CITY OF NORWALK
A Connected Community

LOCAL HAZARD MITIGATION PLAN

February 2022

TETRA TECH

City of Norwalk Hazard Mitigation Plan

February 2022

PREPARED FOR

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DEFINITIONS/ACRONYMS

°F—Degrees Fahrenheit

0.2 percent-annual-chance flood—The flood that has a 0.2 percent chance of being equaled or exceeded in any given year; often referred to as the 500-year flood

1 percent-annual-chance flood—The flood that has a 1 percent chance of being equaled or exceeded in any given year; often referred to as the 100-year flood

AB—Assembly Bill

ADA—Americans with Disabilities Act

asset—Any man-made or natural feature that has value, including people; buildings; infrastructure, such as bridges, roads, sewers, and water systems; lifelines, such as electricity and communication resources; and environmental, cultural, or recreational features such as parks, wetlands, and landmarks

base flood—The flood having a 1% chance of being equaled or exceeded in any given year, also known as the "100-year" or "1 percent annual chance" flood. The base flood is a statistical concept used to ensure that all properties subject to the National Flood Insurance Program (NFIP) are protected to the same degree against flooding.

basin—The area within which all surface water—whether from rainfall, snowmelt, springs, or other sources—flows to a single water body or watercourse. The boundary of a river basin is defined by natural topography, such as hills, mountains, and ridges. Basins are also referred to as "watersheds."

benefit/cost analysis—A systematic, quantitative method of comparing projected benefits to projected costs of a project or policy. It is used as a measure of cost effectiveness.

benefit—A net project outcome and is usually defined in monetary terms. Benefits may include direct and indirect effects. For the purposes of benefit/cost analysis of proposed mitigation measures, benefits are limited to specific, measurable, risk reduction factors, including reduction in expected property losses (buildings, contents, and functions) and protection of human life.

BRIC—Building Resilient Infrastructure and Communities

CAL FIRE—California Department of Forestry and Fire Protection

Cal OES—California Office of Emergency Services

capability assessment—An analysis of a community's capacity to address threats associated with hazards. The assessment includes two components: an inventory of an agency's mission, programs, and policies, and an analysis of its capacity to carry them out.

CCR—California Code of Regulations

CDBG-DR—Community Development Block Grant Disaster Recovery grants

CDC—Centers for Disease Control and Prevention

CEQA—California Environmental Quality Act

CFR—Code of Federal Regulations

cfs—Cubic feet per second

CIP—Capital Improvement Program

climate change—A change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels.

Community Rating System (CRS)—A voluntary program under the NFIP that rewards participating communities (provides incentives) for exceeding the minimum requirements of the NFIP and completing activities that reduce flood hazard risk by providing flood insurance premium discounts.

critical facilities—Facilities and infrastructure that are critical to the health and welfare of the population. These become especially important after any hazard event occurs.

CWA—Clean Water Act

dam failure—An uncontrolled release of impounded water due to a partial or complete breach in a dam (or levee) that impacts its integrity.

dam—Any artificial barrier or controlling mechanism that can or does impound or divert water.

debris flow—Dense mixtures of water-saturated debris that move down-valley, looking and behaving much like flowing concrete. They form when loose masses of unconsolidated material are saturated, become unstable, and move down slope. The source of water varies but includes rainfall, melting snow or ice, and glacial outburst floods.

DFIRM—Digital Flood Insurance Rate Map

Disaster Mitigation Act (DMA; Public Law 106-390)—The latest federal legislation enacted to encourage and promote proactive, pre-disaster planning as a condition of receiving certain federal financial assistance.

drought—The cumulative impacts of long periods of dry weather. These can include deficiencies in surface and subsurface water supplies and general impacts on health, well-being, and quality of life.

EAP—Emergency action plan

earthquake—The shaking of the ground caused by an abrupt shift of rock along a fracture in the earth or a contact zone between tectonic plates.

ecosystem services— An ecosystem service is any positive benefit that wildlife or ecosystems provide to people. The benefits can be direct or indirect—small or large.

EMPG—Emergency Management Performance Grant

EPA—U.S. Environmental Protection Agency

epidemic—The spread of an infectious disease beyond a local population, reaching people in a wider geographical area. Several factors determine whether an outbreak will

become an epidemic: the ease with which the disease spreads from vectors, such as animals, to people, and the ease with which it spreads from person to person.

ESA—Endangered Species Act

exposure—Exposure is defined as the number and dollar value of assets considered to be at risk during the occurrence of a specific hazard.

extent—The extent is the size or location of an area affected by a hazard. For hazards that do not have a clearly defined extent, the definition expands to the strength or magnitude (severity) of the hazard. For hazards that do not have mapping in this plan, extent is addressed by the severity discussion of the hazard profile.

extreme heat—Temperatures that hover 10 ºF or more above the average high temperature for a region and last for several days.

FBI—Federal Bureau of Investigation

federal disaster declaration—Declarations for events that cause more damage than state and local governments and resources can handle without federal government assistance. A federal disaster declaration puts into motion long-term federal recovery programs, some of which are matched by state programs, to help disaster victims, businesses, and public entities.

FEMA—Federal Emergency Management Agency

FERC—Federal Energy Regulatory Commission

flash flood—A flood that occurs with little or no warning when water levels rise at an extremely fast rate

Flood Insurance Rate Map (FIRM)—The official maps on which the Federal Emergency Management Agency delineate the Special Flood Hazard Area.

Flood Insurance Study—A report published by the Federal Insurance and Mitigation Administration for a community in conjunction with the community's Flood Insurance rate Map. The study contains such background data as the base flood discharges and water surface elevations that were used to prepare the FIRM. In most cases, a community FIRM with detailed mapping will have a corresponding flood insurance study.

floodplain—The land area along the sides of a river that becomes inundated with water during a flood.

flood—The inundation of normally dry land resulting from the rising and overflowing of a body of water.

FMA—Flood Mitigation Assistance grant program

freeboard—The margin of safety added to the base flood elevation.

frequency—How often a hazard of specific magnitude, duration, and/or extent is expected to occur on average. Statistically, a hazard with a 100-year frequency is expected to occur about once every 100 years on average and has a 1 percent chance of occurring any given year. Frequency reliability varies depending on the type of hazard considered.

g—Gravity (%g, percent acceleration force of gravity)

geographic information system (GIS)—A computer software application that relates data regarding physical and other features on the earth to a database for mapping and analysis.

goal—A general guideline that explains what is to be achieved. Goals are usually broad-based, long-term, policy-type statements and represent global visions. Goals help define the benefits that a plan is trying to achieve. The success of a hazard mitigation plan is measured by the degree to which its goals have been met (that is, by the actual benefits in terms of actual hazard mitigation).

greenhouse gases—Methane, nitrous oxide and other gases that trap heat and warm the Earth, as a greenhouse traps heat from the sun.

ground shaking—The result of rapid ground acceleration caused by seismic waves passing beneath buildings, roads, and other structures.

hazard—A source of potential danger or adverse condition that could harm people and/or cause property damage.

HMGP—Hazard Mitigation Grant program

hazardous material—A substance or combination of substances (biological, chemical, radiological, and/or physical) that, because of its quantity, concentration, or physical, chemical or infectious characteristics, has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors.

Hazards U.S. Multi-Hazard Loss Estimation Program (Hazus)—A GIS-based program used to support the development of risk assessments as required under the DMA. The Hazus software program assesses risk in a quantitative manner to estimate damage and losses associated with natural hazards.

high-hazard dam—Dams that can cause loss of human life from the failure or improper operation of the dam.

HSGP—Homeland Security Grant Program

intensity—The measure of the effects of a hazard.

inventory—The assets identified in a study region comprise an inventory. Inventories include assets that could be lost when a disaster occurs, and community resources are at risk. Assets include people, buildings, transportation, and other valued community resources.

IPCC—Intergovernmental Panel on Climate Change

liquefaction—Loosely packed, water-logged sediments losing their strength in response to strong shaking, causing major damage during earthquakes.

local government—Any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and

any rural community, unincorporated town or village, or other public entity.

magnitude—The measure of the strength of an earthquake.

meteorological drought—Precipitation at levels below normal over a period of time. Meteorological measurements are the first indicators of drought and are usually region-specific.

mitigation actions—Specific actions to achieve goals and objectives that minimize the effects from a disaster and reduce the loss of life and property.

mitigation—A preventive action taken in advance of an event to reduce or eliminate risk to life or property.

Mw—Moment Magnitude Scale

N/A—Not applicable

NASA—National Aeronautics and Space Administration

NCEI—National Centers for Environmental Information

NEHRP—National Earthquake Hazard Reduction Program

NFIP—National Flood Insurance Program

NMDC—National Drought Mitigation Center

NOAA—National Oceanic and Atmospheric Administration

NWS—National Weather Service

pandemic—An epidemic of infectious disease that has spread through human populations across a large region, multiple continents, or worldwide.

peak ground acceleration (PGA)—A measure of the highest amplitude of ground shaking that accompanies an earthquake, based on a percentage of the force of gravity.

PGA—Peak Ground Acceleration

ppm—Part per million

preparedness—Actions that strengthen the capability of government, people, and communities to respond to disasters.

probability of occurrence—A statistical measure or estimate of the likelihood that a hazard will occur. This probability is generally based on past hazard events in the area and a forecast of events that could occur in the future. A probability factor based on yearly values of occurrence is used to estimate probability of occurrence.

repetitive loss property—Any NFIP-insured property that, since 1978 and regardless of any changes of ownership during that period, has experienced—Four or more paid flood losses in excess of $1000.00; or two paid flood losses in excess of $1000.00 within any 10-year period since 1978; or three or more paid losses that equal or exceed the current value of the insured property.

recurrence interval —The recurrence interval (sometimes called the return period) is based on the probability that the given event will be equaled or exceeded in any given year.

residual risk—The risk that remains after controls are accounted for.

risk—The estimated impact that a hazard would have on people, services, facilities, and structures in a community. Risk measures the likelihood of a hazard occurring and resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage above a particular threshold due to occurrence of a specific type of hazard. Risk also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

risk assessment—The process of measuring potential loss of life, personal injury, economic injury, and property damage resulting from hazards. This process assesses the vulnerability of people, buildings, and infrastructure to hazards

risk ranking—Process to score and rank hazards based on the probability that they will occur and the impact they will have if they do.

riverine—Of or produced by a river. Riverine floodplains have readily identifiable channels.

Robert T. Stafford Act—The statutory authority for most federal disaster response activities, especially as they pertain to FEMA and its programs (Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 100-107). Signed into law November 23, 1988; amended by the Disaster Relief Act of 1974 (Public Law 93-288).

