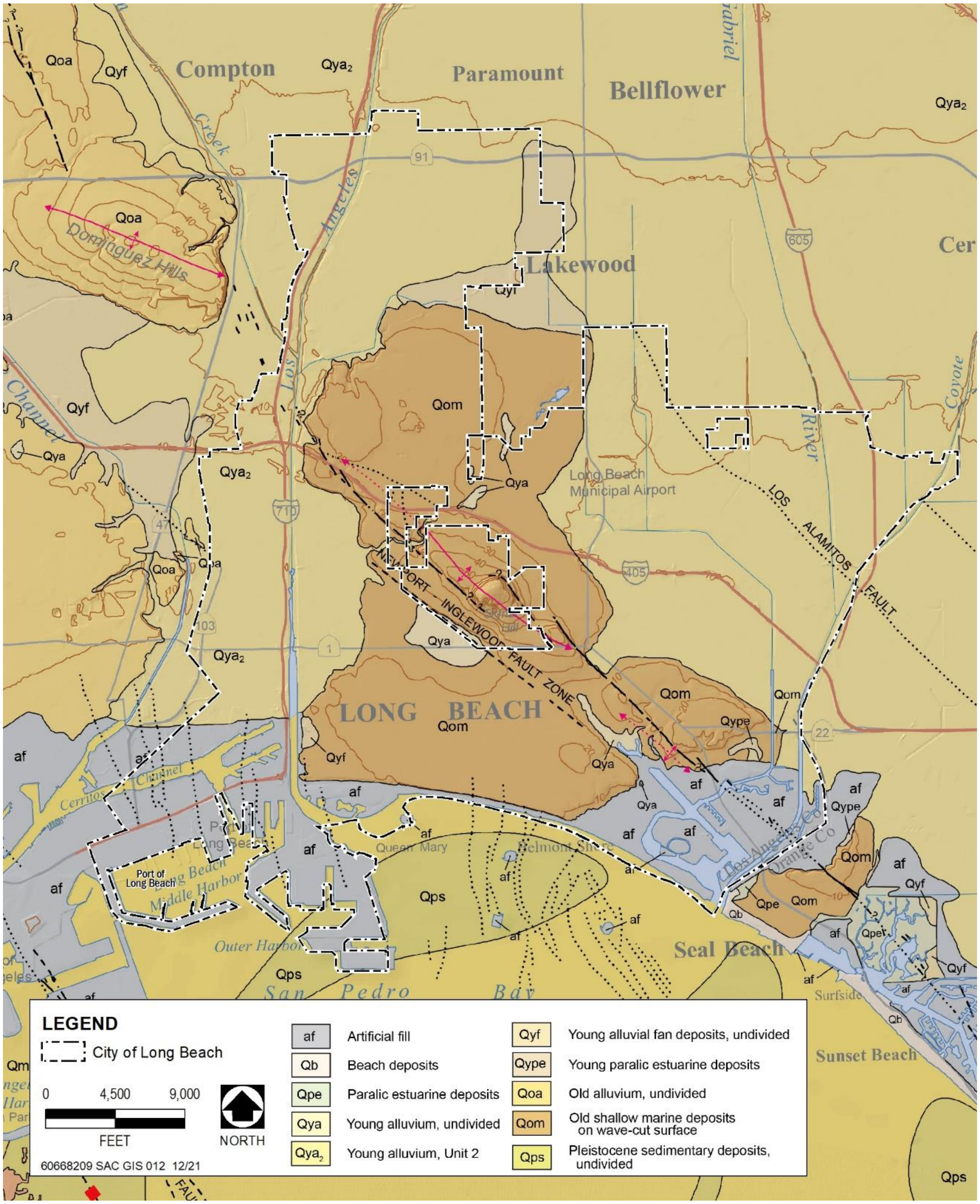

Plate 1. Geologic Formations

Source: Saucedo et al. 2016

2.2 SEISMIC HAZARDS

Long Beach is in a seismically active area. The locations of major earthquake fault zones as mapped by the California Geological Survey (CGS), and the age of last known activity of each fault, are shown on Plate 2 (Jennings and Bryant 2010). Several historic earthquakes have occurred in and near Long Beach, the most notable being the magnitude 6.3 earthquake along the Newport-Inglewood Fault Zone in 1933. Rupture on another segment of this fault zone caused the 1920 Inglewood Earthquake, which had an estimated magnitude of 4.9. The Palos Verdes Fault Zone, approximately 1.5 miles west of Long Beach, is a system of active faults that traverses along the northern edge of the Palos Verdes Hills and trends offshore through the Los Angeles Harbor. The location of historic earthquakes in the region with a magnitude of 5.0 or greater (CGS 2016a), are shown on Plate 3.

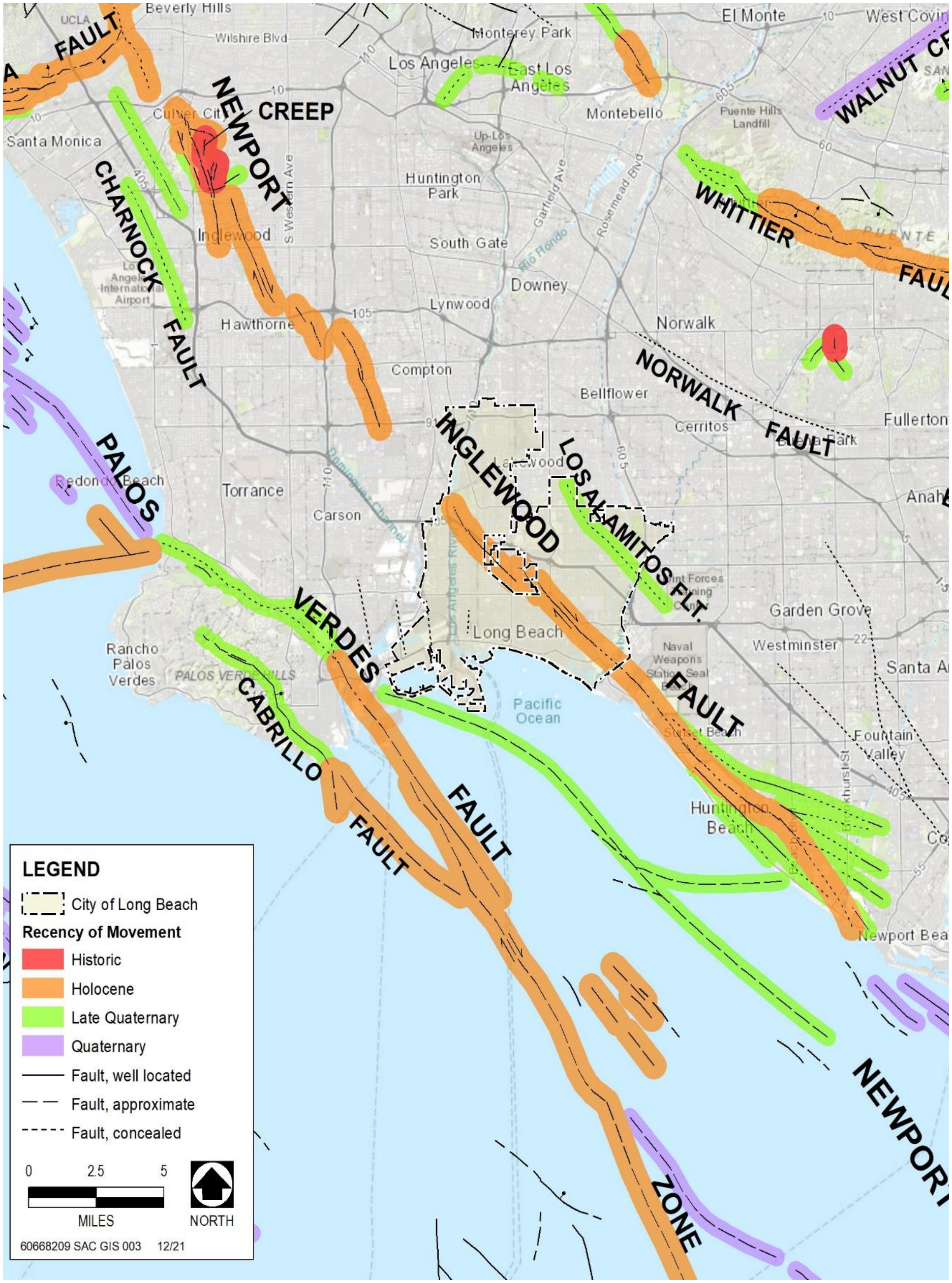

Plate 2. Regional Fault Map

Source: Jennings and Bryant 2010

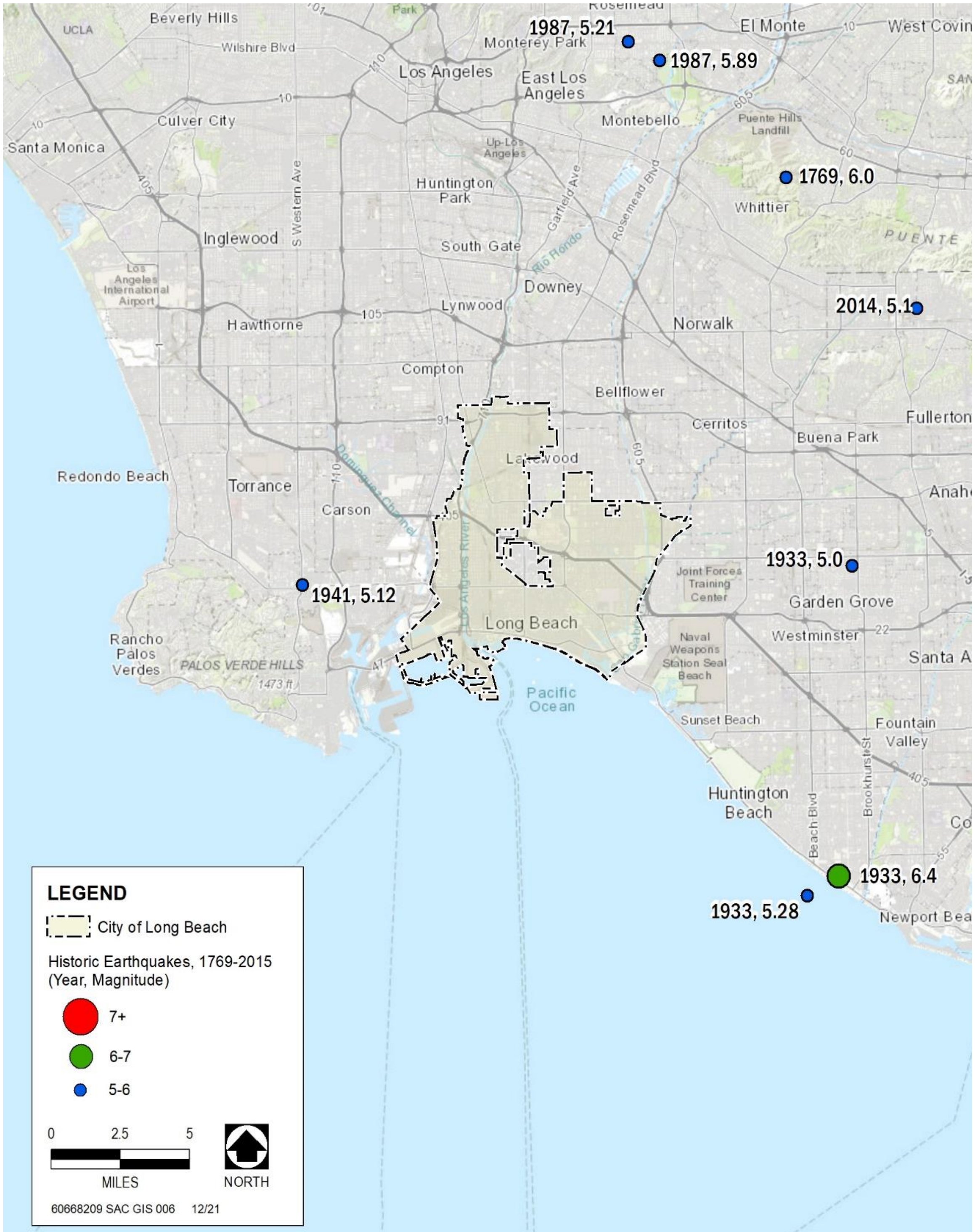

Plate 3. Historic Large-Magnitude Earthquakes
Source: California Geological Survey 2016a

The following seismic hazards may affect Long Beach and are discussed in further detail below:

- surface fault rupture,
- strong seismic ground shaking,
- liquefaction and earthquake-induced settlement, and
- seismically-induced landslides.

Tsunamis and seiches also represent a public safety hazard for Long Beach. Although tsunamis and seiches are caused by earthquakes, the potential hazard from these events is related to flooding; therefore, this topic is addressed in Chapter 3, Flooding.

2.2.1 Surface Fault Rupture

Geologists have determined that the greatest potential for surface fault rupture and strong seismic ground shaking is from “active faults”; that is, faults with evidence of activity during the Holocene epoch (i.e., the last 11,700 years). Faults classified as “potentially active” (where there is evidence that movement has occurred during the Quaternary period, which is currently defined as the last 2.6 million years), have a lower potential for surface fault rupture and strong seismic ground shaking.

The Newport-Inglewood Fault Zone, which runs diagonally through the city in a northwest to southeast direction, is an active fault (see Plate 2). Within Long Beach, the Newport-Inglewood Fault Zone includes the Cherry Hill Fault, Pickler Fault, Northeast Flank Fault, Reservoir Hill Fault, and Seal Beach Fault (CGS 1998). The Newport-Inglewood Fault Zone has been delineated under California’s Alquist-Priolo Earthquake Fault Zoning Act (CGS 1998), which is intended to reduce the hazard of surface faulting by preventing the construction of structures intended for human occupancy across the trace of active faults. The Alquist-Priolo Act required the State Geologist to establish regulatory zones, known as Earthquake Zones of Required Investigation, around the surface traces of active faults and to issue appropriate maps. The width of each Earthquake Zone of Required Investigation varies depending on the fault, but is generally one-quarter mile wide or less; in Long Beach, the width along the Newport-Inglewood Fault Zone is approximately 450 feet on both sides of the actual fault trace (900 feet wide total) (CGS 2018a). The Alquist-Priolo Earthquake Fault Zone maps are distributed to all affected cities, counties, and state agencies for their use in planning efforts. Under the Alquist-Priolo Act, additional studies such as site-specific geotechnical investigations must be conducted prior to certain types of construction in areas with established risk for surface fault rupture, prior to the issuance of building permits. Plate 4 shows the Earthquake Zone of Required Investigation for surface fault rupture associated with the Newport-Inglewood Fault Zone in Long Beach (CGS 2018a).

As shown on Plate 2, the Los Alamitos Fault traverses the northeastern portion of Long Beach, in a northwest to southeast direction roughly parallel to the Newport-Inglewood Fault Zone. However, since the Los Alamitos Fault has not exhibited evidence of movement within the last 11,700 years (Holocene epoch), but rather during the 700,000 years (Late Quaternary period), it is considered "potentially active." Thus, surface fault rupture is unlikely, and there is a lower potential for strong seismic ground shaking.

Plate 4. Newport-Inglewood Fault Zone, Alquist-Priolo Fault Zone of Required Investigation

Source: California Geological Survey 2018a

2.2.2 Seismic Ground Shaking

Ground shaking can affect very large areas (up to 50,000 square miles or more) during a very large earthquake and is usually the greatest cause of damage, especially in urban areas. Structures of all types are susceptible to ground shaking, and most deaths resulting from earthquakes historically are a result of structural failure due to ground shaking. Calculations of earthquake shaking hazard for California are part of a cooperative project between the U.S. Geological Survey (USGS) and CGS, and are part of the National Seismic Hazard Mapping program. Earthquake shaking hazards are calculated by projecting earthquake rates based on earthquake history and fault slip rates, the same data used for calculating earthquake probabilities. Fault parameters are developed for these calculations by the Working Group on California Earthquake Probabilities. A probabilistic seismic hazard map is a map that shows the hazard from earthquakes that geologists and seismologists agree could occur in California. It is “probabilistic” in the sense that the analysis takes into consideration the uncertainties in the size and location of earthquakes and the resulting ground motions that can affect a particular site. Plate 5 shows the potential for seismic ground shaking in the city of Long Beach (CGS 2016b).

Structures most vulnerable to collapse and or damage from seismic ground shaking are those which do not comply with the provisions of the Field and Riley Acts of 1933. These acts were passed after the magnitude 6.3 earthquake in Long Beach along the Newport-Inglewood Fault Zone in 1933, which killed 115 people mostly from falling unreinforced masonry. State Assemblyman Riley represented the district that was most heavily damaged by the 1933 earthquake.