SEMS—Standardized Emergency Management System

SFHA—Special Flood Hazard Area

significant-hazard dam—Dams that can cause economic loss, environmental damage, or disruption of lifeline facilities, or can impact other concerns, but not necessarily loss of life.

special flood hazard area—The base floodplain delineated on a Flood Insurance Rate Map. The SFHA is mapped as a Zone A in riverine situations and zone V in coastal situations. The SFHA may or may not encompass all of a community's flood problems

stakeholder—Business leaders, civic groups, academia, non-profit organizations, major employers, managers of critical facilities, farmers, developers, special purpose districts, and others whose actions could impact hazard mitigation.

surface fault rupture—An offset of the ground surface when fault rupture extends to the Earth's surface.

terrorism—The unlawful use or threatened use of force or violence against people or property with the intention of intimidating or coercing societies or governments. Terrorism is either foreign or domestic, depending on the origin, base, and objectives of the terrorist or organization.

transportation incident—A major incident related to a means of transportation such air, rail or highway travel resulting in death, serious injury, or extensive property loss or damage.

USDA—U.S. Department of Agriculture

USDM—U.S. Drought Monitor

USGS—U.S. Geological Survey

vulnerability—Assessment of how exposed or susceptible an asset is to damage. Vulnerability depends on an asset's construction, contents, and the economic value of its functions.

watershed—An area that drains downgradient from areas of higher land to areas of lower land to the lowest point.

Zone C, Zone X—Areas determined to be outside the 1 percent and 0.2 percent annual chance floodplains.

zoning ordinance—Ordinance that designates allowable land use and intensities for a local jurisdiction.

EXECUTIVE SUMMARY

HAZARD MITIGATION OVERVIEW

Hazard mitigation is the use of long-term and short-term policies, programs, projects, and other activities to alleviate the death, injury, and property damage that can result from a disaster. The City of Norwalk has developed a hazard mitigation plan to reduce risks from disasters to the people, property, economy, and environment within the city. The plan complies with federal and state hazard mitigation planning requirements to establish eligibility for funding under Federal Emergency Management Agency (FEMA) grant programs.

PLAN DEVELOPMENT APPROACH

The City of Norwalk Public Safety Department managed the development of the *City of Norwalk Hazard Mitigation Plan.* The planning area for the hazard mitigation plan was defined as the entire incorporated area of the city.

A planning team facilitated the development of this plan, consisting of staff from several departments of the City and a contract consultant. A 14-member steering committee of local stakeholders oversaw the plan development. Coordination with other local, state, and federal agencies involved in hazard mitigation occurred throughout the planning process. The planning team and Steering Committee reviewed previous City planning documents, the 2018 *State of California Multi-Hazard Mitigation Plan*, and existing programs that may support hazard mitigation actions.

The planning team implemented a multi-media public involvement strategy that was approved by the Steering Committee. This plan was drafted during the COVID-19 pandemic, limiting in-person public outreach events, and under an expedited project timeline. Public outreach efforts included a hazard mitigation survey, a project website, the use of social media, distribution of city-wide newsletters, and a public comment period for review of the draft hazard mitigation plan.

Based on the review of existing plans and programs, the input received through the public involvement strategy, the direction of the Steering Committee, and the findings of a new, detailed risk assessment, this hazard mitigation plan meets federal hazard mitigation planning requirements. The California Governor's Office of Emergency Services and FEMA Region IX granted pre-adoption approval of the document, the Norwalk City Council has formally adopted the plan, and FEMA has issued final plan approval.

RISK ASSESSMENT

Risk assessment is the process of measuring the potential loss of life resulting from hazards, as well as personal injury, property damage and environmental damage. The assessment determines a community's overall vulnerability to hazard events. The Steering Committee used the risk assessment to gauge the potential impacts of each natural hazard of concern in the planning area.

For this plan, risk assessment models for natural hazards were based on current data and technologies. The assessment of each hazard of concern includes discussion of the following:

- Hazard identification and profile
- The impact of hazards on the population, property, and the environment
- Specific areas of vulnerability
- The estimated cost of potential damage, where applicable

RISK RANKING

Based on the risk assessment, natural hazards were ranked for the risk they pose to the overall planning area as listed in Table ES-1. Three other hazards of interest—public health incidents, terrorism, and cybersecurity threats—also were also reviewed for this plan, but their risk was not fully assessed and they were not included in the risk ranking.

Table ES-1. Hazard Risk Ranking

Hazard Ranking	Hazard Event (score)	Category
1	Earthquake (54)	High
2	Dam Failure (36)	High
3	Drought/ Extreme Heat (27)	Medium
4	Flooding (17)	Medium

MISSION STATEMENT, GOALS, AND OBJECTIVES

The Steering Committee determined the need for a mission statement for the current plan, reviewed several example mission statements, and approved the following as the statement through consensus of the Steering Committee members:

> The mission of the City of Norwalk Hazard Mitigation Plan is to establish and promote a mitigation policy and program to protect City residents and the business community, their property, public facilities, lifelines, and the environment from hazards.

The Steering Committee determined the following goals for this hazard mitigation plan:

1. Protect health and safety by minimizing the potential for loss of life and injury
2. Protect property by minimizing the potential for damage and increasing the resilience of infrastructure and lifelines
3. Protect the economy by minimizing financial impacts and public expenses due to hazards
4. Protect the environment

5. Increase community awareness by developing a public understanding of hazards along with methods to reduce community vulnerability

The Steering Committee identified the following objectives for the current hazard mitigation plan:

1. Minimize the disruption of local government operations caused by hazards
2. Develop and provide updated information regarding threats, hazards, vulnerabilities, and mitigation strategies to public, private entities
3. Inform the public of exposure risks and hazards, along with ways to increase capacity to prevent, respond to, recover from, and mitigate impacts
4. Establish and maintain partnerships that identify and implement hazard mitigation measures
5. Encourage the incorporation of hazard mitigation best practices into plans, codes, projects, development, and regulatory standards
6. Advance community and environmental sustainability through preparation and participation in state, regional and local projects
7. Enhance emergency response capabilities and improve systems that provide warning and emergency communications
8. Ensure equitable access by and inclusion of the whole community to all hazard mitigation information, practices, planning, and benefits

MITIGATION ACTION PLAN

Mitigation actions presented in this plan are designed to reduce or eliminate losses resulting from hazard events. The development process resulted in the identification of 16 mitigation actions. Many of these actions are within the current capabilities of the City of Norwalk, resulting in a high priority for implementation over the next five years. Table ES-2 summarizes the actions and their priority for implementation and for seeking grant funding.

IMPLEMENTATION AND MAINTENANCE

Plan implementation will occur over the next five years as City departments begin to implement the actions identified in this plan. Full implementation of the recommendations will require time and resources. The measure of the plan's success will be its ability to adapt to changing conditions. The framework established by this plan prioritizes actions whose benefits exceed their cost.

The Steering Committee developed a plan maintenance strategy that includes annual progress reporting, a strategy for continued public involvement, a commitment to plan integration with other relevant plans and programs, and continued oversight from a plan maintenance steering committee.

Table ES-2. Mitigation Action Plan

Action Number and Description	Priority for Implementation	Priority for Pursuing Grants
Action NOR-1—Develop and conduct a multi-hazard seasonal public awareness program for the residents of the Norwalk community.	High	Medium
Action NOR-2—Develop and conduct a seismic vulnerability study of Norwalk's critical facilities and infrastructure.	Medium	High
Action NOR-3—Assess the City's stormwater facilities for their capacity, capability, and functionality during extreme storm events.	Medium	High
Action NOR-4—Acquire emergency generators for critical facilities and infrastructure that lack backup power capability.	Medium	High
Action NOR-5—Develop and conduct a risk assessment plan for soft story buildings in the City of Norwalk.	Medium	High
Action NOR-6—Develop the City of Norwalk's capacity to integrate geographic information system (GIS) hazard mapping into planning documents.	High	Medium
Action NOR-7—Provide information to new home and property buyers on earthquake, fire, and multi-hazard safety.	High	N/A
Action NOR-8—Develop and implement a climate action/adaptation plan for the City of Norwalk.	High	High
Action NOR-9—Coordinate with appropriate stakeholders on the strengthening and/or retrofitting of the Whittier Narrows Dam.	High	N/A
Action NOR-10—Evaluate long-term capacity and capability of the City's designated cooling centers and shelters.	High	High
Action NOR-11—Investigate and evaluate flood control systems, including but not limited to permeable pavement and catchwater systems, that can address urban flooding and stormwater surges.	Medium	High
Action NOR-12—Continue to maintain the City's good standing and compliance under the NFIP through implementation of floodplain management programs that, at a minimum, meet the NFIP requirements: • Enforce the flood damage prevention ordinance. • Participate in floodplain identification and mapping updates. • Provide public assistance/information on floodplain requirements and impacts.	High	N/A
Action NOR-13—To support implementation of any future updates to the City's local hazard mitigation plan and safety element, use the best available local data on hazard extent and location to inform development and redevelopment within the City.	High	N/A
Action NOR-14—Revise the emergency operations plan, including functional annexes, to include new information from the hazard mitigation plan to ensure coordination between the plans.	High	High
Action NOR-15—Acquire mobile camera systems with the ability to deploy at critical facilities to monitor mitigation efforts during incidents. System will be able to deploy at strategic sites throughout the city to monitor areas for early warning detection of hazards such as flooding, earthquake, or man-made issues. System will support implementation of any future updates to the City's local hazard mitigation plan and safety element, use the best available local data on hazard extent and location to inform development and redevelopment within the City.	Medium	High
Action NOR-16—Acquire a GIS mapping tool that can create visual representations of City critical facilities and how they may be impacted by hazards such as flooding, dam failure, earthquakes. The goal is to help identify locations that might be impacted by hazards and to look at strategies to mitigate them.	Medium	High

PART 1—PLANNING PROCESS AND COMMUNITY PROFILE

1. INTRODUCTION TO HAZARD MITIGATION PLANNING

1.1 WHY PREPARE THIS PLAN?

1.1.1 The Big Picture

Hazard mitigation is defined as any action taken to reduce or alleviate the loss of life, personal injury, and property damage that can result from a disaster. It involves long- and short-term actions implemented before, during and after disasters. Hazard mitigation activities include planning efforts, policy changes, programs, studies, improvement projects, and other steps to reduce the impacts of hazards.

The federal Disaster Mitigation Act (DMA) of 2000 emphasizes planning for disasters before they occur. The DMA requires state and local governments to develop hazard mitigation plans as a condition for federal disaster grant assistance. Regulations developed to fulfill the DMA's requirements are included in Title 44 of the Code of Federal Regulations (44 CFR).

The responsibility for hazard mitigation lies with many, including private property owners, commercial interests, and local, state and federal governments. The DMA encourages cooperation among state and local authorities in pre-disaster planning. The planning network called for by the DMA helps local governments to articulate accurate needs for mitigation, resulting in faster allocation of funding and more cost-effective risk-reduction projects.