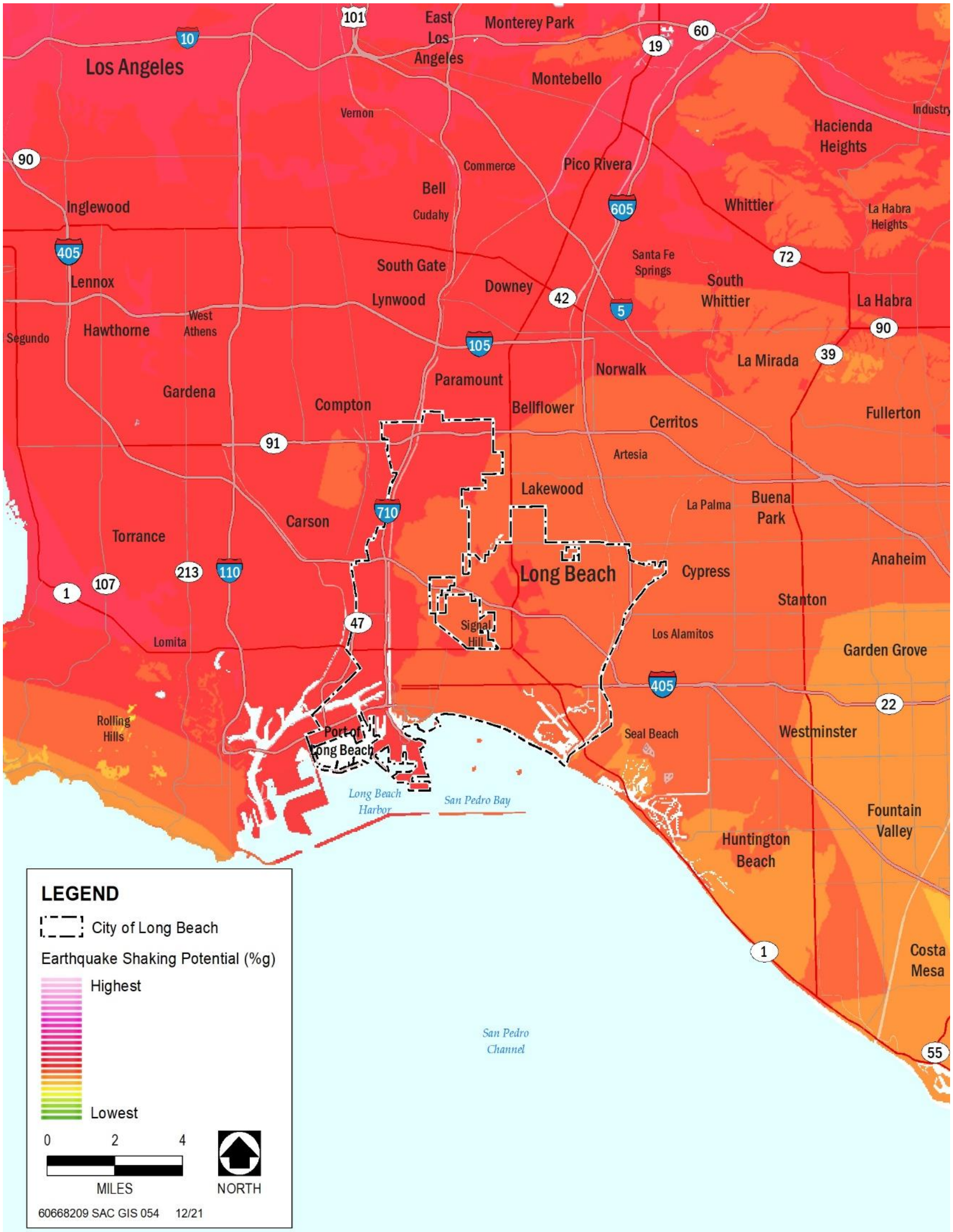

Plate 5. Earthquake Shaking Potential
Source: California Geological Survey 2016b

The Riley Act required all cities and counties to establish departments to regulate building construction, and required all buildings constructed after 1933 to be designed to withstand minimum horizontal and vertical forces that could be exerted during an earthquake. The 1933 Long Beach earthquake also destroyed 70 schools and damaged hundreds of others. The 1933 Field Act required schools to be designed to withstand earthquake pressures, required schools to be designed by licensed structural engineers rather than civil engineers, and required all school construction to be overseen by independent engineers retained by the Division of the State Architect.

Like many cities, Long Beach contains numerous old, unreinforced masonry buildings. Many of the older sections of the City, particularly the downtown area and along the major transportation corridors such as Broadway, 4^{th}, 7^{th}, 10^{th}, Anaheim, Atlantic, and Long Beach Boulevard, have an abundance of such structures. The rehabilitation and renovation necessary to bring older structures into compliance with current building codes is expensive, and is voluntary. Long Beach Municipal Code Title 18, Chapters 18.71 and 18.72, contain provisions that require reinforcement of buildings constructed prior to 1976 when a new permit for structural work is required (for example, additions or remodels). When projects are proposed and implemented in and around the Long Beach central business district, the unsafe structures would be either retrofitted, or demolished and replaced with new construction that confirms to current building codes. Removal of existing unsafe structures can best be accomplished by replacing them with new development that meets current Uniform Building Code and California Building Standards Code earthquake safety requirements.

2.2.3 Liquefaction and Seismically Induced Settlement

Liquefaction occurs when loose, water-saturated sediments lose strength and fail during strong seismic ground shaking. This process can occur instantaneously as a result of an earthquake, producing shear stresses that exceed the bearing strength of the soil. Three simultaneous conditions are necessary for liquefaction to occur: a) loose and cohesionless soils (such as uncompacted artificial fill), b) a high groundwater table, and c) strong seismic ground shaking. Cohesionless soils are often closely associated with marsh and fill areas which, in Long Beach, are present in developed areas along the Pacific Ocean and along the historic channel of the Los Angeles River. The Seismic Hazards Mapping Act of 1990 (passed by the State legislature following the 1989 Loma Prieta earthquake), directed CGS to identify and map areas prone to earthquake hazards from amplified ground shaking, liquefaction, and earthquake-induced landslides. The purpose of the Seismic Hazards Mapping Act is to reduce the threat to public safety and to minimize the loss of life and property by identifying and mitigating these seismic hazards. Areas in Long Beach that are considered to be at high risk from liquefaction are shown in Plate 6 (CGS 2018b).

Additional studies such as site-specific geotechnical investigations must be conducted prior to certain types of construction in areas with established risk for liquefaction.

Damaging soil settlement can occur during earthquakes even without the presence of liquefaction. In saturated granular soils, water pressure between grains that is built up during earthquakes may lead to settlement after the shaking has stopped and the pressure released. The areas most susceptible to seismically induced settlement are the same as those indicated for liquefaction and damage resulting from such settlement is generally less severe than for liquefaction.

Because liquefaction is a phenomenon that occurs at shallow depths, it is possible to reduce the hazards with various geologic techniques and structural design measures, such as removal of the old unstable fill and replacement with properly engineered and compacted fill, or construction on steel pilings that are drilled into bedrock below the unstable materials.

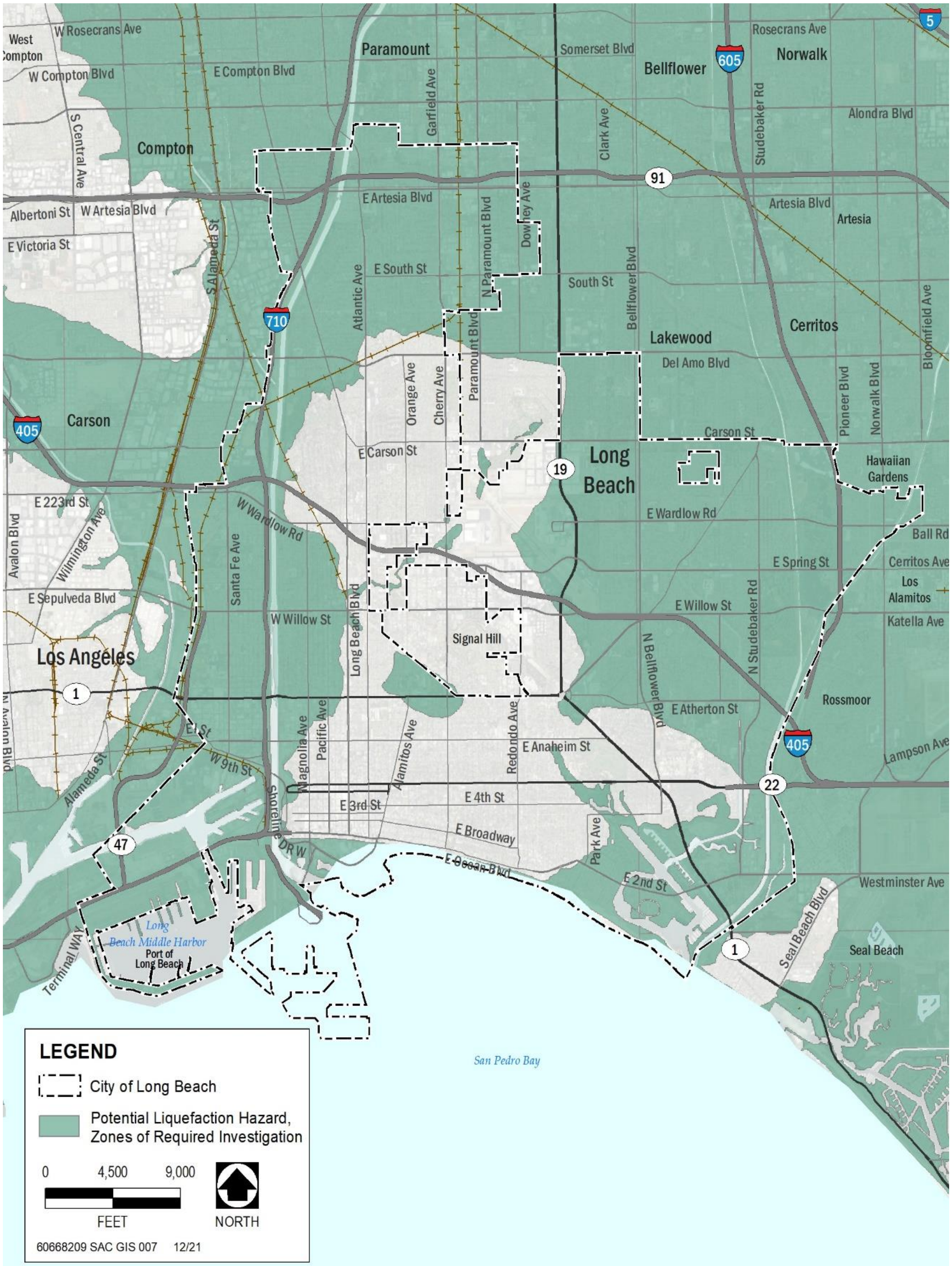

Plate 6. Liquefaction Hazards, Zones of Required Investigation

Source: California Geological Survey 2018b

2.2.4 <u>Seismically Induced Landslides</u>

Landslides tend to occur in weak soil and rock on sloping terrain. The landslide hazard Zone of Required Investigation boundaries that have been delineated under the Seismic Hazards Mapping Act generally indicate areas where steep hillslopes composed of weak materials may fail when shaken by an earthquake. The process for zoning earthquake-induced landslides incorporates expected future earthquake shaking, existing landslide features, slope gradient, and strength of hillslope materials. The earthquake zones of required investigation for landslides in Long Beach, which represent areas of high probability for seismically induced landslides, are shown in Plate 7 (CGS 2018c).

Plate 7. Seismically Induced Landslides, Zones of Required Investigation

Source: California Geological Survey 2018c

2.3 Slope Instability

Mudslides and landslides that are not caused by seismic activity can occur in areas of steep slopes during periods of heavy rainfall, where the underlying soil or rock are unstable, where vegetation has been removed from the slope, where heavy construction equipment or buildings are placed to close the edge of the top of slope, or where excessive material is removed from the base of the slope. The California Landslide Inventory Program is an ongoing program by CGS to collect and display landslide data throughout the State of California. The data includes both the most recently mapped landslides and data developed over the past 30 years by CGS and its collaborators. The program includes maps showing areas where landslides have occurred in the past, and areas where landslides may occur in the future based on regional estimates of rock strength and steepness of slopes. Based on this data, Long Beach is not located in an area where landslides are likely to occur (CGS 2021). Furthermore, slope instability is addressed in Long Beach through compliance with the Uniform Building Code and the California Building Standards Code.

2.4 Soil Hazards

2.4.1 Erosion

Erosion, in and of itself, does not present any significant threat to public safety. Due primarily to the existing breakwater, which protects the harbor and beach areas, beach erosion is a much less problem in Long Beach as compared to other coastal communities throughout the state. However, stormwater runoff, if uncontrolled, can cause erosion and transport pollutants and sediment to downstream waterbodies, which can degrade water quality. In general, rates of erosion can vary depending on the soil's capacity to drain water, slope angle and length, extent of groundcover, and human influence. In extreme cases of erosion, watercourses can be downcut and gullies develop that can eventually undermine adjacent structures or vegetation. Human activities, such as earthmoving activities during construction, can expose soil to water erosion during the winter rainy season. All projects that disturb 1 acre or more of land are required by existing law to implement a plan and best practices that prevent erosion.

2.4.2 Unstable Soils

Soil properties influence the development of building sites, including the site selection, structure design, construction, performance after construction, and site and structure maintenance. For example, expansive soils (which have a high clay content and shrink when dry and expand when wet) can cause damage to building foundations, roads, and other structures. However, hazards from construction in areas with expansive soils can be remediated by removing the clay layer in the soil and replacing it with compacted artificial fill, or by soil treatment with lime. Hazards from unstable soils can also result from low bearing strength, which can be corrected by mixing or replacement with properly engineered and compacted fill according to current engineering specifications. Finally, subsidence and liquefaction can occur from the weight of construction equipment in areas where a clay layer is present at a shallow depth, combined with a shallow groundwater table. This problem can be avoided by reducing or avoiding earthmoving activities during the winter rainy season and staging heavy equipment off-site.

Because Long Beach is fully urbanized, the Natural Resources Conservation Service’s soil survey database does not contain detailed data regarding soil properties, because the soils are generally classified as “urban soils.” This term refers to soils in areas of high population density in the largely built environment. These soils consist of substantially changed human-transported materials and human-altered materials (artificial fill), intermixed with minimally altered or intact “native” soils. Soils in urban areas exhibit a wide variety of conditions and properties and are generally covered by large expanses of impervious surfaces, such as buildings and pavement. Based on the results of soil borings for projects in a variety of locations throughout the city, soils in Long Beach generally consist of artificial fill, sand, silty sand, sandy silt, and silty clay.

Hazards related to unstable soils are addressed in Long Beach through site-specific geotechnical investigations as specifically required by the City and/or in compliance with the California Building Standards Code.

2.5 SEISMIC AND GEOLOGIC GOALS AND POLICIES

GOAL PHS-2: Reduce risks to people and property from seismic and geologic hazards.

Policy PHS-2.1: Coordinate with and support efforts by federal, state, and local agencies such as the U.S. Geological Survey, California Geological Survey, Governor's Office of Emergency Services, and Los Angeles County, to investigate local seismic and geologic hazards and support those programs that effectively mitigate these hazards.

Policy PHS-2.2: In accordance with the Alquist-Priolo Earthquake Fault Zoning Act, prohibit the construction of structures intended for human occupancy (as defined in CGS Special Publication 42) across the trace of active faults.

Policy PHS-2.3: Require a site-specific geotechnical investigation for projects in areas subject to geologic and seismic hazards, and require new development to include project features that minimize these risks.

Policy PHS-2.4: As feasible, locate or relocate critical infrastructure facilities such as hospitals, police and fire stations, communications facilities, government centers, and designated shelters (such as schools), along with facilities that use or store large quantities of hazardous materials (such as propane and petroleum tank farms), in areas of lower seismic risk.

Policy PHS-2.5: Require the installation of earthquake-triggered automatic gas shut-off sensors in high occupancy facilities and in industrial and commercial structures.

Policy PHS-2.6: Continue to implement Long Beach Municipal Code Title 18, Chapters 18.71 and 18.72, to retrofit existing unreinforced masonry buildings when considering permit applications for structural additions or modifications.

Policy PHS-2.7: Discourage grading activities during the rainy season, unless adequately mitigated, to avoid erosion, pollutant transport, and sedimentation of downstream water bodies.

Policy PHS-2.8: Overhead transformers and powerlines should be installed below or at the ground surface, as feasible, so as to avoid the risks of having the equipment fall in the event of an earthquake.

CHAPTER 3.0

FLOODING

3. FLOODING

Floodplains are the areas of low-lying ground adjacent to streams, composed mainly of nutrient-rich stream sediments, and subject to flooding after storms and heavy snowmelt. A stream channel and its floodplain naturally function together in one integrated system that has evolved over time to convey water and sediment downstream, with the floodplain serving to both store water and to slowly release it back into the main channel of the stream as the flood passes. Initially during a flood, as more water enters the river or stream, the height of the water rises. Once the volume of water exceeds what the stream channel is capable of carrying, it spills out onto the floodplain and its energy is reduced, which results in lower flood flows downstream, reduced erosion of earthen stream banks and channel bottoms, deposition of sediments higher in the watershed, and improved groundwater recharge. In general, floodplains are delineated and managed based on the volume of water or the size or likelihood of a potential storm.

Natural floodplains also include plant and wildlife habitat, along with scenic resources. Poorly planned development in floodplains can lead to increased erosion, loss of valuable property, increased flooding of downstream properties, and degradation of water quality.

In addition to riverine flooding, coastal communities may be subject to flooding from wave action during major winter storms, and from sea level rise.

Levies, berms, dikes, dams, and breakwaters are all man-made methods by which potential flood flows can be contained within a stream channel or bay to provide flood protection. Long Beach is subject to the following potential flooding hazards, each of which is discussed separately below:

- flood hazard zones delineated by the Federal Emergency Management Agency (FEMA);
- coastal flood hazards;
- localized flooding in areas subject to a 10-year recurrence interval;

- dam failure inundation;
- tsunami inundation; and
- subsidence.

3.1 FEMA Flood Hazard Zones

Much of the city of Long Beach is essentially a flat alluvial plain, which slopes gently downhill to the toward San Pedro Bay. Long Beach encompasses the southern end of two watersheds: the Los Angeles River and the San Gabriel River. The Los Angeles River flows southward to the Bay along the west side of the City, and the San Gabriel River flows southward to the Bay along the east side of the City. Flooding in large river systems such as the Los Angeles and San Gabriel typically results from large-scale weather systems that generate prolonged rainfall over a wide geographic area, causing flooding in hundreds of smaller streams, which then drain into the major rivers. Both of these rivers, along with their major tributaries, have existing levees on the east and west sides of the stream channels that are designed to protect the surrounding development from flood hazards. The levees are shown in Plate 8 (FEMA 2021).

The City of Long Beach participates in the National Flood Insurance Program, which is managed by FEMA. The NFIP provides federally backed flood insurance to homeowners and businesses. FEMA has minimum floodplain management standards for communities, with which the City must comply, in order to participate in the NFIP. FEMA has adopted Flood Insurance Rate Maps (FIRMs) showing the locations of the 100-year floodplain, which represents areas areas that have a 1 percent chance of flooding happening in any given year. Similarly, a “500-year flood” refers to the probability that a flood of that magnitude has a 0.2 percent chance (or 1-in-500 chance) of occurring in any given year. FEMA 100-year and 500-year flood hazard zones are shown on Plate 8 (FEMA 2021, California Department of Water Resources 2021).

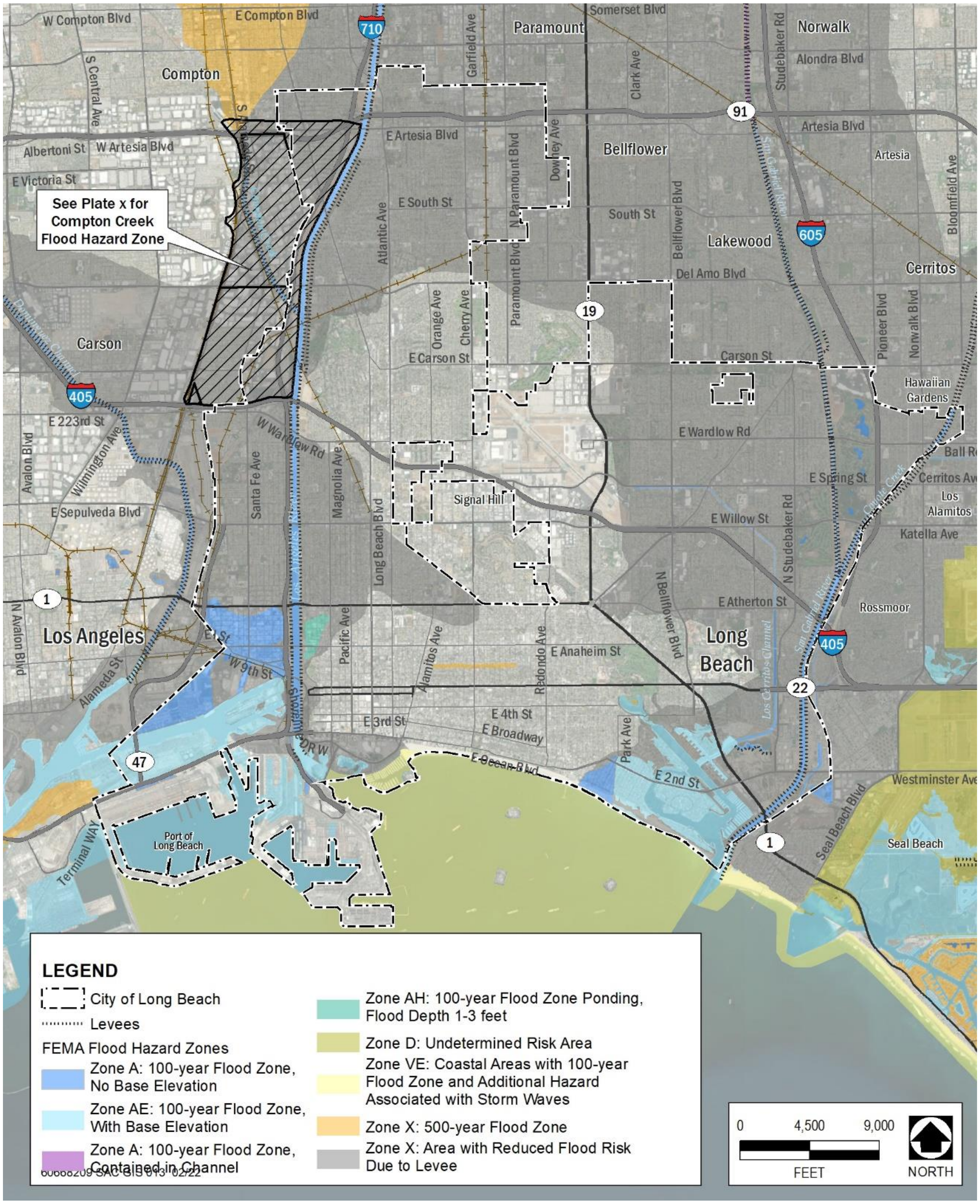

Plate 8. FEMA Flood Hazard Zones

Source: Federal Emergency Management Agency 2020

Plate 8 also shows the existing development that is located within designated 100- and 500-year floodplains.

In addition to FEMA, the City works with several other agencies, including the U.S. Army Corps of Engineers and the Los Angeles County Flood Control District, to provide flood protection.

Compton Creek, which originates near Willowbrook (northwest of Long Beach) is a tributary to the Los Angeles River. The southern end of Compton Creek is within the city of Long Beach. After Hurricane Katrina, FEMA reevaluated and updated its criteria for levee certification. The Los Angeles County Flood Control District subsequently analyzed Compton Creek, along with the Dominguez Channel levee just west of Long Beach, to determine if they meet the current FEMA requirements for flood protection. While the levees were determined to be structurally sound, they were found to no longer be able to contain a 100-year flood under FEMA's current classification system. As a result, FEMA will declassify these levees and designate the surrounding areas as a flood zone, requiring mandatory flood insurance. The Los Angeles Flood Control District is in the process of developing improvement alternatives to address flood capacity for Compton Creek, which includes habitat restoration along with aesthetic and recreational improvements. The proposed Special Flood Hazard Zone along Compton Creek, including existing development within this hazard zone, is shown in Plate 9 (Los Angeles County Flood Control District 2016).

3.2 COASTAL FLOODING

The California Coastal Act was enacted in 1976 to provide long-term protection and public access to seashores in the state. California Public Resources Code Division 20, Chapter 6, Article 1 requires local governments within the coastal zone to prepare a local coastal program that, (1) contains a specific public access component to assure that maximum public access to the coast and public recreation areas is provided (Section 30500), and (2) addresses identification, assessment, minimization, and mitigation of sea level rise (Section 30501). Long

Beach has adopted a local coastal program, which is included as a separate Element of the General Plan.

As a result of serious historic coastal erosion and flooding problems along San Pedro Bay, the federal government constructed three breakwaters extending 8.5 miles across most of the bay, with two openings to allow ships to enter the Port of Los Angeles and the Port of Long Beach. The San Pedro Breakwater was constructed between 1899 and 1911 at San Pedro; the Middle Breakwater was completed over the next 25 years, and the Long Beach Breakwater was finished after World War II.

Plate 8 shows the location of FEMA flood hazard zones designated as “VE”, comprised of coastal areas with 100-year flood zones and additional hazards from storm waves. As also shown in Plate 8, there are areas where riverine flooding overlaps with coastal flooding, making these areas especially vulnerable to future flood hazards.

Sea level rise, which could result in flooding in coastal areas of Long Beach, is addressed in the City’s Climate Action and Adaptation Plan (CAAP) (City of Long Beach 2020). The CAAP contains a variety of actions designed to address sea level rise in coastal areas, such as retrofitting and/or extending sea walls and storm surge barriers, elevating streets and pathways, realigning beach parking lots, and conducting a citywide beach stabilization study. Sea level rise effects on riverine flooding, including areas where riverine and coastal flooding overlap, are also described and addressed in the CAAP. (See also Chapter 5, “Climate Change Resiliency,” of this Safety Element for additional details and policies related to sea level rise.)

3.3 LOCALIZED FLOODING

As land is converted from fields or woodlands to impermeable surfaces such as buildings, roads, and parking lots, it loses its ability to absorb rainfall. Heavy rainfall collects on impervious surfaces and flows faster into the stormwater drainage system. This can result in flood waters that rise very rapidly and peak with a strong force. Because Long Beach is fully urbanized, it has a high

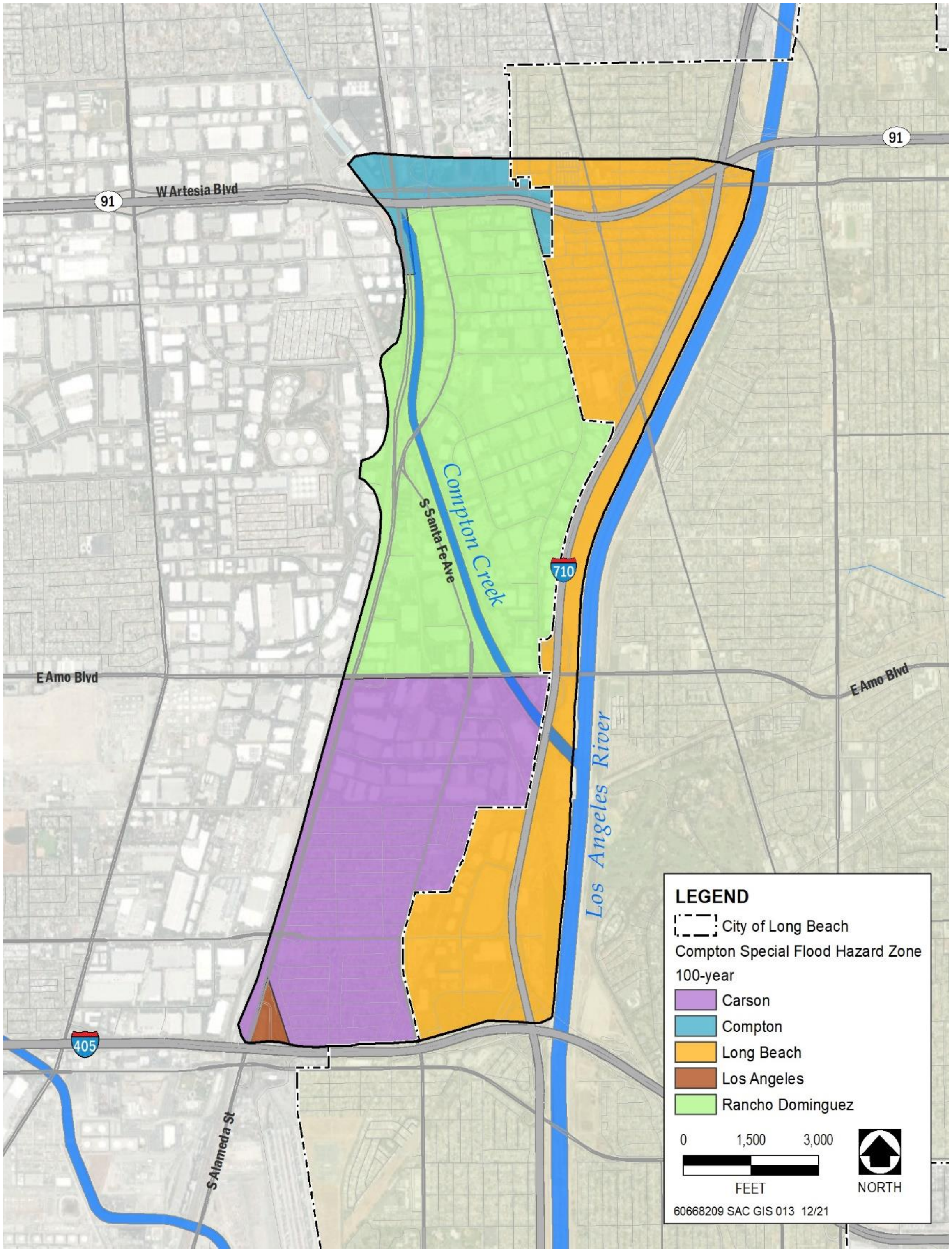

Plate 9. Compton Creek, Proposed Special Flood Hazard Zone

Source: Los Angeles County Flood Control District 2016 concentration of impermeable surfaces that either collect water or concentrate the flow of water in drainage channels. During periods of prolonged, heavy rainfall, the stormwater drainage system can temporarily become overwhelmed, resulting in localized flooding. In addition, storm drains can back up with vegetative debris, causing localized flooding.

Long Beach has a complex system of stormwater drainage that includes streets; gutters; catch basins; underground pipes; ditches, streams, and creeks; channels and rivers; and pump stations (City of Long Beach 2005). County drainage facilities, and larger regional drains, also play an important role in conveying stormwater runoff. Key elements of the local flood control system are shown in Plate 10 (Los Angeles County Flood Control District 2021).

Localized urban flooding during precipitation events (i.e., flooding that occurs with a 10-year recurrence interval) has occurred in certain areas of Long Beach. For example, during the 1997-1998 El Nino rain season, severe rainstorms overwhelmed portions of the storm drainage system and resulted in flooding of streets and homes. Heavy rainfall during the 2017 winter season also resulted in localized flooding. Certain areas that are known to the City to be subject to localized urban flooding include Low-lying areas, such as Belmont Shore, Naples, and the Peninsula are already experiencing coastal flooding, particularly during combined high tide and rain events.

All development projects are required to provide engineered drainage plans demonstrating that impervious surfaces will not generate stormwater runoff that exceeds the capacity of the receiving drainage network. The benefits of effective stormwater runoff management include:

- flood control,
- protection of wetlands and aquatic ecosystems,
- improved water quality, and
- conservation of water resources.

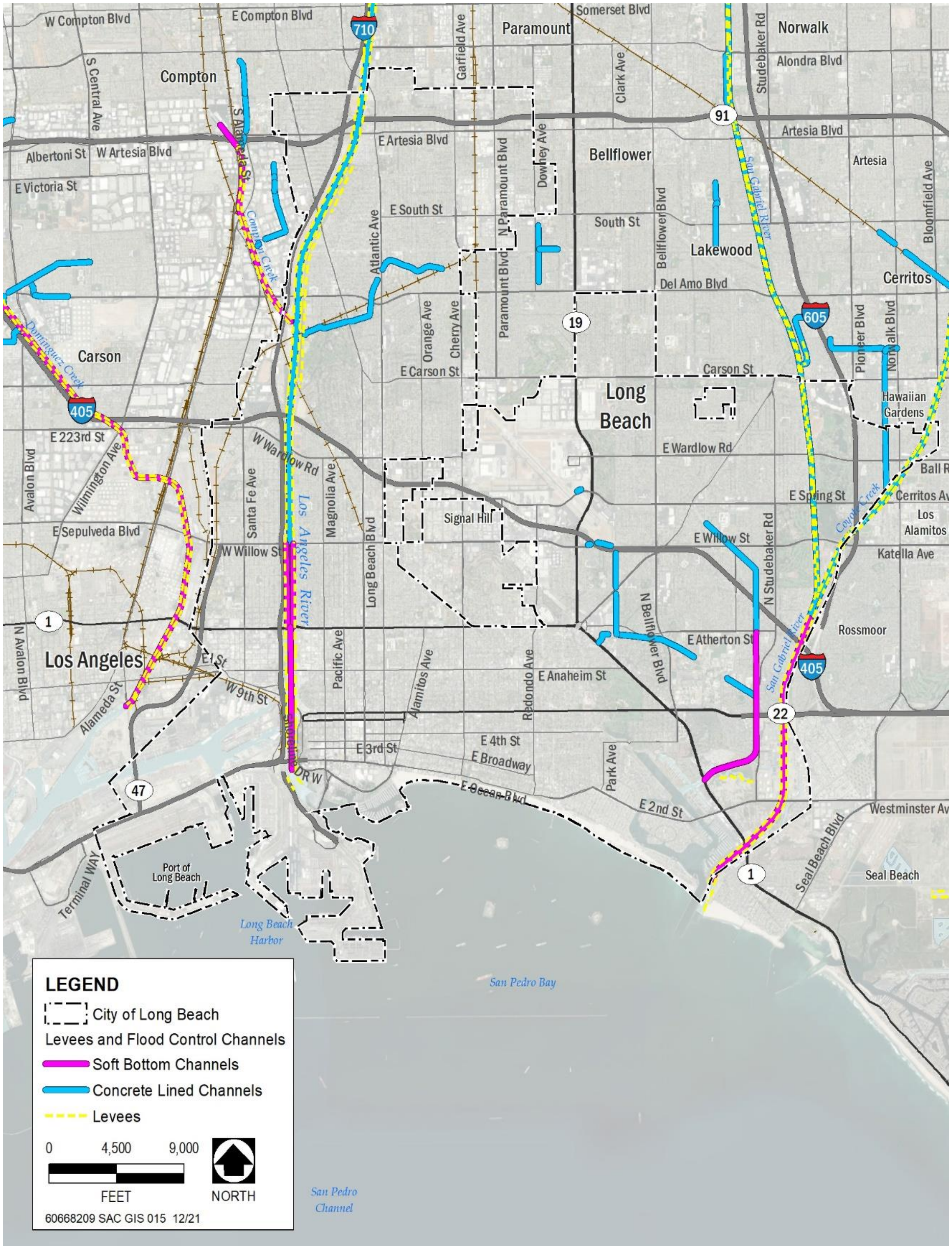

Plate 10. Local Flood Control System

Source: Los Angeles County Flood Control District 2021

3.4 DAM FAILURE INUNDATION AREAS

Early development in the Los Angeles Basin was hampered by repeated, frequent flooding events from the Los Angeles, Rio Honda, and San Gabriel Rivers, and their major tributary streams. These floods destroyed roadways, bridges, residences, and agricultural crops, and resulted in substantial erosion of land along the stream channels. Beginning in the late 1920s through the 1950s, the U.S. Army Corps of Engineers and the Los Angeles County Department of Public Works instituted projects to construct a variety of dams in the Los Angeles Basin to help reduce flooding hazards. Each dam impounds a reservoir that is intended to retain water during the region's seasonal (winter/spring) rainstorms.

There are five federal and four privately owned dams in the region that could result in inundation (flooding) in Long Beach if a dam failure or overtopping were to occur. Table 3-1 lists the name, size of the reservoir impounded by each dam, ownership, and oversight agency, and Plate 11 shows the location of each dam. The dam failure inundation area in Long Beach for each dam is identified on Plate 12 (federal dams) and Plate 13 (local dams).

Table 3-1. Dam Failure Inundation Facts

Name	Reservoir Capacity	Owner	Oversight Agency
Hansen Dam	33,348 acre-feet	U.S. Army Corps of Engineers	U.S. Army Corps of Engineers
Sepulveda Dam	17,300 acre-feet	U.S. Army Corps of Engineers	U.S. Army Corps of Engineers
Whittier Narrows Dam	37,491 acre-feet	U.S. Army Corps of Engineers	U.S. Army Corps of Engineers
Prado Dam	314,400 acre-feet	U.S. Army Corps of Engineers	U.S. Army Corps of Engineers
Cogswell Dam	8,969 acre-feet	Los Angeles County Department of Public Works	DWR DSOD
San Gabriel Dam No. 1	44,183 acre-feet	Los Angeles County Department of Public Works	DWR DSOD
Morris Dam	39,300 acre-feet	Los Angeles County Department of Public Works	DWR DSOD
Puddingstone Dam	22,232 acre-feet	Los Angeles County Department of Public Works	DWR DSOD

Notes: DWR DSOD = California Department of Water Resources, Division of Safety of Dams
Source: Data compiled by AECOM in 2022

3.4.1 Reclassification of Whittier Narrows Dam

Whittier Narrows Dam and Reservoir is a flood risk management and water conservation project constructed in 1957 and operated by the U.S. Army Corps of Engineers (USACE), Los Angeles District. The dam and reservoir are located, as the name implies, at the "Whittier Narrows," a natural gap in the hills that form the southern boundary of the San Gabriel Valley. The Rio Hondo and the San Gabriel Rivers flow through this gap and are impounded by the reservoir. On the south side of the Whittier Narrows Dam, both of these rivers continue to flow southward through Long Beach where they discharge into the Pacific Ocean. As shown in Plate 11, the Whittier Narrows Dam is directly upstream (to the north) from Long Beach. The primary purpose of the dam is flood risk management. Some of the water from the reservoir is released into the San Gabriel River, but most is released into the Rio Hondo River (a tributary of the Los Angeles River).