The DMA also promotes sustainability in hazard mitigation. To be sustainable, hazard mitigation needs to incorporate sound management of natural resources and address hazards and mitigation in the largest possible social and economic context.

1.1.2 Purposes for Planning

The City of Norwalk prepared this DMA-compliant hazard mitigation plan to identify resources, information, and strategies for reducing risk from natural hazards. Elements and strategies in the plan were selected because they meet a program requirement and the intent of the City and its residents to mitigate hazards. The plan will help guide mitigation activities throughout the planning area. It was developed to meet the following needs:

- Meet or exceed program requirements specified under the DMA
- Enable the City of Norwalk to apply for federal grant funding to reduce hazard risk through mitigation
- Fulfill state and federal requirements for hazard mitigation planning
- Create a risk assessment that focuses on the hazards of concern in Norwalk
- Coordinate existing plans and programs so that high-priority projects to mitigate potential disaster impacts are funded and implemented

1.2 WHO WILL BENEFIT FROM THIS PLAN?

All residents, businesses and employees of the City of Norwalk are the beneficiaries of this hazard mitigation plan. The plan reduces risk for those who live in, work in, and visit the City. It provides a viable planning framework for all foreseeable natural hazards. Participation in development of the plan by key stakeholders helped to ensure that the outcomes will be mutually beneficial. The plan's goals and recommendations lay groundwork for the development and implementation of local mitigation activities and partnerships.

1.3 CONTENTS OF THIS PLAN

This hazard mitigation plan is organized into three primary parts:

- Part 1—Planning Process and Community Profile
- Part 2—Risk Assessment
- Part 3—Mitigation Strategy

The following appendices provided at the end of the plan include information or explanations to support the main content of the plan:

- Appendix A—Public outreach materials used in preparation of this plan
- Appendix B—Summary of federal and state regulations and programs pertinent to hazard mitigation
- Appendix C—Descriptions of the sources and methods used to generate hazard maps for this plan
- Appendix D—City of Norwalk resolution adopting this hazard mitigation plan and FEMA final approval letter
- Appendix E—Template for progress reports to be completed as this plan is implemented

Each part of the plan includes elements required under federal guidelines. DMA requirements are cited at the beginning of subsections as appropriate to illustrate compliance. Table 1-1 indicates how the content of the plan meets all 44 CFR planning requirements.

Table 1-1. Plan Content

44 CFR Requirement	How Addressed in This Plan
§201.6(b): In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: • *(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;* • *(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and* • *(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*	The plan development process for this followed the Community Rating System (CRS) 10-step planning process, which features the facilitation of a planning process through an organized steering committee of City departments and 10 stakeholder agencies. The process included a robust commitment to public engagement through all phases using multiple media. Chapter 3 of this plan describes the planning process.
§201.6(c)(2): The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.	Part 2 of the plan includes a robust risk assessment of four identified hazards of concern that could impact the City of Norwalk. It also provides a profile of other "hazards of interest," and profiles possible impacts from climate change on the primary hazards of concern assessed by the plan. The risk assessment includes multiple-scenario modeling for earthquake and flooding. Hazard profiles are standardized for each hazard of concern, so there is uniformity in the discussion of each hazard, and the information provided can support ranking of risk for each jurisdiction.
§201.6(c)(2)(i): [The risk assessment shall include a] description of the … location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.	Assessments of each hazard category include information on past events, location, frequency, severity, warning time, secondary impacts, exposure, vulnerability, future trends, scenarios, and issues.
§201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i). This description shall include an overall summary of each hazard and its impact on the community	Vulnerability was assessed for all hazards of concern. The Hazus computer model was used for the dam failure, earthquake and flood hazards. These were Level 2 (user defined) analyses using city and county data. Site-specific data on City-identified critical facilities were entered into the Hazus model. Hazus outputs were generated for other hazards by applying an estimated damage function to an asset inventory extracted from Hazus.
§201.6(c)(2)(ii): [The risk assessment] must also address National Flood Insurance Program insured structures that have been repetitively damaged floods	As of this plan, the City of Norwalk has no FEMA identified repetitive loss properties. Chapter 9 provides information and statistics on the NFIP for the City of Norwalk
§201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.	A complete inventory of the numbers and types of buildings exposed was generated for each hazard of concern—both critical facilities and infrastructure. Critical facilities were defined for the planning area and were inventoried by exposure. Each hazard chapter provides a discussion of future development trends.
§201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) and a description of the methodology used to prepare the estimate.	Loss estimates in dollars were generated for all hazards of concern. These estimates were generated by Hazus for the dam failure, earthquake, and flood hazards. For the other hazards, loss potential was defined by a range of percentages of replacement cost for the exposed inventory. The asset inventory was generated in Hazus and was the same for all hazards.
§201.6(c)(2)(ii)(C): [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.	There is a discussion of future development trends as they pertain to each hazard of concern. This discussion looks predominantly at the existing land use and the current regulatory environment that dictates this land use.

44 CFR Requirement	How Addressed in This Plan
§201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.	This plan contains a mission statement, five goals, eight objectives, and 14 actions. The actions are department specific and strive to meet multiple objectives. All objectives meet multiple goals and stand alone as components of the plan. A core capability assessment by the City looks at its regulatory, technical, financial, public outreach, National Flood Insurance Program (NFIP) and adaptive capacity capabilities.
§201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.	The mission, goals, and objectives are described in Chapter 13, which are all new for this plan. Goals and objectives stand on their own merit. Each was selected based on its ability to support a higher-level component. Each component was identified based on core capabilities of the City.
§201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.	Chapter 14 includes collections of mitigation best management practices that was developed through a facilitated process that identified the strengths, weaknesses, obstacles and opportunities of the City for each identified hazard of concern. The collections identify actions that manipulate the hazard, reduce exposure to the hazard, reduce vulnerability, and increase mitigation capability. The collections further segregate actions by scale of implementation. A table in the action plan analyzes each action by mitigation type to illustrate the range of actions available.
§201.6(c)(3)(ii): [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program, and continued compliance with the program's requirements, as appropriate.	The City of Norwalk is a voluntary participant of the NFIP and has identified actions showing its commitment to maintain compliance and good standing under the program. The City reviewed its current NFIP programmatic capabilities and included the results in Section 4.3.7.
§201.6(c)(3)(iii): [The mitigation strategy shall describe] how the actions identified in Section ©(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.	Each recommended action is prioritized using a qualitative methodology that looked at the objectives the project will meet, the timeline for completion, how the project will be funded, the impact of the project, the benefits of the project and the costs of the project. This prioritization scheme is detailed in Chapter 15.
§201.6(c)(4)(i): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.	Chapter 16 of this plan includes a detailed plan maintenance strategy centered on a bi-annual progress report maintained by the City, and a schedule to begin the plan revision in the fourth year of the 5-year performance period of the plan.
§201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.	Chapter 16 details recommendations for incorporating the plan into other planning mechanisms, such as: • General plan • Emergency operations plan • Capital improvement programs • Municipal code Specific current and future plan and program integration activities are detailed in the capability assessment in Chapter 5.
§201.6(c)(4)(iii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.	Chapter 16 details a comprehensive strategy for continuing public involvement developed by the Steering Committee.
§201.6(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commission, Tribal Council).	Chapter 16 includes all formal adoption and FEMA plan approval documentation.

2. PLAN DEVELOPMENT APPROACH

2.1 CITY FUNDING

This planning effort was funded by a FEMA Hazard Mitigation Grant Program (DR-4407-0031-P) planning grant that covered 75 percent of the cost of the project. The remaining 25 percent of the project costs were borne by the City through cash or in-kind contributions. The City of Norwalk Public Safety Department managed the project.

2.2 FORMATION OF THE PLANNING TEAM

The City of Norwalk selected Tetra Tech, Inc. through its standard procurement protocol to assist with development and implementation of the plan. The Tetra Tech lead planner reported directly to the City of Norwalk project manager. A planning team was formed to lead the planning effort, made up of the following members:

- Eric Wosick, Public Safety Lieutenant, City of Norwalk
- Gabriela Garcia, Management Analyst, City of Norwalk
- Grissel Chavez, Director of Public Safety, City of Norwalk
- Christine Roberto, Public Services Manager, City of Norwalk
- Jessica Serrano, Planning Manager, City of Norwalk
- Rob Flaner, Tetra Tech (Project Manager)
- Bart Spencer, Tetra Tech (Lead Project Planner)
- Carol Baumann, Tetra Tech (Risk Assessment Lead)
- Jeana Gomez, Tetra Tech (Public Outreach Lead)
- Desmian Alexander, Tetra Tech (Support Planner)

The planning team coordinated regularly during the project to track plan development milestones and to identify meeting content for a steering committee established to help with development of the plan. The planning team met a total of 15 times over the nine-month planning process. Planning team meeting summaries are available for review from the City.

2.3 DEFINING THE PLANNING AREA

The planning area consists of the incorporated area within the Norwalk city limits. Relevant planning area characteristics are described in Chapter 3. The defined planning area is shown in Figure 2-1.

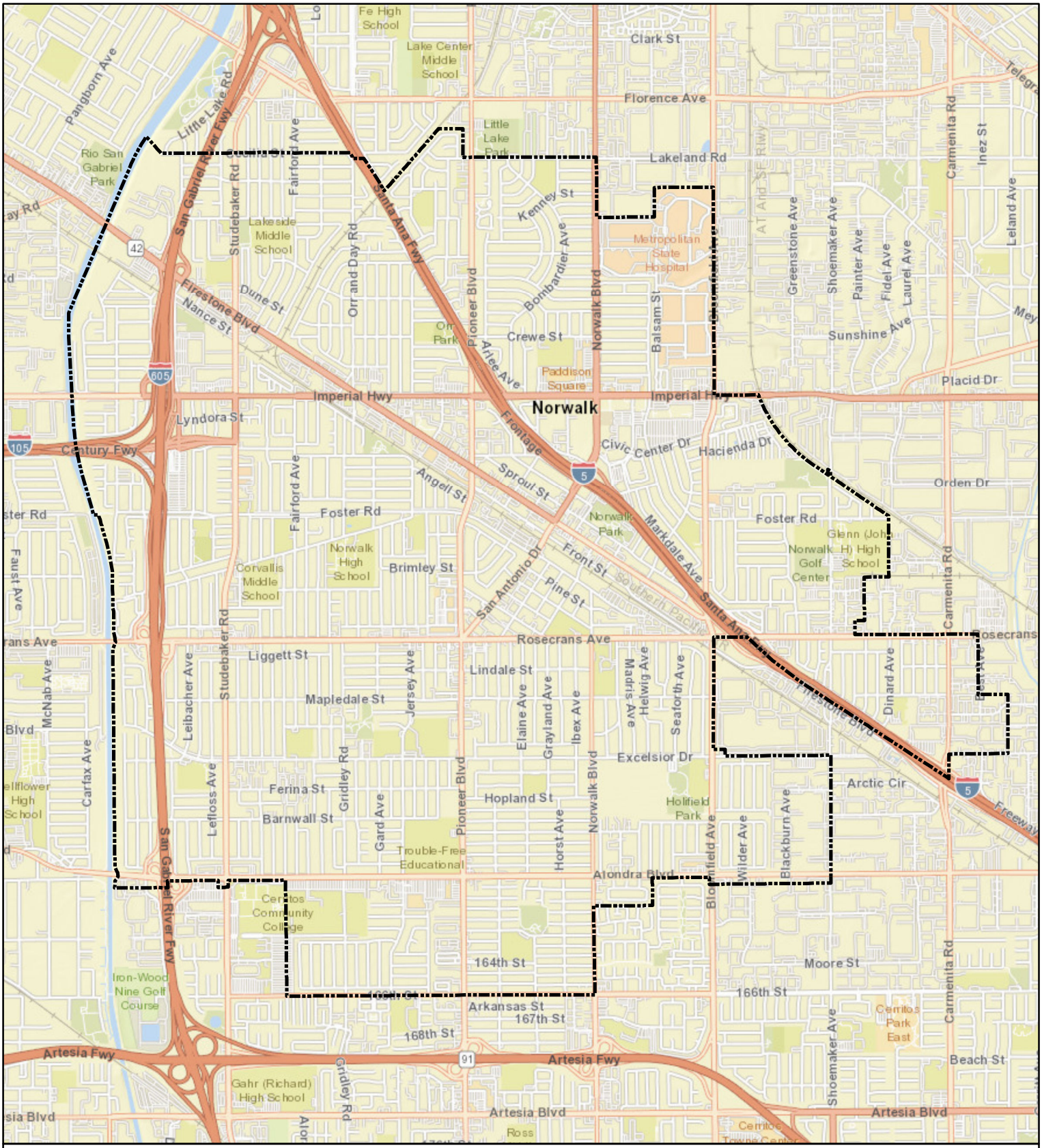


Figure 2-1. Planning Area for the Hazard Mitigation Plan

City Boundary

N

0 0.4 0.8 Miles

Data Sources: Esri, City of Norwalk

2.4 THE STEERING COMMITTEE

A steering committee was formed to oversee all phases of the development of this plan. The members of this committee included key City of Norwalk staff, residents, and other stakeholders from within the planning area. The planning team assembled a list of candidates representing interests within the planning area that could have recommendations for the plan or be impacted by its recommendations. The team confirmed a committee of 14 members at a planning kickoff meeting. Table 2-1 lists the Steering Committee members.

Table 2-1. Steering Committee Members

Name	Department or Agency	Title
Gabriela Garcia (Co-Chair)	City of Norwalk	Management Analyst
Eric Wosick (Co-Chair)	City of Norwalk	Public Safety Lieutenant
Julia Emerson	SoCal Gas	Public Affairs Manager
Noe Garcia	Los Angeles County Sheriff's Department	Lieutenant
Louis Gaytan	Los Angeles County Fire Department	Firefighter
Koi Dao	Los Angeles County Fire Department	Firefighter
Wendy Bruget	Athens Services	Government Affairs Liaison
David Ashman	Disaster Management Area E	Disaster Management Area Coordinator
Albert Rivera[a]	Golden State Water District	Superintendent
Alison Vai	Liberty Utilities	Program Manager
Dr. William Crean	Little Lake City School District	Superintendent
Elaine Williams	Norwalk La Mirada Unified School District	Chief, School Safety
John Lopez	Norwalk La Mirada Unified School District	Superintendent
Adrian Garcia	SoCal Edison	Government Relations Manager

a. Resigned from Steering Committee after second meeting due to other commitments.

Leadership roles and ground rules were established during the Steering Committee's initial meeting on February 12, 2021. The Steering Committee agreed to meet for one hour on the second Friday of every month through the course of the plan's development. The planning team facilitated each Steering Committee meeting, which addressed a set of objectives based on the work plan established for the planning process. The Steering Committee met five times from February through September 2021. All meetings were open to the public, and agendas and meeting summaries are provided in Appendix A.

2.5 COORDINATION WITH STAKEHOLDERS AND AGENCIES

Opportunities for involvement in the planning process must be provided to neighboring communities, local and regional agencies involved in hazard mitigation, agencies with authority to regulate development, businesses, academia, and other private and nonprofit interests (44 CFR, Section 201.6(b)(2)). This task was accomplished by the planning team as follows:

- **Steering Committee Involvement**—Agency representatives were invited to join the Steering Committee.
- **Agency Notifications**—The following agencies were invited to participate in the plan development process from the beginning and were kept apprised of plan development milestones:
  - American Red Cross, Los Angeles Region
  - California Department of Water Resources

- California Office of Emergency Services
- City of Artesia
- City of Bellflower
- City of Cerritos
- City of Santa Fe Springs
- Disaster Management Area E Coordinator
- FEMA Region IX
- Golden State Water District
- Little Lake City School District
- Los Angeles County Fire Department
- Los Angeles County Office of Emergency Management
- Los Angeles County Public Works
- Los Angeles County Sheriff's Department
- Norwalk Chamber of Commerce
- Norwalk La Mirada Unified School District
- U.S. Army Corps of Engineers, Los Angeles District

These agencies received meeting announcements, meeting agendas, and meeting minutes by e-mail throughout the plan development process. Some of them supported the effort by attending meetings or providing feedback on issues.

- **Pre-Adoption Review**—All the agencies listed above were provided an opportunity to review and comment on this plan during the public comment period, primarily through the hazard mitigation plan website. Each agency was sent an e-mail message informing them that draft portions of the plan were available for review. In addition, the complete draft plan was sent to the California Governor's Office of Emergency Services (Cal OES) and FEMA for a pre-adoption review to ensure program compliance.

2.6 REVIEW OF EXISTING PROGRAMS

Hazard mitigation planning must include review and incorporation, if appropriate, of existing plans, studies, reports, and technical information (44 CFR, Section 201.6(b)(3)). Chapter 4 of this plan provides a review of laws and ordinances in effect within the planning area that can affect hazard mitigation actions, including an assessment of all City of Norwalk regulatory, technical, and financial capabilities to implement hazard mitigation actions. In addition, the following programs and plans can affect mitigation within the planning area:

- City of Norwalk Emergency Operations Plan
- Norwalk Municipal Code
- Norwalk Capital Improvement Program
- Norwalk General Plan
  - Land Use Element
  - Housing Element
  - Conservation Element
  - Open Space Element
  - Safety Element
- Economic Development Opportunities Plan, 2018
- 2017 Los Angeles County Fire Code (Title 32 of the Los Angeles County Code)
- Los Angeles County Code

- California Fire Code
- 2016 California Building Code
- California Clean Air Act
- California State Hazard Mitigation Forum
- Title 24 California Energy Code 2016 Edition
- California Green Building Standards 2016 Edition

2.7 PUBLIC INVOLVEMENT

Broad public participation in the planning process helps ensure that diverse points of view about the planning area's needs are considered and addressed. The public must have opportunities to comment on disaster mitigation plans during the drafting stages and prior to plan approval (44 CFR, Section 201.6(b)(1)).

2.7.1 Strategy

The strategy for involving the public in this plan emphasized the following elements:

- Include members of the public on the Steering Committee
- Use a survey to determine if the public's perception of risk and support of hazard mitigation has changed since the previous planning process
- Attempt to reach as many planning area residents as possible through the following activities:
  - Development of a public outreach plan, approved by the Steering Committee
  - Attendance at advertised public outreach events and meetings with live interaction
  - Development of a hazard mitigation plan webpage on the City Emergency Management Division website and additional City department websites
  - Use of social media, such as Instagram, Facebook, and Twitter
  - Development and advertisement of a public survey posted on Survey Monkey to collect pertinent information from residents and the business community

Stakeholders and the Steering Committee

Stakeholders are the individuals, departments, agencies and jurisdictions that have a vested interest in the recommendations of the hazard mitigation plan. The effort to include stakeholders in this process included stakeholder participation on the Steering Committee. The following federal, state, regional, and local stakeholders also played a role in the planning process:

- FEMA Region IX provided planning guidance and data from the National Flood Insurance Program
- The U.S. Geological Survey provided ShakeMaps for earthquake analyses
- The U.S. Army Corps of Engineers provided information on the Whittier Narrows Dam failure hazard
- Cal OES provided planning guidance and reviewed the draft and final versions of the plan as part of the state hazard mitigation planning process required by the DMA
- The governmental and non-governmental agencies listed in Section 2.5 were given the opportunity to review the draft version of the plan to provide input

Project Website, Media Releases, and Social Media

During the planning process, a webpage was created on the City of Norwalk website to introduce the hazard mitigation plan and keep the public apprised of upcoming outreach events, meeting dates and times, public survey, and plan development process. The website address is: https://www.norwalk.org/city-hall/departments/public-safety/norwalk-emergency-management-office/local-hazard-mitigation-plan. Figure 2-2 shows a screenshot of the website's home page.

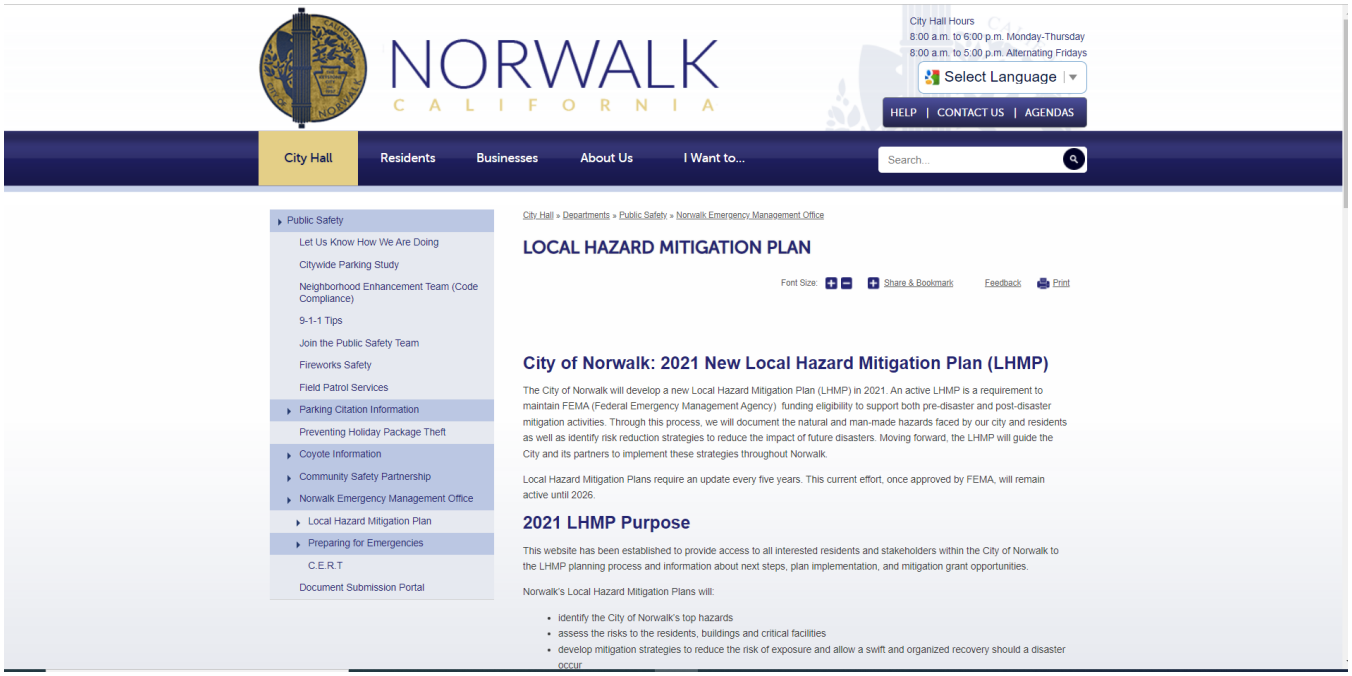


Figure 2-2. Hazard Mitigation Plan Webpage on the Emergency Management Division Website