Whittier Narrows Dam received a Dam Safety Action Class (DSAC) II rating in December 2008, and was reclassified as DSAC I in 2016. A DSAC I rating indicates “a very high urgency” and is assigned to dams where failure could begin during normal operations or be initiated as the consequence of an event, and the likelihood of failure from one of these occurrences, prior to remediation, is too high to ensure public safety; or the combination of life or economic consequences with probability of failure is very high. The DSAC I rating identifies the Whittier Narrows Dam as one of the highest priority dam safety projects in the USACE’s portfolio of dams.

Failure of the Whitter Narrows Dam could occur from erosion, or from overtopping. Under certain conditions, the dam spillway on the San Gabriel River can release more than 20 times what the downstream channel can safely contain within its levees. Depending on the size of the discharge (flows coming out of the dam), flooding could extend from Pico Rivera (immediately downstream of the dam) to Long Beach.

In 2017, USACE completed the Whittier Narrows Dam Safety Modification Study, and an Environmental Impact Statement was certified in 2019, which recommends important modifications to the dam to ensure it continues to appropriately reduce flood risk for downstream communities. Construction of the Whittier Narrows Dam Safety Modification Project is expected to be completed in 2026 (USACE 2018).

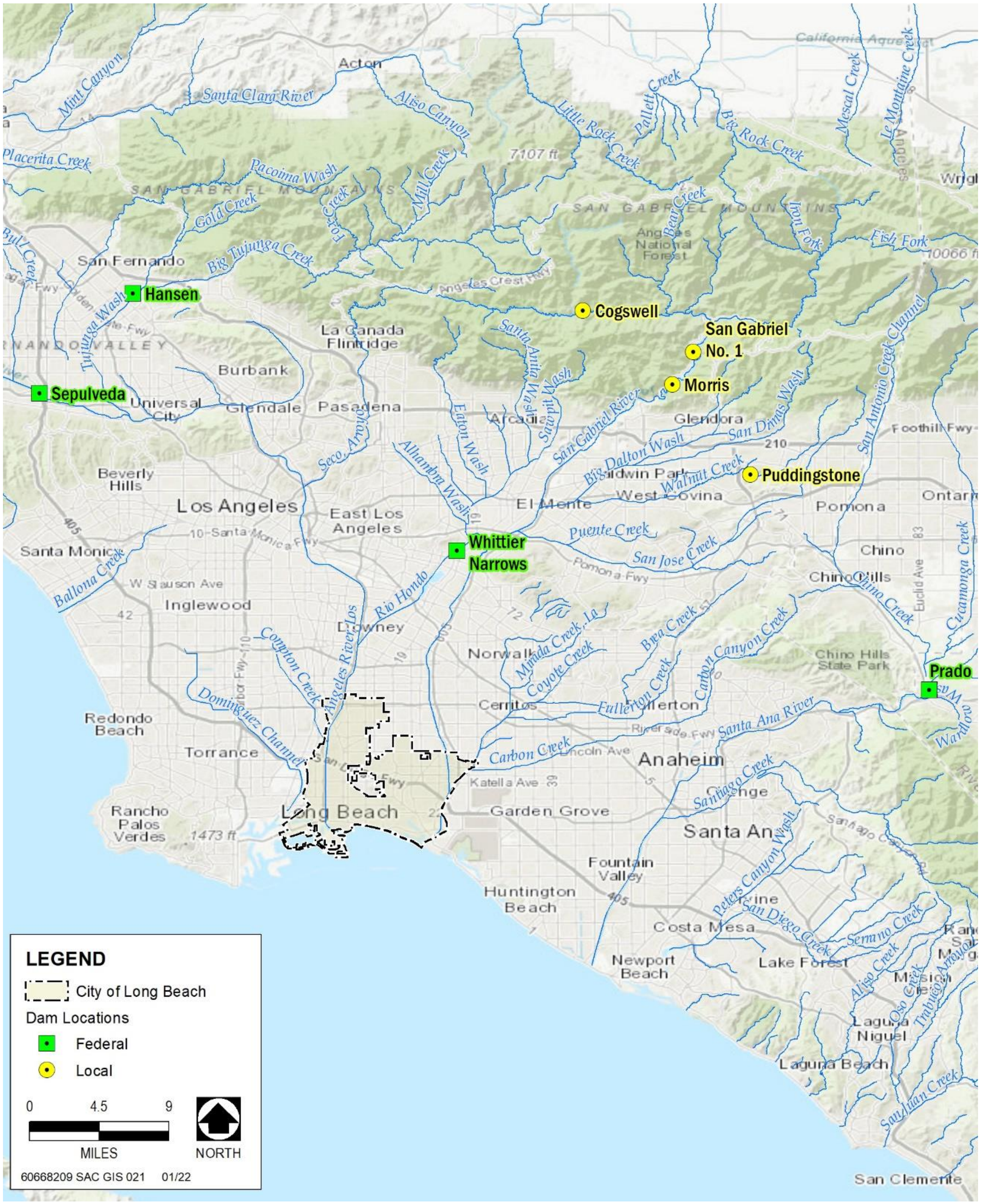

Plate 11. Dams Where Failure Could Result in Long Beach Flooding

Sources: Los Angeles County 2018, California Department of Water Resources Division of Safety of Dams (2021)

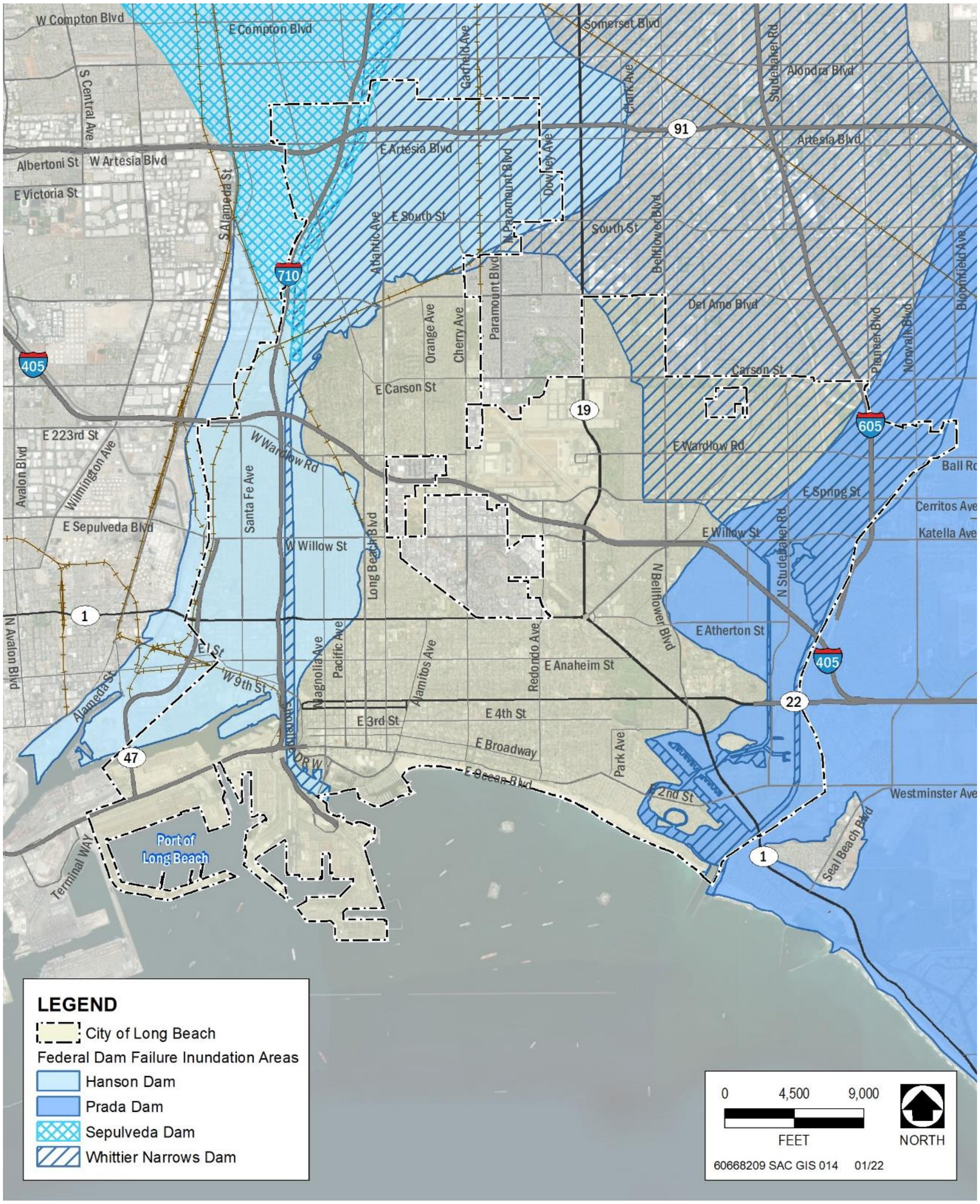

Plate 12. Dam Failure Inundation Areas – Federal Dams

Source: Los Angeles County 2018

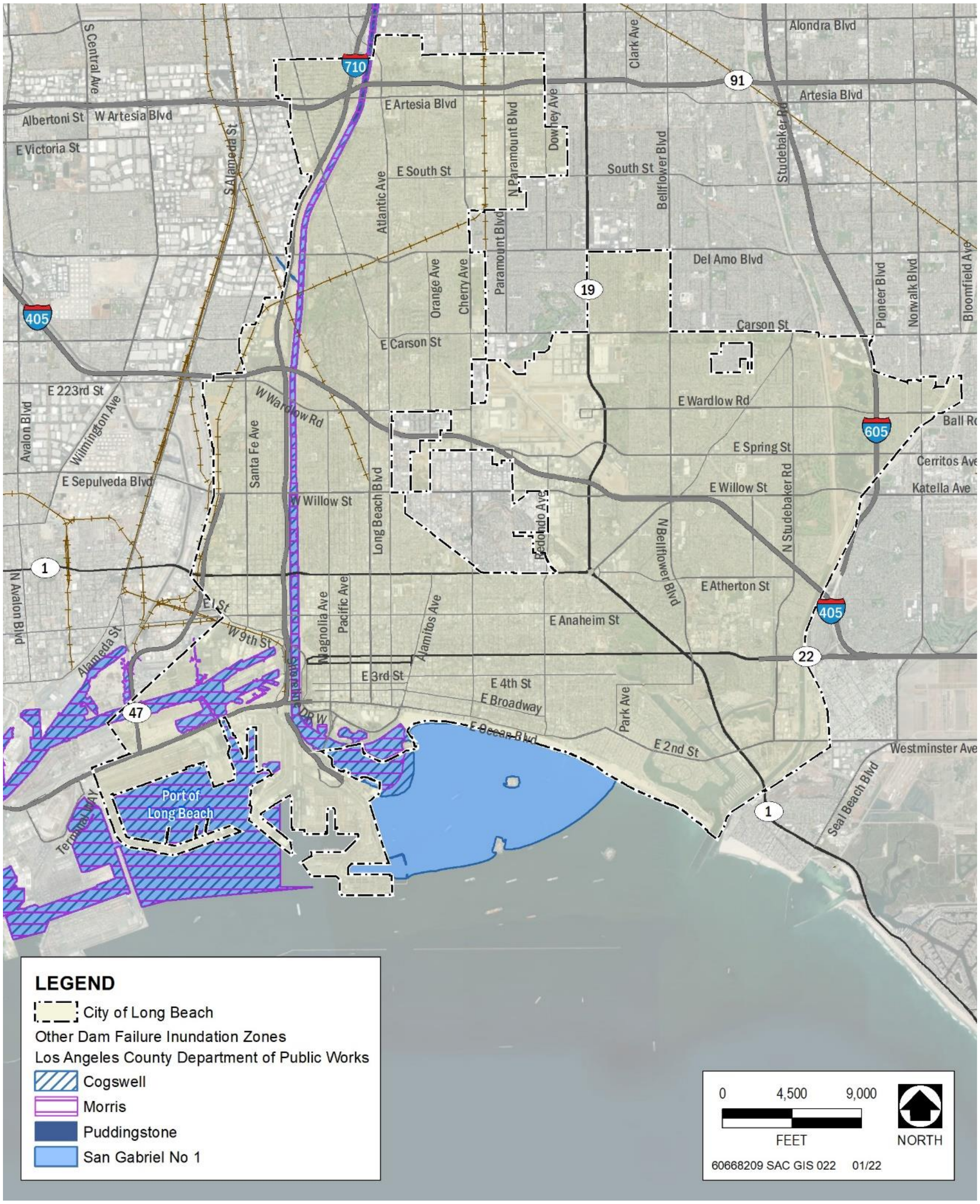

Plate 13. Dam Failure Inundation Areas – Private Dams

Source: California Department of Water Resources Division of Safety of Dams (2021)

3.5 TSUNAMI AND SEICHE INUNDATION AREAS

A tsunami is a sea wave usually generated by a large submarine earthquake. A seiche is similar to a tsunami, but is generated in an enclosed body of water such as a harbor, lake, or swimming pool. The potential damage is generally much greater from a tsunami than seiche. Tsunamis travel across the ocean as long, low waves. As the tsunami approaches the coastline, it is affected by shallow bottom topography and the configuration of the coastline, which transform it into very high and potentially devastating waves or can produce strong currents that can cause extensive damage.

In southern California, the most serious recorded tsunami was generated by the 1960 Earthquake in Chile. Damage was estimated at between one-half to over one million dollars, and was primarily related to boats and harbor facilities. The greatest damage occurred in the Long Beach–Los Angeles Harbor, where 5-foot waves surged back and forth in the channels. Currents of 12 knots were reported as the water rose and fell rapidly. A 5.8-foot drop in water level occurred in one minute at Long Beach and a 3-foot drop occurred in 5 minutes along the Cerritos Channel. The currents tore some 300 small boats and yachts from their slips, and as many as 30 were sunk. The Long Beach–Los Angeles Harbor also experienced minor damage during the March 1964 Alaska Earthquake. Both the 1960 and 1964 tsunamis arrived in the southern California area at periods of low tides. If the tsunamis had occurred during periods of higher tides, tsunami damage would have been significantly greater. The 1933 Long Beach earthquake (M 6.3) on the Newport-Inglewood Fault Zone did not result in tsunami damage along the Long Beach coastline.

Due to the presence of the Palos Verdes Peninsula, Channel Islands, and the harbor breakwater, the Long Beach coastline and harbor are somewhat protected (especially to the north and west). However, due to the more open exposure to the south, the harbor and coastline are more vulnerable to tsunamis generated in the south seas and offshore southern California. Published estimates of recurrence intervals indicate maximum wave heights of 3–6 feet for

50- and 100-year recurrence intervals (Weldey 1974). Shoreline property damage from a tsunami could be substantial, and loss of life is a potential depending on the amount of warning and the number of people on the roadways during an evacuation. Potential tsunami hazard inundation areas (CGS et al. 2021) are shown in Plate 14.

3.6 SUBSIDENCE

Subsidence is the sinking or gradual lowering of the earth's surface. It is found worldwide in a variety of environments on land and the seafloor. Subsidence can result from either natural geologic and/or man-made causes. Man-made causes include groundwater pumping, oil and gas production, and hydrocompaction (where dry, buried, unconsolidated deposits collapse when wetted). A subsided area can vary in size from a few acres to thousands of square miles. Elevation losses can be from a fraction of an inch to tens of feet. Damage can range from minor land elevation loss to costly infrastructure disruption and long-lasting environmental damage.

Subsidence has taken place extensively in the Long Beach Harbor area as a result of historic extraction from the Wilmington Oil Field. At the center of the basin, subsidence amounted to as much as 30 feet in 1958. Over 20 square miles were affected adjacent to the shoreline from the Port to Seal Beach. As a result of the subsidence caused by oil fluid withdrawal and hydrocompaction, ocean flooding inundated wharves, rail lines and pipelines were warped or sheared, and buildings and streets were cracked and displaced. Ninety-five oil wells were severely damaged. To correct this problem, a full-scale water injection operation was initiated in 1958. Extensive repressurization of the reservoir through water injection has stabilized the area, which, along with substantial remedial land fill operations, has allowed continued use of the

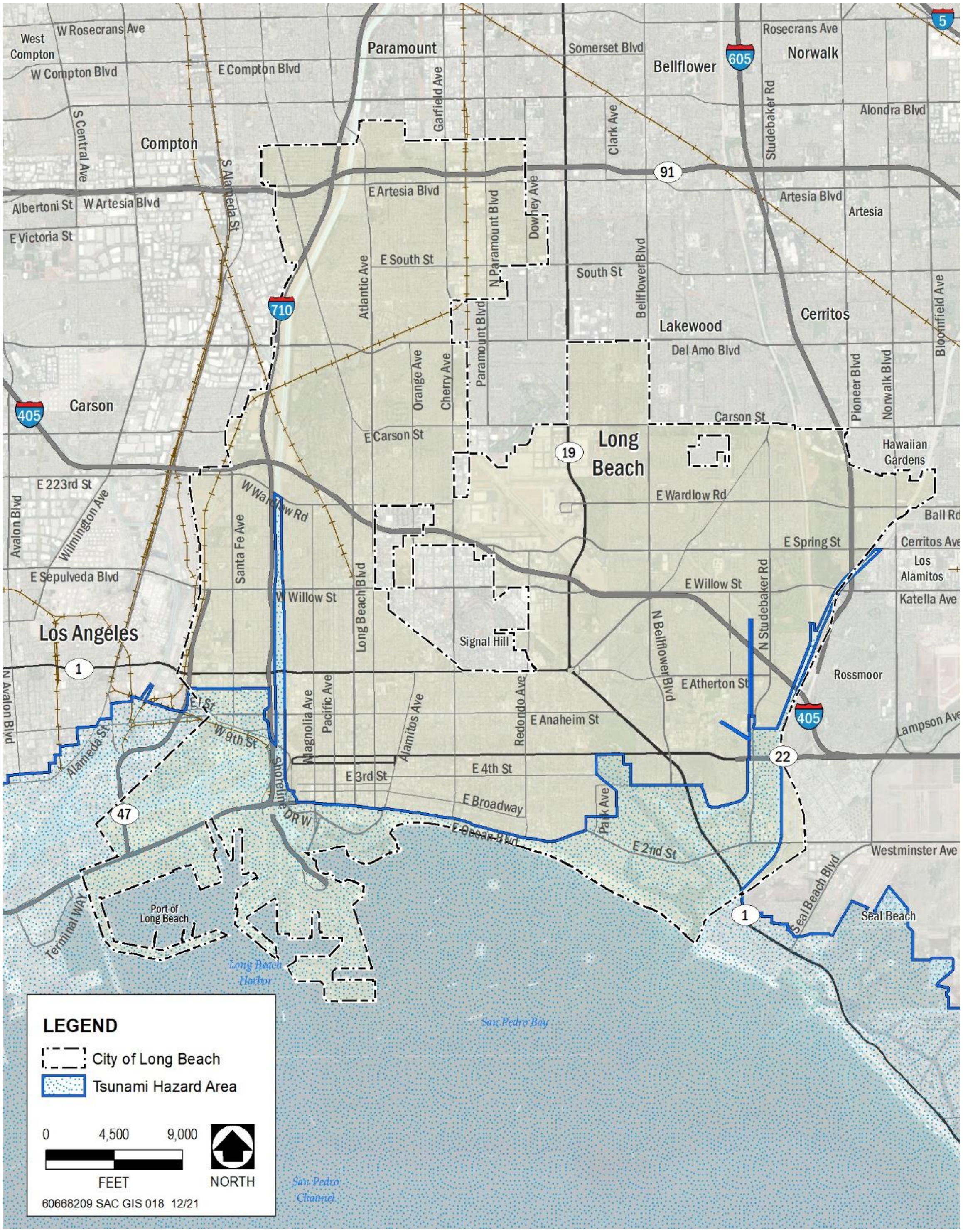

Plate 14. Tsunami Hazard Inundation Areas

Source: California Geological Survey et al. 2021

Port, petroleum production, and commercial facilities. The off-shore extension of the Wilmington Oil Field is operated via four, 10-acre drilling islands that were built offshore and landscaped in such a manner as to enhance the beauty of the shoreline. Each drilling island includes water injection, in addition to oil extraction, to ensure that subsidence does not occur (City of Long Beach 2021a).