The site's address was publicized at all public meetings and in all social media releases. Information on the plan development process, the Steering Committee, the survey, and drafts of the plan were made available to the public on the website throughout the process. The City of Norwalk intends to retain the website to keep the public informed about successful mitigation projects and future plan updates.

As appropriate, the City of Norwalk released notices to local media with information about the planning process (see Figure 2-3). The City also conducted a thorough social media campaign, posting several Facebook posts informing the public about the hazard mitigation planning process. Using *Norwalk Now*, the City's monthly newsletter, the City provided information on the hazard mitigation survey, steering committee meetings, and other details relevant to the planning process (see Figure 2-4).

Public Survey

A hazard mitigation plan survey (see Figure 2-5) was developed by the planning team to be distributed to the public. The Steering Committee provided guidance for the questions, and approval of the final survey. The survey was used to gauge level of knowledge about preparedness activities to reduce risk and loss from the hazards.

NEWS LIST

The City of Norwalk has Obtained a FEMA Grant for the Development of a New Local Hazard Mitigation Plan

The City of Norwalk Emergency Management Office has begun to develop the City's new Hazard Mitigation Plan to address natural and man-made hazards such as earthquake, flooding, and extreme heat.

The City needs your help identifying solutions to the problems associated with hazards. The public is invited to participate in the hazard mitigation plan by completing a survey about Norwalk's hazard risks: https://www.surveymonkey.com/r/T8JVZH3

The planning process will be organized into three phases. Each phase will include opportunities for public input and feedback:

Phase 1 | March - April 2021

- Take the community member survey! https://www.surveymonkey.com/r/T8JVZH3
- Attend a Steering Committee meeting: April 9th at 3pm
- Email comments: LHMP@norwalkca.gov

Phase 2 | May - June 2021

- Take the community member survey! https://www.surveymonkey.com/r/T8JVZH3
- Public Meeting #1: "What is Hazard Mitigation Planning + Norwalk's Risk Analysis Results"
- Attend a Steering Committee meeting: schedule to be posted to the project website
- Email comments: LHMP@norwalkca.gov

Phase 3 | July - August 2021

- Review the *Draft* plan: When ready, the plan will be posted to the website
- Public Meeting #2: "Review of Norwalk's first *draft* Local Hazard Mitigation Plan"
- Attend a Steering Committee meeting: schedule to be posted to the project website
- Email comments: LHMP@norwalkca.gov

More public engagement opportunities may become available throughout the process and if so, will be posted to the project website: www.norwalk.org/city-hall/departments/public-safety/norwalk-emergency-management-office/local-hazard-mitigation-plan

A Local Hazard Mitigation Plan will serve as a meaningful template for a more resilient and sustainable Norwalk. The plan looks at how Norwalk can reduce its impact of natural and man-made hazards such as earthquakes, floods, and extreme heat. Once approved by the Federal Emergency Management Agency (FEMA), the plan makes Norwalk eligible for pre- and post-disaster mitigation project grant funding through FEMA's Hazard Mitigation Assistance programs and other non-emergency disaster assistance like FEMA's new Building Resilient Infrastructure and Communities (BRIC) program. Norwalk currently does not have its own Local Hazard Mitigation Plan and is therefore not eligible for federal hazard mitigation grants directly from FEMA.

With support from a consulting team led by Tetra Tech, Inc., the City of Norwalk Emergency Management Office has formed an Advisory Committee of city and regional leaders to inform the planning process. The Advisory Committee held its first meeting in February 2021 and plans to hold its second meeting in March 2021.

For more information about Norwalk's new Local Hazard Mitigation Plan or to learn about ways to participate in the development of the LHMP, contact Gabriela Garcia at 562-929-5964 or send an email to LHMP@norwalkca.gov. You can also visit the project's website: www.norwalk.org/city-hall/departments/public-safety/norwalk-emergency-management-office/local-hazard-mitigation-plan

Figure 2-3. City of Norwalk Hazard Mitigation Planning Process Press Release

Figure 2-4. *Norwalk Now* Hazard Mitigation Planning Process Announcement, June 2021

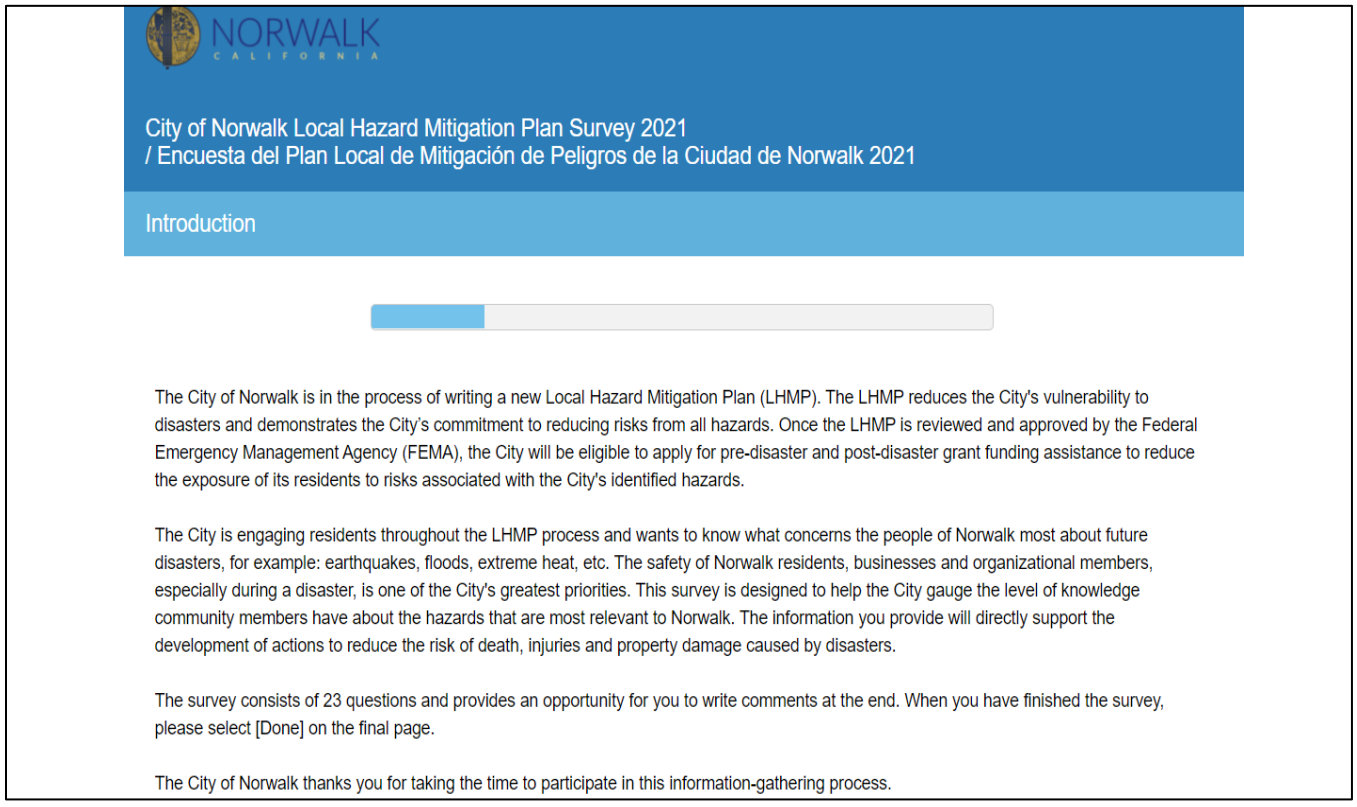


Figure 2-5. Sample Page from Public Survey

This survey was designed to help identify areas vulnerable to one or more hazards. The answers to its questions helped guide the Steering Committee in determining planning actions and mitigation strategies. Surveys were distributed at public-outreach events, and a link to a web-based version of the survey was provided on the City's hazard mitigation plan webpage. The complete survey and results can be found in Appendix A.

Public Review of the Draft Plan

A 14-day public comment period was initiated on September 10, 2021. During this comment period, the public was asked to review the proposed draft of the hazard mitigation plan and provide comments to the planning team by September 24, 2021. A virtual public meeting was held on September 16, 2021, to explain the draft plan and receive comments. The public comment period was advertised on the hazard mitigation plan website as well as in a press release to all media outlets and in a social media blast through outlets used by the City.

2.7.2 Public Involvement Results

Survey Results

Completed surveys were received from 169 respondents. Survey results were provided to the Steering Committee. Detailed survey results are provided in Appendix A. Key results are summarized as follows:

- 86 percent of respondents reported having experienced a pandemic, 66 percent having experienced an earthquake, and 55 percent having experienced extreme heat events.
- Regarding non-natural hazards, 22 percent of respondents reported having experienced civil unrest, 5 percent having experienced transportation accidents, and 3 percent having experienced terrorism events.
- Overall results showed earthquake as the hazard of highest concern, followed by pandemic, critical infrastructure failure, extreme heat, cyber-attacks, drought, terrorism, civil unrest, flooding and dam failure.
- Social media was identified by the highest number of respondents as the best method to receive emergency preparedness information, followed by the City website and City newsletters. Additional methods that scored well were public awareness campaigns, television news and public meetings.
- 12 percent of respondents stated that they have flood insurance and 16 percent stated that they have earthquake insurance.
- 81 percent of respondents indicated that the presence of a hazard risk zone was not disclosed to them when they purchased their home; 73 percent indicated that disclosure of such information would have influenced their decision to purchase or move into a home.
- 69 percent of respondents stated that a property tax break would encourage them to spend money to protect their home against disasters; over 63 percent stated that insurance premium discounts or grant funding would encourage them to do so.
- Over 70 percent of respondents either somewhat or strongly agreed it is their personal responsibility to protect themselves and their property from disasters.
- 58 percent of respondents identified themselves as Hispanic or Latino; 32 percent identified as being white.
- The available Spanish language survey was completed by 2 percent of the respondents.

Social Media Interaction

The City tracked responses to its social media posts regarding the hazard mitigation planning efforts. As an example, Table 2-2 shows interaction with five posts on the City's Instagram account regarding the planning activities

Table 2-2. Public Interaction with Instagram Posts Regarding the Hazard Mitigation Planning Effort

Post Date/Topic	Total Views	Number of Unique Users Viewing Post	Percent of Viewers Who Engaged with Post	Likes
March 23, 2021/ Survey Announcement	1,200	1,100	0.22%	19
April 5, 2021/Survey Announcement	1,300	1,200	0.20%	17
April 14, 2021/Survey Announcement	1,100	990	0.19%	17
May 8, 2021/Steering Committee Meeting Announcement	1,800	1,600	0.25%	22
May 18, 2021/Steering Committee Meeting Announcement	1,600	1,500	0.28%	25

a. Engagement with a post includes commenting, liking, sharing, following, or other active interactions.

Public Comment Period Results

No comments were received during the public comment period that resulted in any edits to this plan.

2.8 PLAN DEVELOPMENT MILESTONES

Table 2-3 summarizes important milestones in the planning process.

Table 2-3. Plan Development Milestones

Date	Event	Description	Attendance
2020			
3/5	Request for proposals to develop hazard mitigation plan	• City releases a request for proposals to facilitate development of the City's hazard mitigation plan.	N/A
8/28	Consultant selection	• City selects Tetra Tech as its technical support consultant	N/A
12/8	Kickoff meeting with consultant and City staff	• Makeup of planning team • Makeup of Steering Committee • Data acquisition	7
12/22	Planning Team Call # 1	• Data acquisition status • Steering Committee update • Planning team meeting schedule • Goals setting • Public outreach strategy	11
2021			
1/7	Planning Team Call # 2	• Steering Committee confirmation • Mission/vision statement • Hazards of concern • Website • Survey	8
1/21	Planning Team Call #3	• Goals/objectives • Hazard of concern scenarios • Public outreach strategy • 1st Steering Committee meeting	9

Date	Event	Description	Attendance
2/4	Planning Team Call #4	• Planning process-timeline check • Hazard analysis status report • Public outreach strategy • Administrative tasks	9
2/12	Steering Committee Meeting #1	• Welcome/introductions • The planning team roles and responsibilities • Project overview • Steering Committee ground rules • Present the public outreach strategy	12
2/15	Public Outreach	• Hazard mitigation plan website goes live with advertisement of the hazard mitigation survey	N/A

2/24	Planning Team Call #5	• Potential project discussion
		• Hazard analysis—"lifelines" vs. "critical Facilities"
		• Public outreach strategy
		  ○ Website
		  ○ Survey
			9

3/1	Public Outreach	• Article on the hazard mitigation plan published in the "Norwalk Now" newsletter	N/A
3/12	Steering Committee Meeting #2	• Project planning-SWOO exercise introduction • Hazard analysis—exposure results • Public outreach strategy	15
3/16	Public Outreach	• City project management staff updated City Council on the hazard mitigation plan. https://norwalk.granicus.com/player/clip/536?view_id=1&redirect=true (starting at minute 35)	10+
3/25	Planning Team Call #6	• Planning process update • Project alternatives discussion • Hazard analysis update—exposure results • SWOO update • Public outreach strategy update	7
4/9	Steering Committee Meeting #3	• Planning process update • SWOO discussion • Hazard analysis update • Public involvement strategy	11
4/15	Planning Team Call #7	• SWOO results • Action items discussion	10
4/29	Planning Team Call #8	• Plan maintenance strategy • Action items discussion • Public outreach update	9
5/21	Steering Committee Meeting #4	• Hazard analysis update • Plan maintenance strategy • Public involvement strategy – final survey results	12
6/10	Planning Team Call #9	• Action item planning process • Steering committee needs • Plan maintenance strategy	5
6/24	Planning Team Call #10	• Mitigation action plan matrix • Public outreach update	6
7/29	Planning Team Call #11	• Vulnerability loss results update • Public comment period	5

Date	Event	Description	Attendance
8/19	Planning Team Call #12	• Loss matrix results • Public outreach update • Planning process update	6
9/9	Planning Team Call #13	• Public review draft plan release • Public outreach on draft plan availability • New recommended mitigation actions	
9/10	Public Outreach	• Initiate 2-week final public comment period for review of the draft plan	
9/16	Public Meeting	• Describe and receive comments on the draft plan	
9/24	Public Outreach	• Closure of 2-week final public comment period	
10/1	Plan Review	• Plan sent to Cal OES for review and forwarded to FEMA for review	
10/20	Approval Pending Adoption	• Approval pending adoption received from FEMA Region IX	
2022			
1/18	Plan adopted by City Council	• Plan is finalized with the Council's adoption	
2/1	Final Approval	• FEMA granted final approval of the adopted plan.	

3. CITY OF NORWALK PROFILE

The City of Norwalk was incorporated on August 26, 1957, becoming Los Angeles County's 66th city. Located in the midst of some of Southern California's most accessible highways in the greater Los Angeles area, and only 17 miles southeast of Los Angeles, the 9.35-square-mile City of Norwalk has become one of the most rapidly developing and growing communities in California.

3.1 HISTORICAL OVERVIEW

Before the middle of the 1700s, the area that the City of Norwalk now occupies was home to the Shoshonean Native American tribe. Their huts were part of the Sejat Indian village. They survived primarily on honey, berries, acorns, sage, squirrels, rabbits and birds.

In the late 1760s, Spanish settlers and missions flourished along the El Camino Real trail traversing the area. Manuel Nieto, a Spanish soldier, received a Spanish land grant (Rancho Los Nietos) in 1784 that included Norwalk. The rancho and mining days ended in 1848 after the Mexican–American War. Portions of the land were subdivided and made available for sale when California was admitted into the United States. In 1869, Atwood Sproul, on behalf of his brother, Gilbert, purchased 463 acres at $11 an acre in an area known as *Corazón de los Valles*, or "Heart of the Valleys."

By 1873, railroads were being built in the area and the Sprouls deeded 23 acres stipulating a "passenger stop" clause in the deed. Three days after the Anaheim Branch Railroad crossed the "North-walk" for the first time, Gilbert Sproul surveyed a town site. In 1874, the name was recorded officially as Norwalk. While most of the Norwalk countryside remained undeveloped during the 1880s, the Norwalk Station allowed potential residents to visit from across the nation.

Norwalk's "first families"—the Sprouls, the Dewitts, the Settles, the Orrs, and others—settled in the area before 1900 D.D. Johnston pioneered the first school system in Norwalk in 1880. Johnston was also responsible for the first real industry in town, a cheese factory, by furnishing Tom Lumbard with the money in 1882. Norwalk's prosperity was evident in the 1890s with the construction of a number of fine homes located in the middle of orchards, farms and dairies. Headstones for these families can be found at Little Lake Cemetery, which was founded in 1843 on the border between Norwalk and Santa Fe Springs at Lakeland Road.

At the turn of the 20th century, Norwalk had become established as a dairy center. Of the 50 local families reported in the 1900 census, most were associated with farming or the dairy industry. Norwalk was also the home of some of the largest sugar beet farms in Southern California during this era. After the 1950s, the area became increasingly residential.

3.2 MAJOR PAST HAZARD EVENTS

The City of Norwalk has never proclaimed a local disaster, though it did declare of state of emergency for the COVID-19 pandemic in March 2020. The City has been included in disaster declarations for Los Angeles County. Since 1969, federal disaster declarations have been issued for 30 disasters affecting Los Angeles County, as listed in Table 3-1. While these events may not have directly impacted the City of Norwalk, they are a testament to the frequency and types of hazard events typical for the geographic region.

Table 3-1. Federal Disaster Declarations for Los Angeles County

Type of Event	FEMA Disaster DR#	Declaration Date
Wildfires	4569	10/16/2020
COVID-19 Pandemic	4482	03/22/2020
Wildfires, flooding, mudflows, debris flow	4353	1/2/2018
Severe Winter Storms, Flooding, and Mudslides	4305	3/16/2017
Severe Winter Storms, Flooding, and Debris and Mud Flows	1884	3/8/2010
Wildfires	1810	11/18/2008
Wildfires, Flooding, Mud Flows, and Debris Flows	1731	10/24/2007
Severe Freeze	1689	3/13/2007
Severe Storms, Flooding, Landslides, and Mud and Debris Flows	1585	4/14/2005
Severe Storms, Flooding, Debris Flows, and Mudslides	1577	2/4/2005
Wildfires, Flooding, Mud Flow and Debris Flow	1498	10/27/2003
Severe Winter Storms and Flooding	1203	2/9/1998
Severe Winter Storms, Flooding Landslides, Mud Flow	1046	3/12/1995
Severe Winter Storms, Flooding, Landslides, Mud Flows	1044	1/10/1995
Northridge Earthquake	1008	1/17/1994
Fires, Mud/Landslides, Flooding, Soil Erosion	1005	10/28/1993
Severe Winter Storm, Mud and Landslides, and Flooding	979	2/3/1993
Fire During a Period of Civil Unrest	942	5/2/1992
Rain/Snow/Wind Storms, Flooding, Mudslides	935	2/25/1992
Severe Freeze	894	2/11/1991
Fires	872	6/30/1990
Severe Storms, High Tides and Flooding	812	2/5/1988
Earthquake and Aftershocks	799	10/7/1987
Coastal Storms, Floods, Slides and Tornadoes	677	2/9/1983
Brush and Timber Fires	635	11/27/1980
Severe Storms, Mudslides and Flooding	615	2/21/1980
Coastal Storms, Mudslides and Flooding	547	2/15/1978
San Fernando Earthquake	299	2/9/1971
Forest and Brush Fires	295	9/29/1970
Severe Storms and Flooding	253	1/26/1969

Federal disaster declarations are typically issued for hazard events that cause more damage than state and local governments can respond to and recover from without federal assistance. They put local response, reimbursement, and recovery programs into motion to assist public entities' disaster victims. Many natural hazard events do not

trigger federal disaster declarations but have significant impacts on the communities they affect. These events are also important to consider in establishing recurrence intervals for hazards of concern.