3.7 Critical Facilities in Flood Hazard Zones

A variety of facilities in Long Beach are considered “critical” in terms of providing shelter and services during an emergency. These facilities include fire and police stations, hospitals, emergency command and communication facilities, and schools and other City-designated shelters. As noted previously, Long Beach is fully built-out and developed. The location of existing critical facilities relative to flood hazard zones, including tsunami hazard areas, are shown in Plate 15 (City of Long Beach 2021b, CGS et al. 2021).

3.8 Flood Warning Systems

Long Beach has developed a flood warning system designed to provide at least 1 hour of advance warning of a flood hazard. Flood watches (when conditions are conducive to flooding), and flood warnings (when flooding is imminent), are issued via Alert Long Beach, the City's Emergency Notification System; LBTV Cable Channel 8; and TV, radio, and mobile public address capabilities.

The National Oceanic and Atmospheric Administration (NOAA) operates warning centers that track earthquakes or landslides that have the potential to trigger a tsunami in the Pacific Ocean. Tsunami-generating incidents can be detected, pinpointed, and the magnitude computed within 2–12 minutes depending on the distance from the warning center. The Governor’s Office of Emergency Services (OES) and the National Weather Service, in cooperation with the West Coast/Alaska Tsunami Warning Center operated by NOAA, distribute tsunami information to law enforcement, public safety organizations, and the media. Los Angeles County also distributes tsunami information to local law enforcement, public safety organizations, and the media. Additionally, the County can activate strategic coastal warning sirens to alert the public to tune in to local radio and television stations for emergency information. The County can also provide tsunami warnings by activating the Emergency Alert System. The Long Beach Disaster Preparedness website provides weblinks to live NOAA data regarding current tsunami warnings.

The city's *Tsunami Preparedness Guide,* available on the city's website, also provides information on disaster preparedness, such as the emergency alert system (AlertLongBeach) and the City's real-time Twitter feed, preparation of an emergency kit, purchasing NOAA weather radios, and moving to high ground if a tsunami occurs.

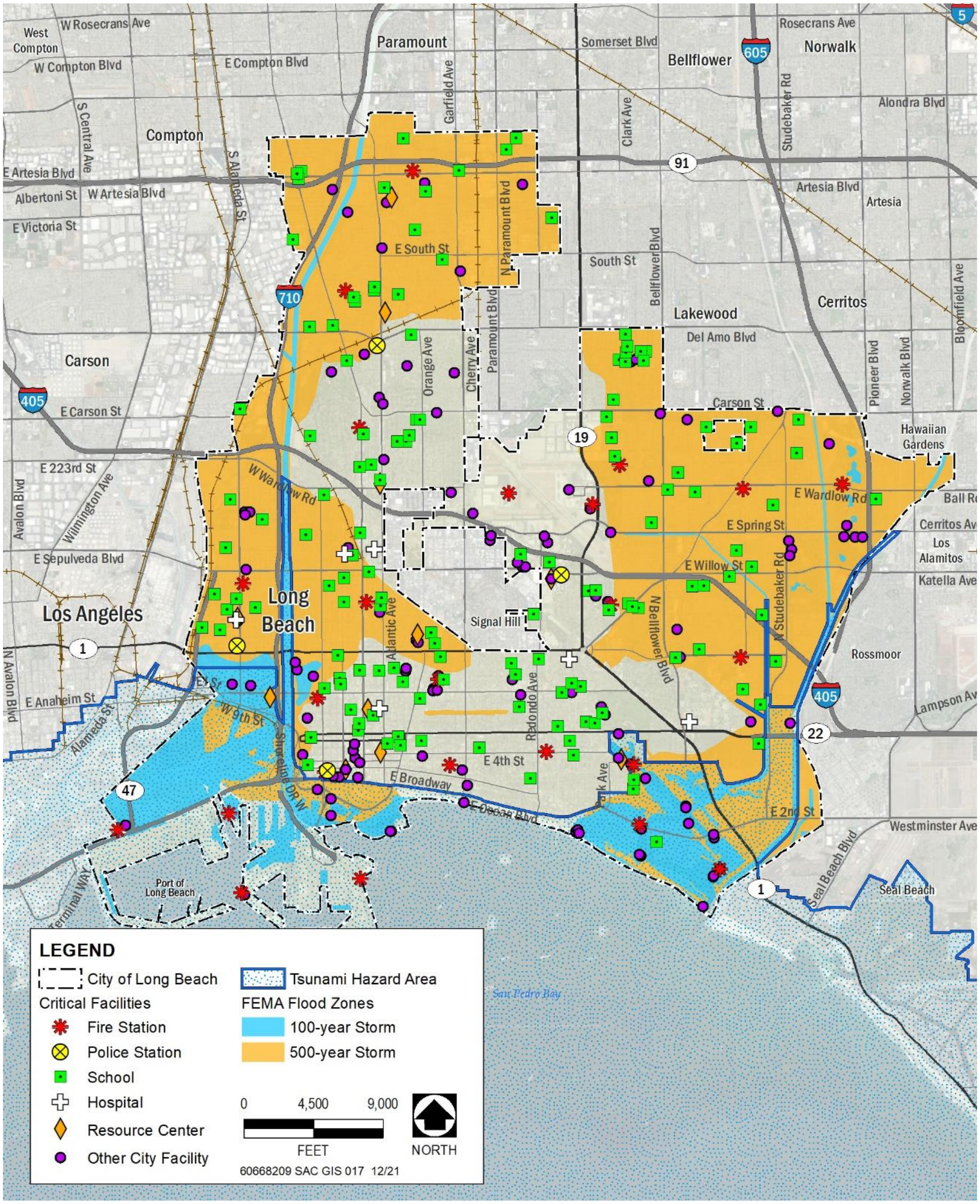

Plate 15. Critical Facilities and Flood Hazard Zones

Sources: City of Long Beach 2020, CGS et al. 2021, AECOM 2021

3.9 GOALS AND POLICIES

Goal PHS-3: Minimize the potential for loss of life and property damage from flooding.

Policy PHS-3.1: Continue to work cooperatively with federal, state, and local agencies to implement projects that reduce the flood hazard potential and provide environmental benefits.

Policy PHS-3.2: Development within a flood hazard zone will not be approved unless the City makes explicit findings that either existing flood management facilities provide an adequate level of protection from flooding, or the City has conditioned the project to provide an adequate level of flood protection.

Policy PHS-3.3: Development within a flood hazard zone shall demonstrate to the City that such development will not substantially impede flood flows or increase downstream flooding.

Policy PHS-3.4: Development shall pay a fee that will be used to update and maintain the City's stormwater drainage facilities.

Policy PHS-3.5: Require proposed development to evaluate potential flood hazards and incorporate appropriate design and engineering to ensure that peak stormwater run-off is maintained at pre-development levels.

Policy PHS-3.6: Locate or relocate new critical facilities including fire and police stations, hospitals, schools, and emergency command and communication centers outside of flood hazard zones. Where such location is not feasible, design the facilities to mitigate potential flood risk to ensure functional operation during a flood event.

Policy PHS-3.7: Require notice to prospective property owners, lessees, and tenants in areas subject to tsunami inundation hazards. The notice shall include a map of delineated tsunami hazard areas, as well as a map of designated emergency evacuation routes.

CHAPTER 4

FIRE PROTECTION

4. FIRE PROTECTION

Fires are generally categorized into two major types: urban fires and wildland fires. Because Long Beach is fully urbanized and does not include any areas classified by the California Department of Forestry and Fire Protection (CAL FIRE) as State Responsibility Areas[1] (SRAs) or Very High Fire Hazard Severity Zones (CAL FIRE 2021), this chapter focuses on urban fire protection.[2]

4.1 CITY OF LONG BEACH FIRE DEPARTMENT

The Long Beach Fire Department consists of two major service Bureaus: the Bureau of Operation and the Bureau of Fire Prevention, which are discussed below.

4.1.1 Bureau of Operation

The Operations Bureau is managed by a Deputy Chief and an Assistant Chief who manage daily field operations (Districts 1, 2, and 3) and Special Operations (Airport, Port, Fireboats, Urban Search & Rescue, Hazardous Materials, Strike Team/Mutual Aid, and Terrorism/Weapons of Mass Destruction). The Bureau of Operations is responsible for all field operations including Fire Suppression, the Lifeguard Division, personnel, policies, and fire/non-fire response activities.

There are presently 23 separate fire stations throughout the City, equipped with various types of trucks and fire-fighting apparatuses. (See Table 4-1 for inventory and Plate 16 for locations.)

---

[1] Areas where the State of California has the primary financial responsibility for the prevention and suppression of wildland fires.

[2] California Government Code Section 65302(g)(3) requires consideration of State Responsibility Areas (SRAs) and Very High Fire Hazard Severity Zones in the safety element of all general plans.

Table 4-1. Fire Stations and Equipment

Station	Address	Equipment
Station #1	100 Magnolia Avenue	1 – 1,500 gpm pumper 1 – 100’ Tiller Drawn Aerial Ladder Truck 1 – ALS ambulance 1 – Battalion Chief Vehicle 1 – Multi Casualty Incident Unit 1 – Swift Water Truck and Trailer
Station #2	1645 East Third Street	1 – 1,500 gpm pumper 1 – Basic life support ambulance
Station #3	1222 Daisy Avenue	1 – 1,500 gpm pumper 1 – Advanced life support ambulance
Station #4	411 Loma Avenue	1 – 1,250 gpm Pumper 1 – 85’ Aerial Ladder 1 – Paramedic Unit 1 – 1,500 gpm pumper 1 – Advanced life support ambulance
Station #5	7575 East Wardlow Road	1 – 1,500 gpm pumper 1 – Light Air Unit
Station #6	835 Windham Avenue	1 – 1,500 gpm pumper 1 – Urban Search and Rescue Tractor Trailer
Station #7	2295 Elm Avenue	1 – 1,500 gpm pumper 1 – 100’ Rear Mount Aerial Ladder
Station #8	5365 East Second Street	1 – 1,500 gpm pumper
Station #9	3917 Long Beach Boulevard	1 – 1,500 gpm pumper 1 – Advanced life support ambulance
Station #10	1417 Peterson Avenue	1 – 1,500 gpm pumper 1 – Advanced life support ambulance
Station #11	160 Market Street	1 – 1500 gpm pumper 1 – 100’ Tiller Drawn Aerial Ladder Truck 1 – Advanced life support ambulance
Station #12	6509 Gundry Avenue	1 – 1,500 gpm pumper 1 – Advanced life support ambulance 1 – Basic life support ambulance 1 – Foam unit 1 – Multi Casualty Incident Unit 1 – Type 3 Apparatus 1 – Type 6 Apparatus
Station #13	2475 Adriatic Avenue	1 – 1,500 gpm pumper 1 – Basic life support ambulance

Station	Address	Equipment
Station #14	5200 Eliot Street	1 – 1,500 gpm pumper 1 – Basic life support ambulance 1 – Battalion Chief Vehicle
Station #15	Pier C, Berth 22	1 – 108’ Fireboat 60,000 gpm
Station #16	3500 East Wardlow Avenue	1 – Twin Agent Quick Response Unit 2 – 3,000 gallon Airport Crash Rigs 1 – Battalion Chief Vehicle 1 – Basic life support ambulance
Station #17	2241 Argonne Avenue	1 – 1,500 gpm pumper 1 – 100’ Tiller Drawn Aerial Ladder Truck
Station #18	3361 Palo Verde Avenue	1 – 1,250 gpm Pumper 1 – Advanced life support ambulance
Station #19	3559 Clark Avenue	1 – 1,500 gpm pumper 1 – Hazardous Material Unit
Station #20	401 Pier D Street	108’ Fireboat 60,000 gpm
Station #21	225 Marine Drive	1 – 32’ Fire/Rescue Boat 700 gpm
Station #22	6340 Atherton Street	1 – 1,500 gpm pumper 1 – ALS ambulance
Station #24	111 Pier S Ave	1 – 1,500 gpm pumper 1 – Hazardous Material Response Unit

Note: gpm = gallons per minute
Source: Data provided by City of Long Beach in 2021

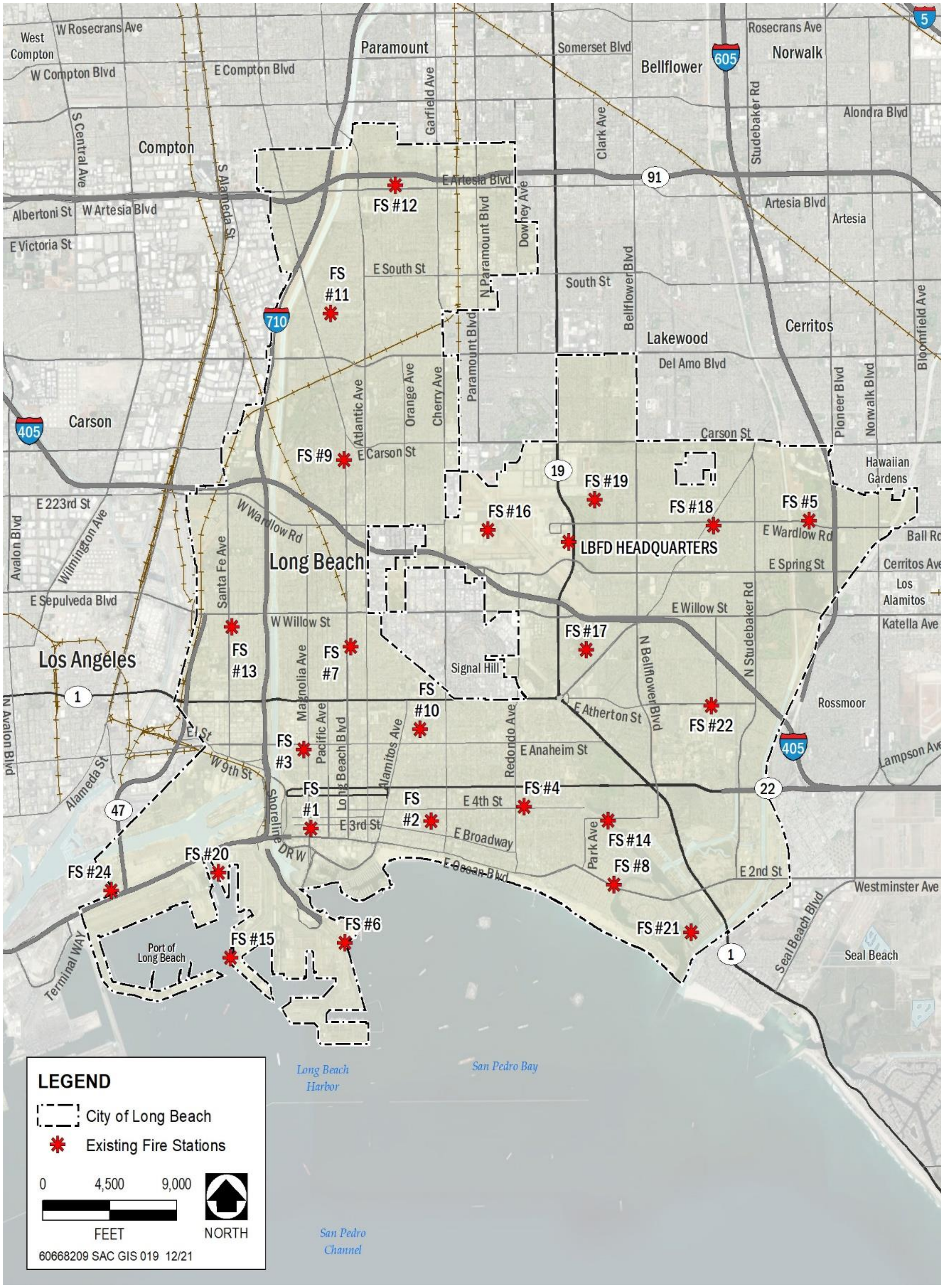

Plate 16. Existing Fire Stations

Source: City of Long Beach 2021c

The Marine Safety Division is directed by a Marine Safety Chief. This Division is responsible for the safe and lawful use of the 9 miles of beaches, 5,300 acres of oceanfront property, and the waterways and marinas of the city of Long Beach. Additionally, the Marine Safety Division is responsible for public safety of the approximately 4,000 pleasure craft moored in the City's marinas, and responding to water emergencies.