3.3 PHYSICAL SETTING

3.3.1 Climate

Norwalk has a Mediterranean climate, with mild, dry summers and cool winters. The warmest month of the year is August, with an average maximum temperature of 82 ºF; the coldest month of the year is December, with an average minimum temperature of 46 ºF. Temperatures vary up to 24 ºF between daytime and nighttime in summer, and about 21 ºF in winter. The annual average precipitation is about 10 inches. Precipitation generally occurs from November through March with the winter months having the highest amount of rainfall. Precipitation during the summer is infrequent, and rainless periods of several months are common.

Table 3-2 lists the historical monthly averages for the planning area for low temperature, high temperature, record low temperature, record high temperature, and average precipitation. When city-specific data was not available, nearby weather station data was used.

Table 3-2. Norwalk Historic Weather Averages and Records

	Temperatures				Average
Date	Average Low	Average High	Record Low	Record High (Year)	Precipitation
January	47°	67°	20°	91°	2.3”
February	49°	67°	34°	91°	1.7”
March	51°	67°	37°	97°	1.0”
April	54°	71°	39°	104°	0.5”
May	58°	73°	48°	99°	0.3”
June	61°	77°	50°	107°	0.0”
July	65°	81°	58°	107°	0.1”
August	65°	82°	54°	102°	0.0”
September	64°	81°	52°	108°	0.2”
October	59°	77°	45°	107°	0.4”
November	51°	72°	37°	96°	0.6”
December	46°	67°	29°	89°	2.5”

3.3.2 Topography

The City of Norwalk is in the center of the Los Angeles basin. The San Gabriel River forms the western edge of the city. The city is built within old floodplains and the topography is relatively flat, ranging from approximately 120 feet above sea level in the northern portion of the city to 65 feet above sea level in the southern portion.

3.3.3 Soils

The 1903 soil survey of the Los Angeles basin identifies the 17 soil types in the planning area listed in Table 3-3.

Table 3-3. Identified Soil Types in the Los Angeles Basin

Soil	% of Total Survey Area	Soil	% of Total Survey Area	Soil	% of Total Survey Area
Placentia sandy loam	18.1	Oxnard loam	5.4	Maricopa gravelly loam	1.6
Fresno sand	15.9	Fresno fine sand	4.4	Galveston clay	1.3
Santiago silt loam	10.8	Maricopa sandy loam	3.8	Dune sand	0.9
Fresno fine sandy loam	10.6	Los Angeles sandy loam	2.5	River wash	0.5
San Joaquin black adobe	10.3	Fullerton sandy adobe	1.9	Peat	0.3
Oxnard sand	9.8	Sierra adobe	1.9		

Source: Mesmer, 1903

3.3.4 Geology

California is divided into large geomorphic provinces defined by similar topography and geologic structure. The Los Angeles basin lies between the Transverse Ranges geomorphic province to the north and the Peninsular Ranges geomorphic province to the south. The boundary between the two provinces is generally the Santa Monica-Hollywood-Raymond fault system along the south edge of the Santa Monica Mountains (Bilodeau, et al. 2007).

The Transverse Ranges geomorphic province is characterized by east-west trending mountains, valleys, and faults that extend eastward from the Channel Islands to the eastern end of the San Bernardino Mountains. The most active faults in the Transverse Ranges are east-west trending faults.

The Peninsular Ranges geomorphic province extends southward from the south edge of the Transverse Ranges geomorphic province to the tip of Baja California in Mexico (Norris and Webb 1990). The Peninsular Ranges are characterized by northwest-southeast trending hills and valleys separated by similarly trending faults. Most active faults in the Peninsular Ranges province are northwest trending.

The Norwalk Fault runs through the southeastern region of the city and is considered to have a very low probability of producing severe earthquakes. However, it may have been the source of a 1929 damaging earthquake. The City of Norwalk is in an area of low to moderate relative liquefaction, but ground failure due to liquefaction could be a potential hazard in the southeastern region of the city (City of Norwalk, 1996).

3.4 SENSITIVE RESOURCES

Cultural resources in Norwalk include an extremely diverse community, with persons from a wide array of cultures. The Southeast Japanese School and Community Center offers a variety of Japanese cultural classes and activities. The Norwalk Arts & Sports Complex provides numerous recreational and cultural outlets. The D.D. Johnston-Hargitt House Museum and the Paddison Ranch Buildings are on the National Register of Historic Places. The Gilbert Sproul Museum is in Norwalk Park (City of Norwalk, 1996).

Educational resources in the planning area include two public school districts, several private schools, and Cerritos College, one of the five largest community colleges in Los Angeles County. Two public county libraries are located within the city limits (City of Norwalk, 1996).

The City of Norwalk General Plan Educational and Cultural Resources subsection provides the following overview of the city's goals regarding these resources (City of Norwalk, 1996):

- To maintain and enhance quality education
- To provide a comprehensive approach to historic preservation and adaptive reuse of buildings
- To maintain and enhance cultural facilities, programs, and services
- To reveal the unique and dynamic cultural identities of Norwalk residents

3.5 DEVELOPMENT PROFILE

3.5.1 Land Use

Residential land use makes up 49.6 percent of total land use in Norwalk, most of it low-density residential. Undesignated land makes up the second largest percentage at 27.8 percent. Table 3-4 summarizes the breakdown of current land use in the City based on designations defined in the Land Use Element of the City's General Plan.

Table 3-4. General Plan Land Use in Norwalk

Land Use	Area (acres)	% of Total
Low Density Residential	3,117	45.50%
Medium Density Residential	12	0.18%
High Density Residential	272	3.97%
Residential Subtotal	***3,401***	***49.64%***
Neighborhood Commercial	66	0.96%
Professional Office	88	1.28%
General Commercial	242	3.53%
Commercial Subtotal	***396***	***5.78%***
Light Industrial	171	2.50%
Heavy Industrial	141	2.06%
Industrial Subtotal	***312***	***4.55%***
Specific Plan Area/Planned Unit Development	82	1.20%
Open Space/Public Schools/Public Facilities	700	10.22%
Institutional	53	0.77%
Undesignated	1,907	27.84%
Total	**6,851**	**100.00%**

Source: City of Norwalk General Plan

3.5.2 Building Stock

According to assessor records, there are 23,248 buildings in the planning area, with a total replacement value of $15.3 billion. The City's housing stock, predominantly characterized by single-family detached dwelling units, makes up 95 percent of the total building stock. Table 3-5 shows the distribution of buildings by type of use.

3.5.3 Critical Facilities

Critical facilities are those that are essential to the health and welfare of the population. These become especially important after any hazard event. Also included are facilities that hold or carry significant amounts of hazardous materials with a potential to impact public health and welfare during a hazard event.

Table 3-5. Distribution of Buildings in the Planning Area by Use Type

Use Type	Number of Buildings	Replacement Costs
Residential	22,182	$7,882,505,207
Commercial	789	$4,546,436,438
Industrial	104	$791,921,039
Religion	108	$346,873,438
Government	27	$693,570,258
Education	38	$1,051,886,989
Total	**23,248**	**$15,313,193,369**

The risk assessment for each hazard in this plan discusses that hazard's potential impact on critical facilities. For some hazards, potential damage to critical facilities was estimated using the Hazards U.S. (Hazus) computer model developed by FEMA. For this reason, the list of critical facilities was categorized using lifeline categories defined in the Hazus model:

- **Safety and Security**—Law Enforcement/Security, Search and Rescue, Fire Services, Government Service, Responder Safety, and Imminent Hazard Mitigation
- **Food, Water and Sheltering**—Evacuations, Schools, Food/Potable Water, Shelter, Durable Goods, Water Infrastructure, and Agriculture
- **Health and Medical**—Medical Care/Hospitals: Patient Movement, Public Health, Fatality Management, Health Care, and Supply Chain
- **Energy**—Power (Grid), Temporary Power and Fuel
- **Communications**—Infrastructure, Alerts, Warnings, Messages, 911 and Dispatch, Responder Communications and Financial Services
- **Transportation**—Highway/Roadway, Mass Transit, Railway, Aviation, Maritime and Pipeline
- **Hazardous Materials**—Facilities, Hazardous Debris, Pollutants and Contaminants

Table 3-6 summarizes the number of critical facilities by Hazus-defined category, based on the best data available on critical facilities at the time of this plan. The City considers this information to be subject to change as new information about critical facilities becomes available during the performance period for this plan. Due to the sensitivity of this information, a detailed list of facilities is not provided. General locations are shown on Figure 3-1.

Table 3-6. Planning Area Critical Facilities

Category	Types of Facilities Included	Number in Planning Area
Safety & Security	Correctional facilities, fire stations, government buildings, schools, sheriff station	40
Food, Water & Sheltering	Affordable rental housing, water wells	4
Health & Medical	Health care facilities, hospitals	6
Energy	Electric substations, power plants	7
Communications	Banks	7
Transportation	Bridges, Metrolink station	45
Hazardous Materials	none identified	0
Total		**109**