The Training Division is responsible for conducting recruit academies, probationary testing and evaluations, as well as all on-going training and education of fire personnel. Directed by a Battalion Chief, this Division is also staffed by Fire Captains, a Communications Specialist III, A/V Media Specialist and Editor, and an Administrative Aide.

The Emergency Medical Services (EMS) Division has administrative and operational responsibility for the design and delivery of all EMS system activities, including the certification of all uniformed personnel. All Long Beach Firefighters, Ambulance Operators, and Lifeguards are certified Emergency Medical Technicians (EMT). This Division is staffed by an Operations Fire Captain, an Emergency Medical Education Coordinator, and two Emergency Medical Educators. The EMS Educators provide continuing education and quality improvement for paramedics, EMTs, and dispatchers.

4.1.2 Bureau of Fire Prevention

The Bureau of Fire Prevention is responsible for preventing fires from starting, providing safety education in case of fire, and investigating and identifying suspicious fires and environmental crimes through proactive enforcement of Fire, Life Safety, and Environmental Code requirements. The Fire Prevention Bureau is responsible for Fire Code Enforcement, Plan Check, Fire Investigation, Arson Prosecution, Environmental Investigations and Records Management. It also oversees community services divisions, including Public Information and the Community Emergency Response Team (CERT).

The Fire Prevention Bureau is managed by a Deputy Chief, who also serves as the Fire Marshal for the City. Staff includes two Deputy Fire Marshal(s), a Port

Assistant Chief, Fire Captain(s), Fire Inspectors, Fire Investigators, an Environmental Crimes Investigator, civilian Fire Plan Reviewers, and Hazmat Specialists.

Scheduled inspections of public assemblages, institutions, hospitals, industrial plants, commercial plants, ships, hotels, and many other facilities are carried out by the Bureau of Fire Prevention.

4.2 TECHNOLOGY AND INNOVATION DEPARTMENT

The City's Technology and Innovation Department is responsible for the maintenance and installation of telephones, radios, fire alarm boxes, alarm communications within the stations, and citywide cable system for the Fire Department.

4.3 TYPES OF FIRES

Fires vary in terms of their potential threat to life and property. Generally speaking, the risk is higher as the occupancy increases and as the building size and value of contents become greater. While the potential risk is greater, the actual risk, as based upon the frequency of occurrence, is often less.

In any mechanized urban area, there exists a great many potential causes of fire. Many of the causes are a result of human carelessness or mechanical failure that is difficult to predict and even harder to eliminate. In some instances, however, potential fire hazards can be reduced if they are recognized as problems.

The primary causes of fires in Long Beach are arson and carelessness (e.g., children playing with matches, inappropriate disposal of cigarettes, etc.). Other causes include automobile accidents, electrical and natural gas equipment failure, flammable liquids, candles, grease, and faulty stoves or furnaces.

Fires from catastrophic causes (e.g., explosion, airplane crash, etc.) are rare and are more controllable in terms of prevention before they happen.

4.4 FACTORS AFFECTING FIRE POTENTIAL

One factor that relates to fire hazard is the age and condition of structures. There are areas throughout many parts of the city with older structures, including Downtown and Midtown, central Long Beach and areas near the coast including Alamitos Beach. Overall, Long Beach's housing stock is older than in most other cities – 88 percent of owner-occupied units are more than 50 years old and 81 percent of renter-occupied units are over 50 years old (City of Long Beach 2021d).

Land use is another factor that affects fire potential. For example, industrial and commercial areas generally include the use and storage of larger quantities of explosive and flammable materials. Industrial and commercial areas having high concentrations of people around them pose fire threats of some magnitude.

4.5 PEAK LOAD WATER SUPPLY

The majority of the city is served by a municipal water system operated by Long Beach Water. Approximately 60 percent of the city's water comes from groundwater, while the remaining 40 percent comes from imported surface water. The two main imported water sources are the Colorado River watershed, and the Sacramento-San Joaquin Bay Delta (via the State Water Project). Water is imported into the region by the Metropolitan Water District of Southern California (MWD), one of the world's largest water agencies and the region's water wholesaler from which Long Beach Water purchases its imported water supplies. MWD consists of 26 member agencies: 14 cities (including Long Beach), 11 municipal water districts, and one county water authority.

In addition to areas served by Long Beach Water (purchased from MWD), a residential area in the northwestern portion of the city is served by the California Water Company and another small residential area in the northeastern part of Long Beach is served by the Golden State Water Company. The Harbor District is served by the Port of Long Beach.

MWD's water supply system is backed up by three reservoirs: Lake Matthews, Lake Skinner, and Diamond Valley Lake. Combined, these reservoirs have a capacity of over 1 million acre-feet.

The City of Long Beach engineering standards require a minimum flow of water for fire protection in accordance with Long Beach Fire Department, California Fire Code, and Insurance Services Office standards.

4.6 FIRE AND EMERGENCY ACCESS

Street widths and turning radii are mandated by the Long Beach Municipal Code, Chapter 20.36, "Design Standards." Dead-end streets without provisions for an adequate turnaround are expressly prohibited by Municipal Code Section 20.36.070(E). The Long Beach Public Works Department requires streets to be designed and constructed according to the California Department of Transportation's Standard Specifications, as modified by the City's Engineering Standard Plans (Section 100).

Adequate emergency vehicle access to buildings is important for effective public safety service and emergency response. Emergency access is regulated by the California Fire Code. Under the current Fire Code, all portions of a building must be located within 150 feet of a serviceable fire access road. In some instances, the Fire Marshal can make an exception to this rule, such as when a building is equipped with an approved automatic sprinkler system. Minimum clearances around structures are regulated through implementation of the City's Zoning Code (Titles 21 and 22).

Implementation of these codes and standards during the permitting process ensures that adequate street widths, turning radii, and clearances around structures are provided for fire and emergency access.

4.7 FIRE PREVENTION CODES AND STANDARDS

Hazardous fire conditions are controlled via the City's building permit issuance program and the business licenses approval required by the Fire Prevention Bureau. Special permits are required for most hazardous materials and processes, and all business license applications must be filed annually and approved by the Fire Prevention Bureau.

The City has adopted, and continues to adopt with each revision cycle, the most current editions of the nationwide Uniform Fire Code, Uniform Plumbing Code, and Uniform Building Code, as well as the California Building Standards Code (CBC) (California Code of Regulations Title 24). The CBC addresses the same topics as the nationwide Uniform Building Codes, but it includes modifications to address specific conditions in California and modifications that have been mandated by the California legislature. The CBC contains building and design and construction requirements related to fire and life safety, structural safety, and access. The CBC includes the following sections:

- Part 2: California Building Code
- Part 3: California Electrical Code
- Part 4: California Mechanical Code
- Part 5: California Plumbing Code
- Part 6: California Energy Code
- Part 8: California Historical Building Code
- Part 9: California Fire Code
- Part 10: California Existing Building Code (applies to alterations, repairs, additions, and relocations of structures)
- Part 11: California Green Building Standards Code

In addition to the municipal codes, the State Vehicle Code regulates the transportation of explosives and the State Fire Marshal regulates the transportation of flammable liquids. Specific routes of travel for transporting hazardous materials are designated by the California Department of Transportation and enforced by the California Highway Patrol.

4.8 GOALS, OBJECTIVES, AND POLICIES

Goal PHS 4-1: Minimize the risk of loss of life, injury, and property damage resulting from fire hazards.

Objective: Maintain fire stations, facilities, equipment and staffing necessary to minimize emergency response for fire protection and emergency medical services.

Policy PHS 4-1.1: Continue to review new development for adequate water supply and pressure, fire hydrants, and access to structures by firefighting equipment and personnel.

Policy PHS 4-1.2: Continue to review projects for compliance with the California Fire Code as part of the building permit process.

Policy PHS 4-1.3: Require that all future projects are reviewed by the Long Beach Fire Department to ensure that sufficient service capacity exists for fire protection and emergency medical services.

Policy PHS 4-1.5: Ensure that new fire station facilities are located strategically throughout the City, as needed, to provide optimum response times to all areas.

Policy PHS 4-1.6: Where feasible, invest in new technological advances that enhance the City's ability to deliver fire protection and emergency medical response services more effectively.

Policy PHS 4-1.7: Continue to implement Fire Facilities Impact Fees (Municipal Code Sections 18.16.050 and 18.16.060), which require proposed developments to contribute fees for fire protection services and facilities.

Policy PHS 4-1.8: Support and promote Long Beach Fire Department’s public outreach and educational programs related to fire safety, prevention, and emergency preparedness.

Policy PHS 4-1.9: Continue to ensure that adequate water supplies are available for fire suppression throughout the city.

Policy PHS 4-1.10: All high-rise structures shall include sprinkler systems and on-site fire suppression equipment and materials, and shall be served by fire stations containing truck companies with specialized equipment for high-rise fire and/or emergency incidents.

CHAPTER 5

CLIMATE CHANGE RESILIENCY

5. CLIMATE CHANGE RESILIENCY

5.1 CLIMATE CHANGE VULNERABILITY[3]

Climate change is a shift in normal weather conditions over time. A growing body of scientific research has linked climate change to an increase in the concentration of greenhouse gas (GHG) emissions in the Earth's atmosphere. Some GHGs occur naturally and are responsible for the "greenhouse effect" that provides a habitable climate on Earth. However, human activities generate a significant amount of GHG emissions, resulting in atmospheric levels of GHGs in excess of natural conditions.

The City of Long Beach developed a Climate Action and Adaption Plan (CAAP) to reduce GHG emissions and ensure the community and physical assets are better protected from the effects of climate change. A climate change climate stressors review and vulnerability assessment for Long Beach was prepared as part of the CAAP and is incorporated by reference herein (City of Long Beach 2020).[4]

Table 5-1 presents a summary of the types of climate change hazards that may occur in Long Beach, and the resulting potential impacts to people and the environment.

[3] California Government Code Section 65302(g)(4) requires cities and counties to address the potential effects from climate change as part of the safety element of their respective general plans. As part of the requirements of California Government Code Section 65302(g)(4), cities and counties are required to conduct a climate change vulnerability assessment for the safety element (or to incorporate such work by reference if it has been prepared for another adopted document such as a CAAP or LHMP).

[4] The California Energy Commission and the University of California, Berkeley (2021) developed a climate change modeling tool called Cal-Adapt, as part of recommendations of the 2009 California Climate Adaptation Strategy. Cal-Adapt produces peer-reviewed, scientific climate projections for the entire state of California. The data is available to the public at https://cal-adapt.org/, and is continuously updated as the science of climate change evolves.

Table 5-1. Projected Effects of Climate Change in the City of Long Beach

Hazard	Climate Change Influence	Results Summary
Extreme Heat[2]	Climate change is expected to cause warmer temperatures overall, as well as an increase in extreme heat events.	Buildings may require additional energy for cooling. Buildings without air conditioning or with insufficient air conditioning could be uncomfortable and potentially unsafe for occupants during extreme heat events. If electrical outages are caused due to areawide brownouts because of extreme heat, building heating and cooling could be disrupted, in addition to all other electronic systems. Extreme heat poses the greatest health risks of any climate threat in Long Beach and can lead to heat related injury, illness or death (ie heat stroke, heat exhaustion)
Sea Level Rise and Coastal Flooding	By the year 2030, sea level rise (SLR) of approximately 11 inches may occur in Long Beach, with up to 24 inches of SLR by 2050.	Modeling indicates that with 11 inches of SLR, approximately 1.3 million square feet of buildings would be exposed to annual king tide flooding.[1] Approximately half of these buildings are residential (624,100 square feet) and half are commercial (689,600 square feet). These buildings are primarily located in Marina Pacifica and along Shoreline Drive south of Ocean Boulevard. An additional 9.5 million square feet of buildings, primarily residential, are exposed to flooding from a 100-year storm surge with 11 inches of SLR. These buildings are primarily located in Naples Island, Belmont Shore, and the Peninsula. With SLR of 24 inches, approximately 8.5 million square feet of residential and commercial development would be exposed to annual king tides.
Riverine Flooding	Climate change is projected to cause more years with particularly intense storm systems that result in high rainfall amounts over a short period, and could overtop the	Modeling indicates that 100-year flood flows would be contained within existing channels. However, given the large extent of the 500-year floodplains, substantially

Hazard	Climate Change Influence	Results Summary
	capacity of local streams and drainage systems.	more development would be subject to flood hazards.
Drought	Climate change is projected to result in statewide droughts that are more frequent and more intense. California's climate varies between extremely dry and extremely wet periods, driven by the presence or absence of a few large winter storms or "atmospheric rivers." There will likely be more years with extreme levels of precipitation, both high and low; more years with very low levels of precipitation would cause more droughts that last longer and are more intense, as compared to historical norms.	Drought results in less water available for human consumption, industrial processes, and agricultural irrigation. It also decreases the amount of water available to plants and animals, threatens endangered species and ecosystems, and increases wildfire hazards. Drought may also result in increased soil shrink-swell effects, which result in damage to building foundations.
Notes: [1] King tides are the largest annual tide events and occur several days each year when a spring tide coincides with the moon being in its closes position to the Earth. In Long Beach, king tide events are approximately 1.5 feet above the average daily high tide. They can cause flooding of low-lying coastal areas, particularly if coinciding with a storm event that elevates tides above normal levels. [2] Defined as the number of days where temperatures are hotter than 95 degrees. Sources: California Energy Commission and U.C. Berkeley 2021, City of Long Beach 2020		

5.2 GOALS, OBJECTIVES, AND POLICIES

Goal PHS 5-1: Low carbon, climate resilient buildings and neighborhoods.

Goal PHS 5-2: Safe and adaptable infrastructure.

Goal PHS 5-3: A healthy, resilient, and ready population.

Goal PHS 5-4: Prioritize resources and services for communities most vulnerable to climate change

Objective: Improve the resiliency of neighborhoods, commercial districts, and public facilities and infrastructure throughout Long Beach while reducing GHG emissions from activities in Long Beach to levels that are supportive of, and consistent with the sate of California's long term climate targets.

Policy PHS 5.1-1: Promote and provide incentives to increase the generation and use of renewable energy and energy efficiency improvements to buildings.

Policy PHS 5.1-2: Facilitate the use of materials that counteract the heat island effect.

Policy PHS 5.1-3: Enhance and expand the urban forest, provide additional shade and access to clean drinking water in public gathering areas, and increase access to cooling centers.

Policy PHS 5.1-4: Require both public projects and private developments to incorporate appropriate resilience strategies in new construction.

Policy PHS 5.1-5: Take measures to maintain the structural and operational integrity of essential public facilities during flooding.

Policy PHS 5.1-6: Locate critical facilities away from hazards that could become worse due to climate change, relocate, or elevate critical infrastructure, as needed, to increase resilience, and retrofit/extend sea walls and storm surge barriers, as appropriate.

Policy PHS 5.1-7: Encourage the capture and use rainfall and recycled grey water in private development and public properties.

Policy PHS 5.1-8: Work with utility partners to identify future vulnerability potential for power outages related to extreme heat and develop plans to prevent outages.

Policy PHS 5.1-9: Expand and improve Citywide pedestrian and bikeway infrastructure to provide alternative transportation options during emergencies while reducing GHGs.

Policy PHS 5.1-10: Support and develop incentives for projects that increase employment and residential development along primary transit corridors, and otherwise increase non-vehicular transportation through increased density, mixing of complementary land uses, and other strategies.

Policy PHS 5.1-11: Encourage the use of electrical rather than gas-powered outdoor power equipment.**Policy PHS 5.1-9:** Require water efficiency in new development and implement citywide water conservation programs.

Policy PHS 5.1-11: Address sea level rise in citywide plans, policies, and regulations.

Policy PHS 5.1-12: Increase access to local food systems to reduce GHGs while increasing community resiliency during an emergency.

CHAPTER 6

HAZARDS AND HAZARDOUS MATERIALS

6. UTILITIES

Utility operations in Long Beach include water and natural gas, provided by the City, and electric power, which is generated and distributed by Southern California Edison Company.

Utilities in general provide life-sustaining services and are essential for urban living. As such, utilities are an asset, which must be continually supplied. In times of emergency, it is imperative that utilities be maintained and/or restored should services be interrupted. At the same time the utility services themselves may pose certain hazards to public safety should damage occur along the established support system. Because of the magnitude of responsibility involved, all of the existing utility systems have rather elaborate safeguards built into the network. By and large, safety measure are dictated to utility services by City ordinances, special commissions, State offices, or Federal requirements. Except in special instances where additional safety precautions may be warranted, the City is well protected from potential threats. In fact, the major threat is that the interruption of one service may hinder another utility service form functioning at its normal level. All of the utility services, however, have established networks throughout the City in such a manner that an interruption at one location may be by-passed and services provided via alternate channels.

6.1 UTILITY-RELATED HAZARDS

The City Water Department has two elevated distribution reservoirs with a combined storage capacity of 117,000,000 gallons of water. The Alamitos Reservoir consists of 23 steel storage tanks, while the Dominguez Reservoir consists of 12. Together these storage reservoirs could provide for approximately two average day’s use in the event of an emergency. While these storage reservoirs are essential as a safeguard of the water supply, the rupturing of these tanks could be catastrophic. The Alamitos Reservoir, near the Traffic Circle, would be of greater concern due to the number of tanks involved and the proximity to the Newport-Inglewood Fault Zone. While the tanks are earthquake-resistant and survived the 1933 quake undamaged, a substantial break along the fault trace could rupture several tanks, causing significant flooding in the downhill areas. There are water and oil storage tanks located throughout the city, but the largest concentration of water tanks is on Reservoir Hill. These tanks are operated by the Long Beach Water Department, which has prepared an earthquake action plan. In the event of an earthquake, the plan calls for an immediate site inspection by a designated field engineer. In addition to this plan, the Water Department has recently installed new shut-off valves on all the tanks.

With regard to the large oil storage tanks in the area, the oil companies are required to maintain dikes around the tanks that are capable of containing any spill from the tanks.

Southern California Edison Company maintains an electrical power generating and distributing network throughout the City. As a part of this system, overhead transformers and distribution lines have been installed in past years. Today, these utility facilities are underground except in special instances where surface or aboveground lines are required for technical reasons. Many of the older overhead utilities remain, however, aside from the aesthetics involved, these overhead transformers and lines are subject to falling in the event of an earthquake. While the transformers switch off upon being grounded, a potential safety threat exists as a result of their suspension. While the safety hazard is not great, these suspended utilities should be installed at or below surface as is feasible.

6.2 TRANSPORTATION-RELATED HAZARDS

Like utilities, industrial and transportation related activities are essential to the livelihood and economic wellbeing of the community. While these activities are an asset, they also pose certain potential hazards. Industries and transportation are controlled by numerous Commissions, State regulations, and Federal guidelines. While a certain risk is created as a result of these activities, hazards are usually minimal. No Safety Element, however, would be complete without a review of the most salient industrial and transportation related hazards.

6.3 INDUSTRIAL LAND USES

Long Beach has 1, 684 acres of industrial land use. For the most part the industrial areas are concentrated in five locations of the City: the harbor area, the Westside industrial area (just north of the harbor), in and surrounding the airport, in north Long Beach, and on the eastside at the conjunction of Westminster and Studebaker Road. (See **Error! Reference source not found.**17).

Industrial land uses could have potential safety impacts on nearby residential or other sensitive land uses. In Long Beach, industrial land uses are located near other land uses that could be considered incompatible. Given this circumstance in the west Long Beach area, an Economic Development Corporation was formed to effectuate industrial revitalization in this Westside area. The area as it now exists is primarily composed of small-scale operations. The situation of incompatible land uses also exists in the north Long Beach. Numerous remedial measures have been considered for the area over the years. Most mitigating measures, however, would be quite expensive and of limited benefit. In view of the deleterious nature of such incompatibly placed land uses, it is incumbent upon the City to avoid such mixtures in the future development of the City. For industrial areas with the greatest compatibility issues, the City has focused on supporting the long-term evolution of those areas to “neo-industrial” uses to help transition existing industrially zoned areas of North Long Beach and the Magnolia Industrial Area to less polluting alternatives in the future, such as light industrial or advanced manufacturing, while maintaining local jobs (Land Use Element, 2019).

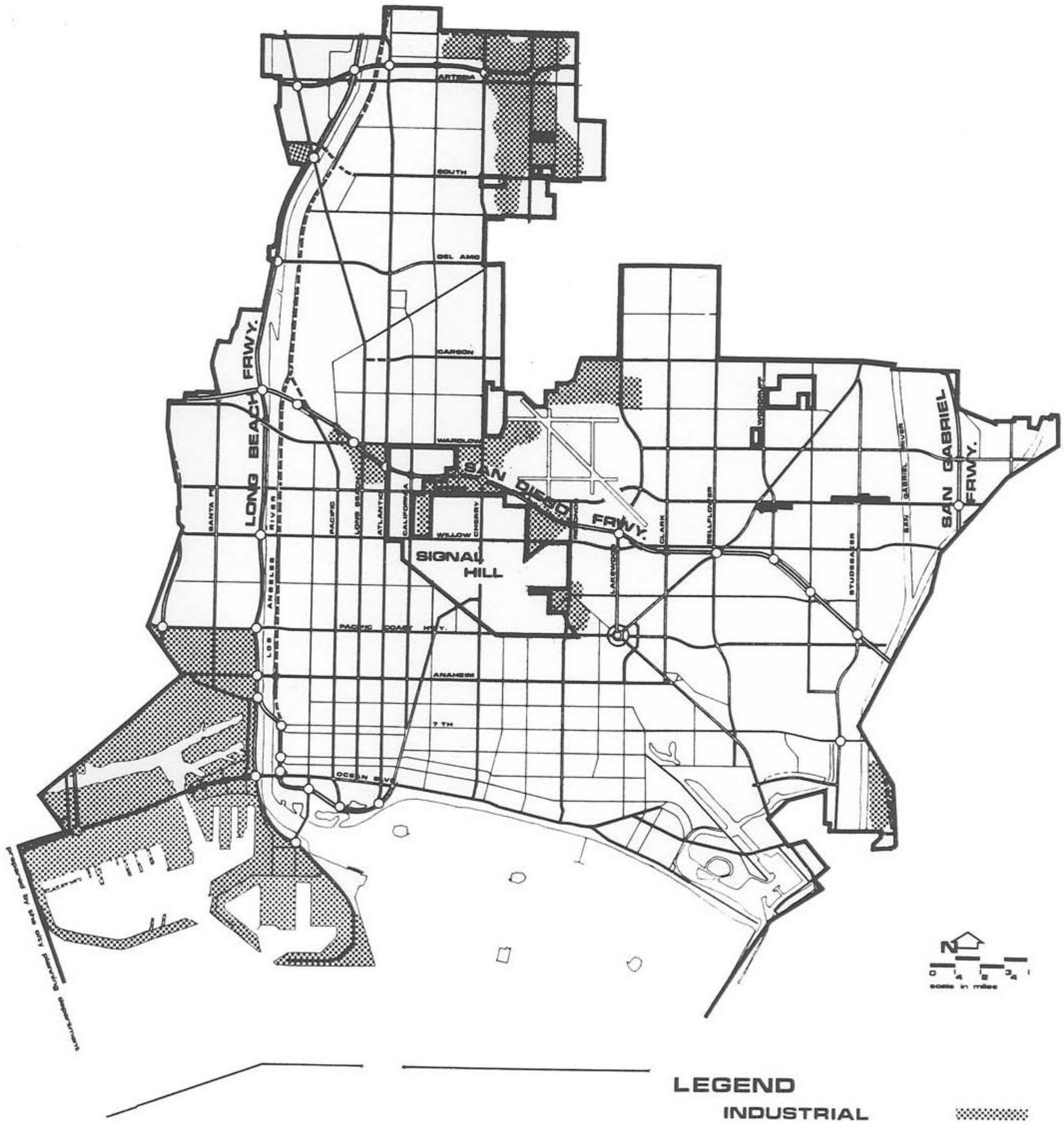

Plate 17. Industrial Land Use

6.4 TRANSPORT OF HAZARDOUS MATERIALS

The California Department of Transportation (CALTRANS) sets forth regulations and restrictions upon the transporting of dangerous fluids, chemicals, or explosives. In the City of Long Beach, designated truck routes are established. These routes are delineated on **Error! Reference source not found.**18, along with freeways and railroads. Aside from the routine safety precautions, the City Fire and Police Departments are alerted when shipments of particularly dangerous materials are due to pass through the City. For the safety of the workmen, Longshoremen and Teamster Unions also require shippers and transporters of dangerous materials to take precautionary measures. In terms of public safety, the designation of truck routes must be coordinated with land use planning in order to reduce for adjacent uses.

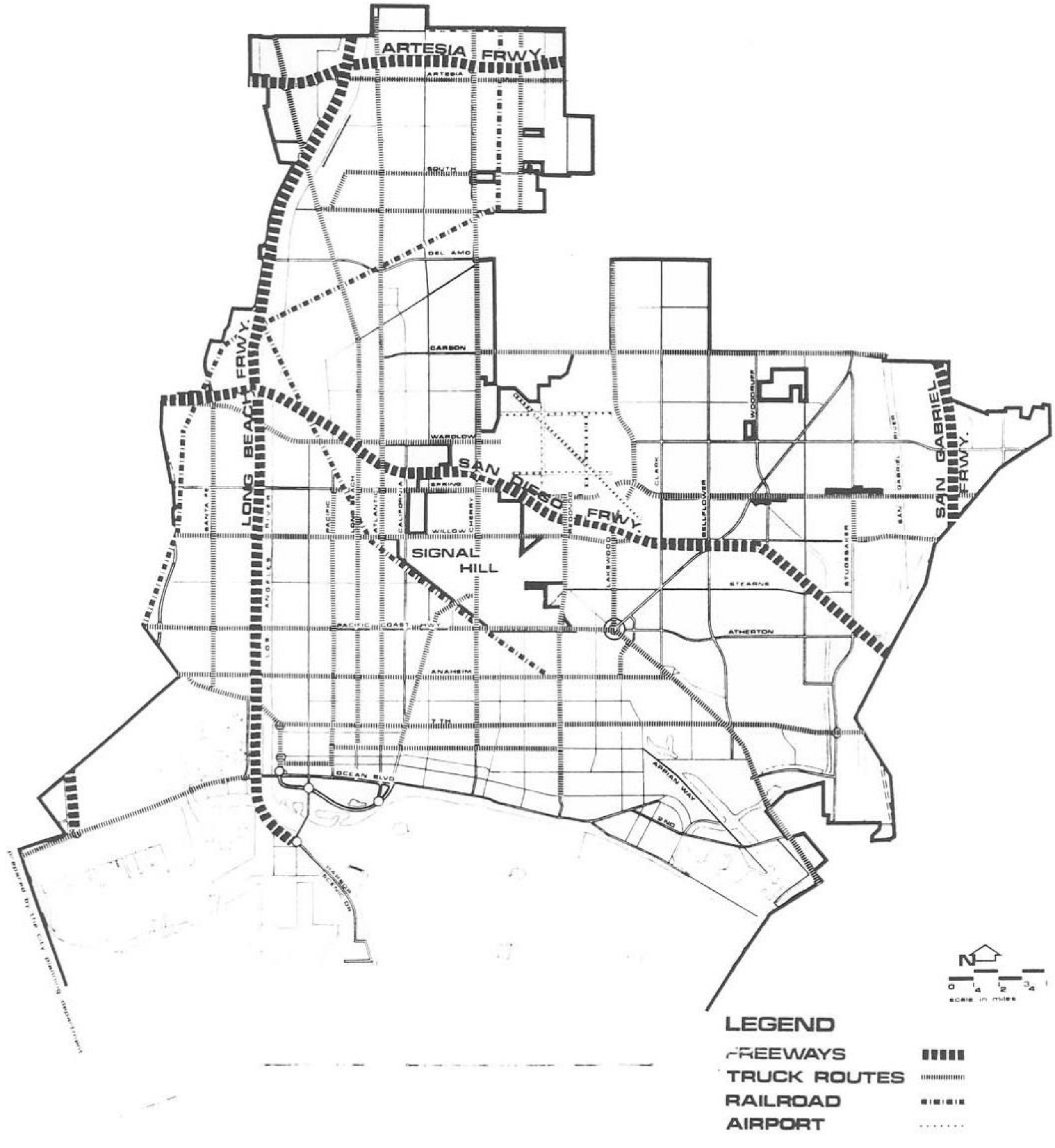

Plate 18. Transportation Routes

6.5 AIRCRAFT SAFETY

The majority of operations at Long Beach are general aviation aircraft, with business jets and large jet operations constituting the remainder.[5] Potential aircraft crashes pose a certain public safety hazard to residents of the area, but aircraft safety regulations are strictly enforced by the Federal Aviation Administration and accidents are relatively few. Nonetheless, some tank farms and above ground storage of other dangerous fuels are incompatibly located in close proximity to airport operations. Future land use planning must recognize such hazards and provide for adequate spacing of these incompatible uses. It is particularly important to avoid placing fuel storage facilities in line with the established flight pattern.

6.6 GOALS, OBJECTIVES, AND POLICIES

Goal PHS 6-1: Utilize safety considerations as a means of encouraging and enhancing desired land use patterns.

Objective: Provide an urban environment which is as safe from all types of hazards as possible.

Policy PHS 6.1-1: Continue to identify existing or proposed uses or activities that may pose safety hazards.

Policy PHS 6.1-2: Use physical planning as a means of achieving greater degrees of protection from safety hazards.

Policy PHS 6.1-3: Encourage transportation systems, utilities, industries, and similar uses to locate and operate in a manner consistent with public safety goals.

Policy PHS 6.1-4: Strive to encourage urbanizations patterns which preserve and/or create greater safety for residents and visitors.

---

[5] City of Long Beach, Planning Department, Noise Element of the Long Beach General Plan (Draft Copy).

Policy PHS 6.1-5: Critically evaluate proposed public or private actions which may pose safety hazards to residents or visitors.

Policy PHS 6.1-6: Discourage the large-scale storage of water, oil, or chemicals in areas of greatest potential seismic activity.

Policy PHS 6.1-7: Minimize and reduce exposure to harmful air pollution from refineries, hydrogen production and sulfur recovery, oil drilling and production, marine ports, trucks, and railyards, with a priority on improvements that would focus on homes, schools, and childcare facilities within disadvantaged communities.

Policy PHS 6.1-8: Encourage the transition of heavy industrial uses in areas with the greatest land use compatibility issues to "neo-industrial" uses with less polluting alternatives in the future uses, such as light industrial or advanced manufacturing uses, that would reduce such compatibility issues.

CHAPTER 7

DISASTER OPERATIONS

7. DISASTER OPERATIONS

The City's Department of Disaster Preparedness and Emergency Communications is charged with planning, coordination, and management of disaster preparedness, mitigation, response and recovery, as well as effective communications in the case of disaster.

Disasters may be caused by man or nature. The ability to survive disaster adversities is dependent to a great extent upon the degree of preparedness that exists prior to the event. Emergency preparedness includes the process of evaluating and attempting to minimize potential disaster occurrences. Should a disaster take place, emergency preparedness would minimize the ill effects and effectuate a rapid recovery. The primary purpose of disaster operation and civil defense is to protect lives and property, preserve the continuity of civil order, and restore a viable and functional economy. While it is hoped that such disaster operations need never be activated, the City would be remiss in its obligation to the citizens if such preparedness were not provided.

In addition to the material that follows, please see the City's Local Hazard Mitigation Plan, which addresses related topics.

7.1 EMERGENCY OPERATING CENTER (EOC)

The Long Beach Department of Emergency Preparedness is located at 4040 East Spring Street near the Airport. (See Plate 19). Its underground facility was originally a Nike Ajax Missile Site, but now serves as the central operating base for all civil defense activities. In the event of a disaster, this Emergency Operating Center (EOC) would become the command post for coordinating manpower, equipment, resources, and facilities. Through the use of the communications network, the disaster coordinator can assemble information from the field, assess existing situations throughout the City, provide resources, organize disaster services, and keep the public informed.

The underground Emergency Operation Center consists of three separate activity areas, divided by corridor walkways. The east chamber is the administrative headquarters and provides an assembly and briefing area. The walls of this area are surrounded by displays and graphic illustrations, which can be used to record events as they occur during a time of emergency. The east chamber also houses the communications and operations groups. The center chamber houses the utilities and supporting staff. This supporting staff may analyze or interpret information so it may be forwarded to the administrative advisors and chiefs in the assembly area. The west chamber of the Center

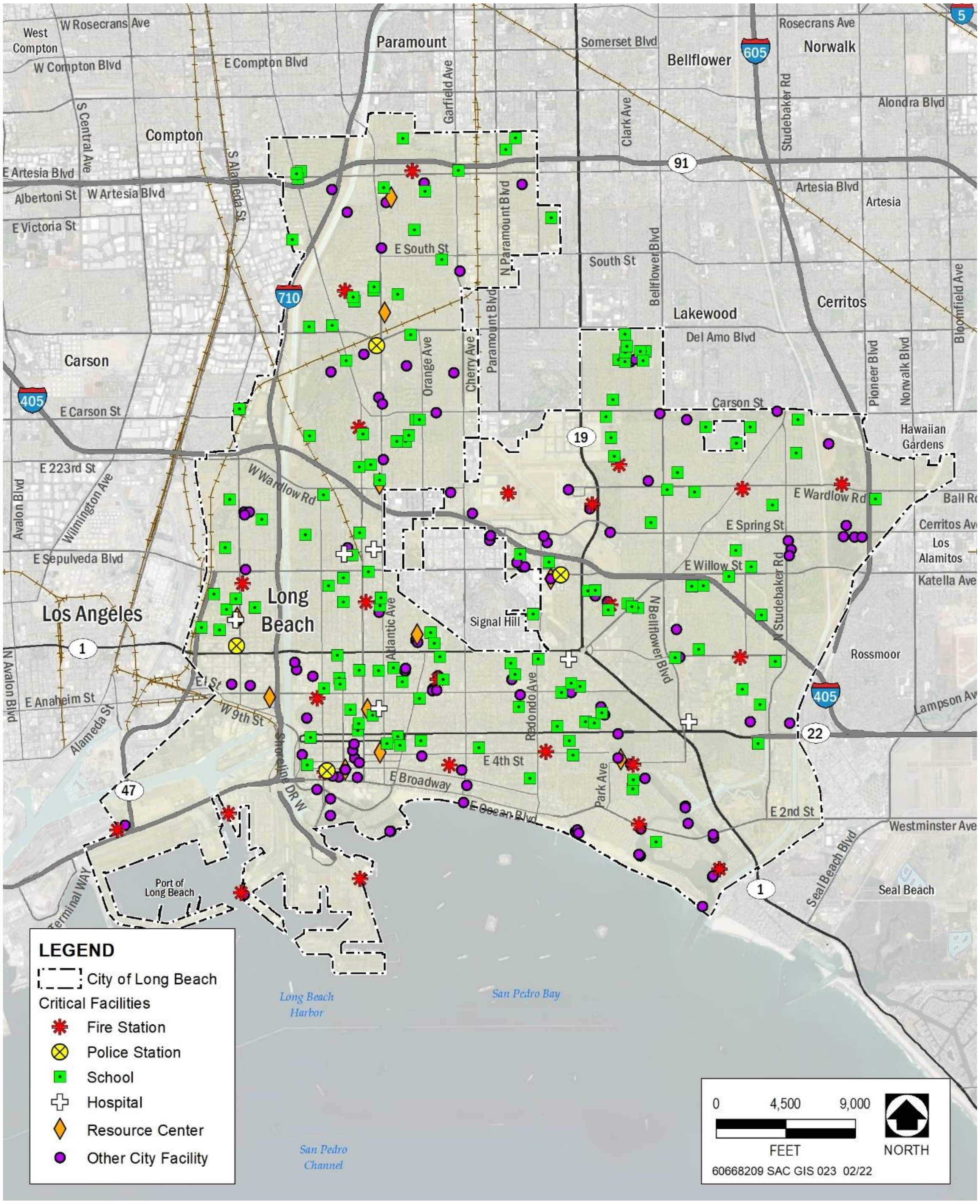

Plate 19. Community Disaster Resources

Source: City of Long Beach 2020

consists of living facilities to be used by the “Operations Group” during a disaster event. This area has an infirmary, kitchen, dining room, and dormitories. While the facility is designed to handle disaster relief activities, the City makes day-to-day use of the available space for conducting training courses, holding conferences, and so forth.

7.1.1 Staff Responsibilities

All City employees are registered disaster service workers. When the emergency organization is activated, the City Manager or their designated alternate directs disaster response activities. Department heads and other designated City officials will serve as deputy directors and service chiefs in the emergency operation. These key personnel will locate themselves in the assembly area in the east chamber of the EOC facility. Additional City employees will serve as support personnel for providing specific information, analysis, and services. These support services include the areas of communications and warning, situation analysis, housing and shelter, health and medical, welfare, fire and rescue, law enforcement and traffic control, public works, economic stabilization, utilities, transportation, building and safety, and others.

7.1.2 Communications

In the event of a disaster, communications are essential for the coordination of various service operators and field workers. Furthermore, it is imperative that the public be kept informed. Through the Emergency Operating Center, the City has access to a variety of radio, telephone, and teletype resources, including the following:

- EOC-City Government radio networks, including the mobile communications center.
- Existing radio networks of the Police, Fire, Health, Public Service, and Marine Departments.
- RACES (the amateur radio operators)
- REACT (the citizen band radio operators)
- GTE mobile radio telephone service

- Radio networks used by local commercial companies
- Municipal telephone system
- GTE facilities
- Police Department Teletype network, which is an intra- and inter-State system.

A great deal of the communications flow will be received and transmitted through the communications room of the EOC. Numerous telephones are provided in the assembly area for the continuous use of service chiefs and advisors.

In addition to the elaborate communications network throughout the City and surrounding area, national communications are ensured by two direct connections with NAWAS, the national warning system. Information regarding disasters anywhere in the U.S. are reported to the NORAD headquarters near Denver, Colorado. Long Beach can become informed of disaster situations in other locales or potential dangers that may be anticipated via two direct taps into this national warning system. One communication terminal is located in the underground Emergency Operating Center and the other is tied into the fire dispatch system at Fire Department headquarters.

7.1.3 Evacuation

State law requires cities and counties to address evacuation routes, as related to identified hazards, in general plans. State law also requires the identification of residential developments in any identified hazard area that do not have at least two emergency evacuation routes.

To protect the populace from potential or imminent danger, it may be necessary to evacuate portions of the City as a result of events such as earthquakes, tsunamis and other types of flooding, major fires, and chemical explosions. Evacuation procedures would need to be coordinated and carried out by the City's emergency response and operations departments, including the Police, Fire, Disaster Preparedness, and Health Departments. The City's emergency alert system (AlertLongBeach) and the City's real-time Twitter feed, in addition to house-to-house police notifications if necessary, would provide notice to citizens of necessary evacuations.

The extent of the affected hazard area, evacuation directions that provide the safest route of escape, and other similar types of information would be determined by the city’s Department of Disaster Preparedness and Emergency Communications. Plates 18 and 20 shows the major transportation routes in the city that would be used if an evacuation were necessary.

The City has prepared tsunami evacuation route maps as part of its *Tsunami Preparedness Guide,* available on the City’s website. The *Tsunami Preparedness Guide* also provides information on disaster preparedness, such as the emergency alert system (AlertLongBeach) and the City’s real-time Twitter feed, preparation of an emergency kit, purchasing NOAA weather radios, and moving to high ground if a tsunami occurs. Designated tsunami evacuation routes are shown on Plate 21 (City of Long Beach 2017b).

For the most part, evacuation of any portion of the City would be accomplished by private automobile. Senior citizens, low-income residents, hospital patients, and others, however, may not have immediate access to private transportation. To provide mobility for these groups, the disaster director has the authority to direct all public buses to the evacuation area.

In the event of a major earthquake, extensive land areas throughout the City may be affected. It is conceivable that numerous traffic corridors could be severed. Freeways, in particular, have proven to be unreliable sources of passage. Primarily because of the numerous bridge structures, freeways often survive poorly during major quakes. The partial collapse of any one-bridge structure or embankment fill cripples that artery. Also some, but probably not all, roads which pass below or over freeways will not be passable after a major event. Should damages be that extensive, the City could be isolated in terms of ingress or egress. As it would involve a great deal of time to repair these roadways, the

Plate 20. Tsunami Evacuation Routes

Source: City of Long Beach 2017b

problem could arise of sustaining the population with food staples, medical supplies, and other essentials. However, Long Beach is fronted by water and has airport facilities. Should the streets and freeway systems be so impaired as to cut-off supplies from other areas, access to the City is possible by water or air.

Because the city is fully built-out and is highly urbanized, all of the residential communities in the city generally have multiple (at least two) ingress and egress points.

7.1.4 Community Resources

Within the City there are numerous physical resources, which could be utilized to provide needed shelter, medical treatment, or other necessary services. In terms of protection, there are 220 licensed fallout shelters in the City. For hospital care, Long Beach is served by 10 separate institutions: Memorial, St. Mary's, Community, Pacific, Veterans, Los Altos, Woodruff Community, U.S. Naval, El Cerrito, and Long Beach General. Furthermore, the City has established 13 First Aid Centers. Most of these centers are school or public facilities, which can be quickly converted for this use. Emergency Shelters can also be provided throughout the City at various recreation facilities. (**Error! Reference source not found.**19 shows the locations of Hospitals, First Aid Centers, and Emergency Shelters.) The Queen Mary is another community resource, which could shelter and protect an estimated 8,000 people if necessary. In addition to the above, Long Beach has numerous auxiliary and convalescent hospitals which could be used for treatment and care of disaster victims.

7.1.5 Disaster Assistance

Emergency Preparedness in Long Beach is an integral part of an overall system, which connects the City with higher levels of Government. The City may call upon the County, State of California, or the Federal Government to obtain assistance in handling any disaster. Los Angeles County is sub-divided into seven civil defense areas, with Long Beach, Lakewood, and Signal Hill being Area "F". Civil Defense operations from other jurisdictions will provide recovery aid should it be warranted under the State's Mutual Aid Pact. Both the State and

Federal governments have established programs allowing local communities to apply for financial and other types of assistance. Monies may be allocated to local communities when a major disaster occurs. Assistance formulas are set forth based upon the type and degree of disaster. Through the various State and Federal agencies and private organizations, individuals affected by the disaster may be eligible for grants, food stamps, commodity programs, unemployment compensation, temporary housing, rent and mortgage payment, legal aid, and so forth.

7.1.6 Disaster Exercises

So as to assure a state of readiness, the City's Department of Emergency Preparedness conducts periodic disaster exercises. City personnel form every department are assigned to participate in the drills, performing functions comparable to those, which may be required in a time of actual emergency. Various conceivable disasters are then simulated so that alternative solutions may be tested. Most recently the City conducted a disaster simulation exercise in conjunction with the University of Southern California and the System Development Corporation. This was part of a research effort to develop guidelines for the response of government to natural disasters. The research was designed to improve conceptual planning for the operational management of natural disasters. Continual involvement in these types of emergency operations is of great benefit to the City in terms of learning to effectively deal with possible disasters.

7.1.7 Citizen Safety

While the Department of Emergency Preparedness will keep the citizens informed during a time of disaster, the process of evaluating the extent of the problem and mobilizing disaster operations involves time. During a disaster, this time can be precious and can affect the safety and wellbeing of citizens.

Simulated disaster operations, as discussed above, reduce the response time and assure the citizen of a greater degree of safety. Nonetheless, it is essential that citizens themselves become aware of how to prepare for and react to an emergency situation. Citizen awareness information related to disaster preparedness is available on the City's website.

The Departments of Emergency Preparedness, Fire, Police and Health now have public education programs. Greater emphasis upon public awareness, however, is always warranted. Through the media, the public education programs, citizen participation, and other lines of communication, a greater dissemination of Safety information should be implemented.

In an effort to assure immediate emergency services, in 1972 the State of California adopted legislation requiring Cities to establish a "911" emergency telephone system. Through the "911" system, all emergency services, including police, fire, ambulance and medical assistance, can be obtained by dialing a single number: 911. During a time of disaster, this system will provide citizens a direct line of communications with disaster coordinators. Residents of Long Beach may also sign up to receive emergency alerts via phone, text, or email through the city's AlertLongBeach system. The city's Twitter feed and Facebook page also provide information during an emergency.

7.2 GOALS, OBJECTIVES, AND POLICIES

The City's goal, objective, and policies related to disaster operations are presented below. Additional detail regarding hazard mitigation and emergency operations is presented in the City's Local Hazard Mitigation Plan and Emergency Operations Plan, which are both updated periodically, and are incorporated by reference by the General Plan.

Goal PHS 7-1. To protect lives and property and restore a viable and functional economy following a disaster.

Policy PHS 7.1-1: Keep the public informed in the event of a disaster, maintain communications with national and regional emergency response agencies, and effectively coordinate service operators and field workers.

Policy PHS 7.1-2: Develop and maintain alternative evacuation and emergency response strategies for earthquakes, tsunamis and other types of flooding, major fires, and chemical explosions.

Policy PHS 7.1-3: Coordinate with other emergency service agencies to prepare for, and ensure evacuation of senior citizens, hospital patients, elderly care home residents, school children, and other residents and visitors that are unable to operate a vehicle or do not have access to private transportation.

Policy PHS 7.1-4: Ensure adequate emergency shelter capacity, medical treatment, and other necessary services during and following a disaster, including planning for the conversion of facilities not normally used for emergency shelter or medical treatment for this use, as needed.

Policy PHS 7.1-5: Conduct periodic disaster exercises, including participation in drills that include functions comparable to those which may be required in a time of actual emergency and simulations to test alternative solutions.

Policy PHS 7.1-6: The City's seismic event planning and preparation will be geared to coping with the maximum probable catastrophe.

Policy PHS 7.1-7: New developments will be evaluated and conditioned, as necessary, to provide adequate emergency access and evacuation routes, including at least two directions of ingress and egress for all structures or grouping of structures.

CHAPTER 8

IMPLEMENTATION STRATEGIES

8. IMPLEMENTATION STRATEGIES

This chapter of the Safety Element includes proposed strategies aimed at promoting and protecting public safety and environmental health. While many actions related to safety are assigned through the City's Local Hazard Mitigation Plan, Climate Action and Adaptation Plan, and Emergency Operations Plan, to achieve the goals and advance the policies in this Safety Element, the City of Long Beach will budget for, implement, and annually report on multiple-pronged initiatives – some necessarily in collaboration with other public agencies.

8.1 SAFETY ELEMENT IMPLEMENTATION MEASURES

Implementation Measure PHS-1: Implement the requirements of the Uniform Building Code and the California Building Standards Code to reduce seismic and geologic hazards.

Implementation Measure PHS-2: Regularly update the City's Storm Drainage Master Plan to ensure the key infrastructure improvements are identified and implemented.

Implementation Measure PHS-3: Update and augment City floodplain regulations as necessary to limit, elevate, or provide floodproofing standards for development in areas designated as vulnerable to flooding in order to minimize physical damage to development.

Implementation Measure PHS-4: Promote public awareness of flood zones and tsunami inundation areas through educational programs and make information publicly available on the City's website.

Implementation Measure PHS 5: Enforce and update, as needed, existing codes and ordinances regarding fire prevention and protection, including building inspection, clearances around structures, and street widths and turning radii.

Implementation Measure PHS 6: Incorporate compatibility issues related to transportation systems, utilities, and industrial land uses into land use planning and zoning updates to reduce harmful exposure to pollutants, prioritizing land use and zoning changes that would benefit sensitive receptors within disadvantaged communities.

Implementation Measure 7: The City will collaborate with the Air District, California Air Resources Board, the U.S. Environmental Protection Agency, and the Port of Long Beach to reduce exposure to harmful air pollution from refineries, hydrogen production and sulfur recovery, oil drilling and production, marine ports, trucks, and railyards with a priority on improvements that would focus on homes, schools, and childcare facilities within disadvantaged communities.

Implementation Measure 8: Implement and, as needed, update the City's Climate Action and Adaptation Plan.

Implementation Measure 9: Expand access to public sources of clean drinking water and cooling centers and improve access to cooling centers for the elderly and persons with disabilities.

Implementation Measure 10: Continue to implement local programs and participate in regional and State efforts to disseminate information to the public regarding safety hazards.

Implementation Measure 11: Update the City's Emergency Operations Plan to identify alternative evacuation and emergency response strategies and routes for earthquakes, tsunamis, major fires, leakage of dangerous fuels, chemical explosions, and flooding.

Implementation Measure 12: Conduct periodic emergency response training and exercises, and identify additional resources, technology, coordination, communication, and other needs to improve emergency response.

Implementation Measure 13: Communicate and coordinate with agencies in the region to ensure efficient and effective sharing of resources for disaster response.

BIBLIOGRAPHY

BIBLIOGRAPHY

California Department of Forestry and Fire Protection. 2021. Fire Hazard Severity Zone Viewer. Available: https://egis.fire.ca.gov/FHSZ/. Accessed December 8, 2021.

California Department of Water Resources. 2021. Best Available Map Viewer. Available: https://gis.bam.water.ca.gov/bam/. Accessed December 14, 2021.

California Department of Water Resources, Division of Safety of Dams. 2021. Dam Breach Inundation Maps. Available: https://fmds.water.ca.gov/webgis/?appid=dam_prototype_v2. Accessed January 6, 2022.

California Energy Commission and U.C. Berkeley. 2021. Cal-Adapt. Available: https://cal-adapt.org/tools/local-climate-change-snapshot. Accessed December 16, 2021.

California Geological Survey. 1998 (updated 2006). *Seismic Hazard Zone Report for the Long Beach 7.5-Minute Quadrangle, Los Angeles County, California*. Seismic Hazard Report 028. California Geological Survey. Los Angeles, CA.

———.2016a. Historic Earthquakes: 1769 to 2015 – California (Magnitude 5.0-plus). Map Sheet (MS) 48: Earthquake Shaking Potential for California. https://maps.conservation.ca.gov/cgs/DataViewer/. Accessed December 2, 2021.

———.2016b. Seismic Ground Shaking. Map Sheet (MS) 48: Earthquake Shaking Potential for California. https://maps.conservation.ca.gov/cgs/DataViewer/. Accessed December 2, 2021.

———. 2018a. Seismic Hazards Program: Alquist-Priolo Fault Hazard Zones. Available: https://maps.conservation.ca.gov/cgs/DataViewer/. Accessed December 2, 2021.

———. 2018b. Liquefaction Zones of Required Investigation. Available: https://maps.conservation.ca.gov/cgs/DataViewer/. Accessed December 2, 2021.

———. 2018c. Landslide Zones of Required Investigation. Available: https://maps.conservation.ca.gov/cgs/DataViewer/. Accessed December 2, 2021.

———. 2021. California Landslide Inventory and Deep-Seated Landslide Susceptibility. Available: https://maps.conservation.ca.gov/cgs/lsi/app/. Accessed January 3, 2022.

California Geological Survey, California Governor's Office of Emergency Services, and AECOM. 2021. *Tsunami Hazard Area Map, Los Angeles County, CA*. Available: https://www.conservation.ca.gov/cgs/tsunami/maps#counties. Accessed December 6, 2021.

City of Long Beach. [2005] *City of Long Beach Modeled Stormwater System.* City of Long Beach Stormwater Master Plan, Drainage Maps. Available: https://longbeach.gov/globalassets/pw/media-library/documents/resources/stormwater-management/reports/maps/stormwater-system-maps-1-22. Accessed December 14, 2021.

———. 2004. *General Plan Safety Element Update, Fire Hazard Areas.* Available: https://www.longbeach.gov/lbds/planning/advance/general-plan/. Accessed December 8, 2021.

———. 2017a. *Hazard Mitigation Plan.* Available: https://www.longbeach.gov/globalassets/disaster-preparedness/media-library/documents/home/longbeach-hazard-mitigation-plan. Accessed December 3, 2021.

———. 2017b. *Tsunami Preparedness Guide.* Available: https://www.tsunamizone.org/wp-content/themes/tsunami/downloads/LBC_Tsunami_Map.pdf. Accessed December 8, 2021.

———. 2020. Draft Climate Action and Adaptation Plan. Available: https://www.longbeach.gov/lbds/planning/caap/. Accessed December 14, 2021.

———. 2021a. Long Beach Energy Resources, About Us, Oil. Available: https://www.longbeach.gov/energyresources/about-us/oil/subsidence/. Accessed December 15, 2021.

———. 2021b. Locations of Critical Facilities in Long Beach. Data provided by the City of Long Beach to AECOM in December 2021.

———. 2021c. Long Beach Fire Department, Station Locations. Available: https://www.longbeach.gov/fire/about-us/station-locations/. Accessed December 28, 2021.

———. 2021d. City of Long Beach Housing Element, Appendix A, citing to Source: U.S. Census Bureau, American Community Survey (ACS), 2015-2019, 5-year Estimates. Available: https://longbeach.gov/globalassets/lbds/media-library/images/planning/housing-element-update/he-adopted-plan-appendix. Accessed March 1, 2022.

Federal Emergency Management Agency. 2021. Flood Map Service Center. Available: https://msc.fema.gov/portal/home. Accessed December 14, 2021.

Los Angeles County. 2016. *Los Angeles County Drainage Area Flood Control Map.* Available: https://www.arcgis.com/home/webmap/viewer.html?webmap=562aa84a5f5f4a28af44a185308a70d7&extent=-119.2102,33.5463,-117.1819,34.5284. Accessed January 6, 2022.

———. 2018. Geographic Information Systems, Hazards Mapserver, Dam Inundation Areas. Available: https://public.gis.lacounty.gov/public/rest/services/LACounty_Dynamic/Hazards/MapServer/14. Accessed January 7, 2022.

Los Angeles County Flood Control District. 2016. *Compton Creek Levee Certification, Preliminary Special Flood Hazard Area*. Available: http://www.ladpw.org/wmd/dsp_LeveeCertificationFAQs.cfm. Accessed December 13, 2021.

Los Angeles County Flood Control District. 2021. Los Angeles County Flood Control System, Map Viewer. Available: https://apps.gis.lacounty.gov/dpw/m/?viewer=fcs. Accessed December 14, 2021.

Saucedo, G.J., H.G. Greene, M.P. Kennedy, and S.P. Bezore. 2016. *Geologic Map of the Long Beach 30' x 60' Quadrangle, California.* California Geological Survey. Regional Geologic Map Series, 1:100,000 Scale. Sacramento, CA.

U.S. Army Corps of Engineers. 2018. *Los Angeles County Drainage Area, Whittier Narrows Dam Flood Control Safety Project, Dam Safety Modification Study, Draft Environmental Impact Statement.* Los Angeles District, Los Angeles, CA.

Weldey, E. 1974. *Tsunami Hazards on the Orange County Coastline*. California Division of Mines and Geology, Unpublished Manuscript. Cited in: Woodward-Clyde Consultants, 1988.

Woodward-Clyde Consultants. 1988. *City of Long Beach Seismic Safety Element*. WCC Project No. 8743099A. Santa Ana, CA.