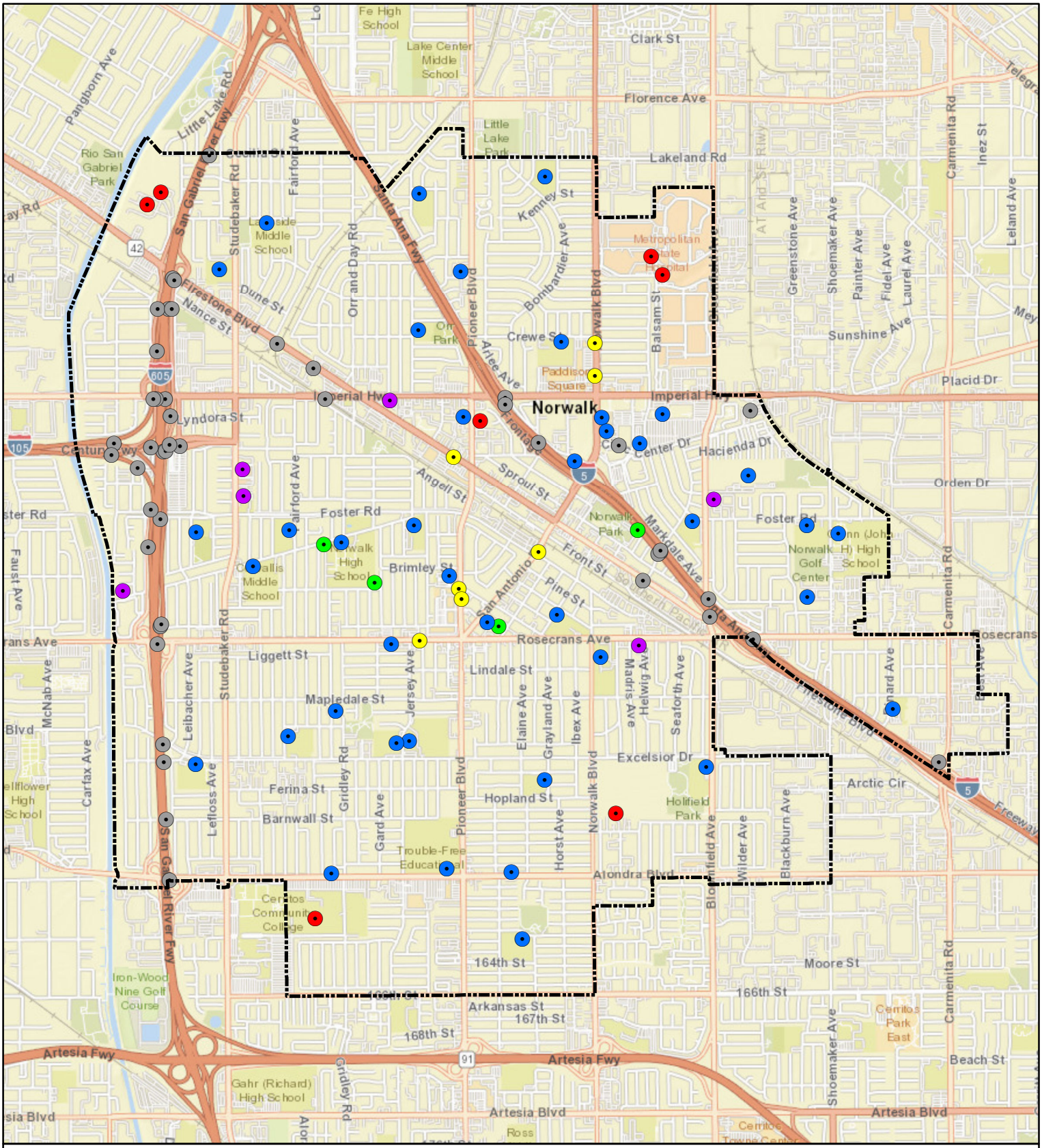


Figure 3-1. Critical Facilities

- Communications
- Energy
- Food, Water, Shelter
- Health and Medical
- Safety and Security
- Transportation
- City Boundary

Data Sources: Esri, City of Norwalk, Caltrans, CA Energy Commission, DHS HIFLD

3.5.4 Development Trends

Tracking previous and future growth in potential hazard areas provides an overview of increased exposure to a hazard within a community. Identifying previous and future development trends is achieved through a comprehensive review of permitting since completion of the previous plan and in anticipation of future development.

The City's General Plan governs land use decision and policymaking. This hazard mitigation plan will work together with the General Plan to support wise land use in the future by providing vital information on the risk associated with hazards within the city. The City of Norwalk will incorporate by reference the hazard mitigation plan in its General Plan. This will ensure that all future trends in development can be established with the benefits of the information on risk and vulnerability to hazards identified in this plan.

Most of the residential areas in Norwalk are built out. The City's overall land use pattern is well established and is not intended to change over time. The few vacant housing sites are located on infill lots, where land uses are underutilized, or older structures have been demolished and removed. Norwalk lacks large undeveloped sites, which are generally easier to develop than smaller sites or sites with existing development.

Most remaining vacant parcels in the City are relatively small or constrained by access issues or surrounding development. In addition, the City of Norwalk experienced a population increase of less than 0.2 percent from 2010 to 2020, as reported by the U.S. Census. Due to the constraints on developable land and the small increase in population, it can be reasonably assumed that Norwalk will experience a slower growth rate moving forward.

The Land Use Element of the City's General Plan states that "most of the housing built in Norwalk replaces existing structures." As the City plans for future housing activity, it is important to note that 25 underutilized non-vacant sites can accommodate the moderate-income housing need. Most existing structures are at least 60 years old and in poor to fair condition. The City currently has 22 programs in the following categories:

- Adequate Housing Sites
- Affordable Housing
- Remove Governmental Constraints
- Improve Housing Conditions
- Promote Fair Housing
- Preserve Assisted Housing at Risk of Conversion to Market Rate Housing
- Promote Energy Conservation

These programs provide guidance for the development of underutilized sites in the City with residential and commercial uses that will contribute to City revitalization and economic development.

The Norwalk 2013–2021 Housing Element focuses on preserving and enhancing existing housing, while assisting the identification of housing sites and the development of lower and moderate-income housing. Housing goals, policies and programs aim to preserve the condition of the existing housing stock, develop new housing in specific targeted growth districts, provide affordable housing opportunities for all income groups, and improve the quality of life in the City's neighborhoods.

3.6 DEMOGRAPHIC PROFILE

Some populations are at greater risk from hazard events because of decreased resources or physical abilities. People living near or below the poverty line, the elderly, individuals with disabilities, women, children, ethnic minorities, and renters all experience, to some degree, more severe effects from disasters than the general population. These vulnerable populations may vary from the general population in risk perception, living conditions, access to information before, during and after a hazard event, capabilities during an event, and access to resources for post-disaster recovery. Indicators of vulnerability—such as disability, age, poverty, and minority race and ethnicity—often overlap spatially and often in the geographically most vulnerable locations. Detailed spatial analysis to locate areas where there are higher concentrations of vulnerable community members would help to extend focused public outreach and education to these most vulnerable citizens.

3.6.1 Population Estimates

Information about population is a critical part of planning because it directly relates to land needs such as housing, industry, stores, public facilities and services, and transportation. Population changes are useful socio-economic indicators.

Current and Historical Population

The California Department of Finance reported the population of Norwalk to be 105,717 as of January 1, 2020 (E-1 Population Estimates for Cities, Counties, and the State). Table 3-7 shows the population in the planning area from 2000 to 2020.

Table 3-7. Annual Population Data

Year	Population	Year	Population	Year	Population
2000	104,323	**2007**	105,785	**2014**	106,687
2001	104,985	**2008**	105,404	**2015**	106,830
2002	106,523	**2009**	105,330	**2016**	106,679
2003	106,983	**2010**	105,529	**2017**	106,466
2004	107,195	**2011**	106,012	**2018**	106,312
2005	106,921	**2012**	106,428	**2019**	105,881
2006	106,317	**2013**	106,536	**2020**	105,717

Source: California Department of Finance Historical Population Estimates

Between 2000 and 2020, California's population grew by 17.5 percent while the planning area's population increased by 1.3 percent. Figure 3-2 shows the planning area's annual population growth rates from 2000 to 2020 compared to those of the state. The state experienced peak population growth for that period in 2000, while the planning area experienced peak growth in 2002. The state and the City both experienced a general slowing of the annual growth rate between 2002 and 2020.

Projected Future Population

According to population projections by the California Department of Finance, Los Angeles County's population should increase to 10,335,448 by 2040 (California Department of Finance, 2020). This represents a 0.76 percent increase from the 2020 population. This is in line with the County's 2035 General Plan Land Use Element.

Source: California Department of Finance Historical Population Estimates

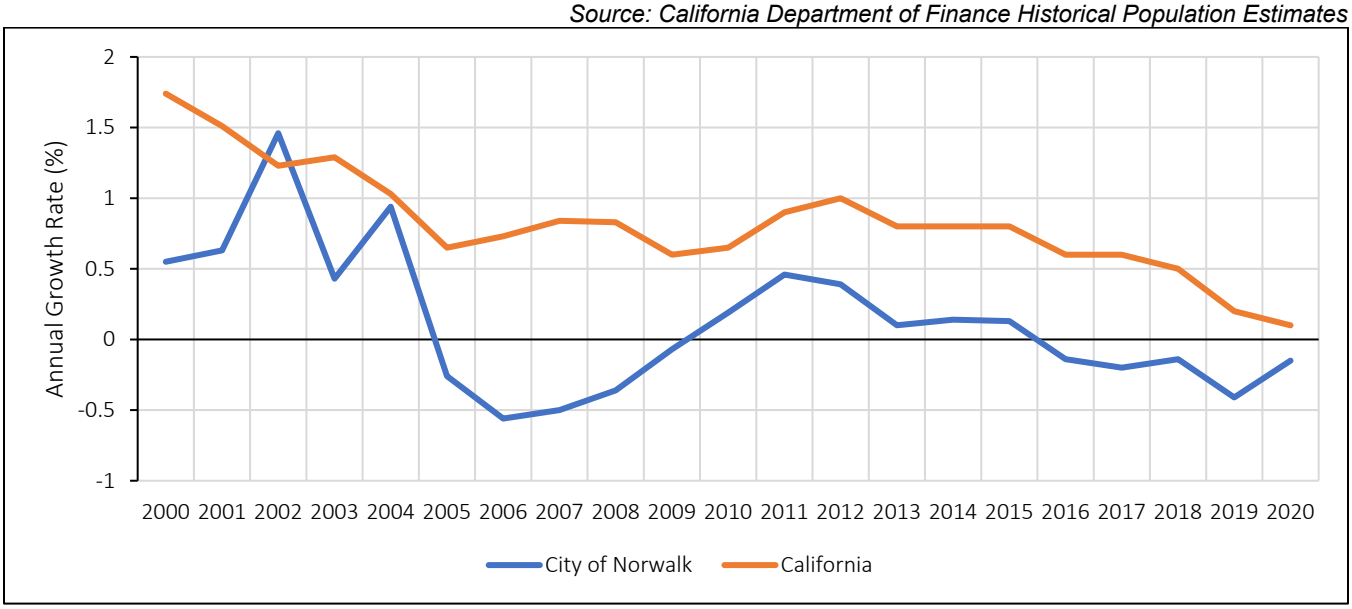


Figure 3-2. California and City of Norwalk Population Growth

3.6.2 Age Distribution

Specific planning attention for the elderly is an important consideration given the current aging of the American population. As a group, the elderly population is more likely than the general population to face the following issues affecting their vulnerability to hazards:

- Lacking the physical and economic resources necessary for response to hazard events
- Suffering health-related consequences, making recovery slower
- Being vision, hearing, and/or mobility impaired
- Experiencing mental impairment or dementia
- Living in assisted-living facilities where emergency preparedness occurs at the discretion of facility operators (these facilities are typically identified as "critical facilities" by emergency managers because they require extra notice to implement evacuation)
- Having more difficulty evacuating their homes, with the potential to be stranded in dangerous situations
- Needing special medical attention, which may not be readily available during natural disasters due to isolation caused by the event

Children under 14 are particularly vulnerable to disaster events because of their young age and dependence on others for basic necessities. Very young children may also be vulnerable to injury or sickness; this vulnerability can be worsened during a natural disaster because they may not understand the measures that need to be taken to protect themselves from hazards.

The overall age distribution for the planning area is shown in Figure 3-3. Based on the 2019 five-year estimates from the U.S. Census Bureau's American Community Survey, 11.9 percent of the planning area's population is 65 or older and 20.5 percent is 14 or younger.

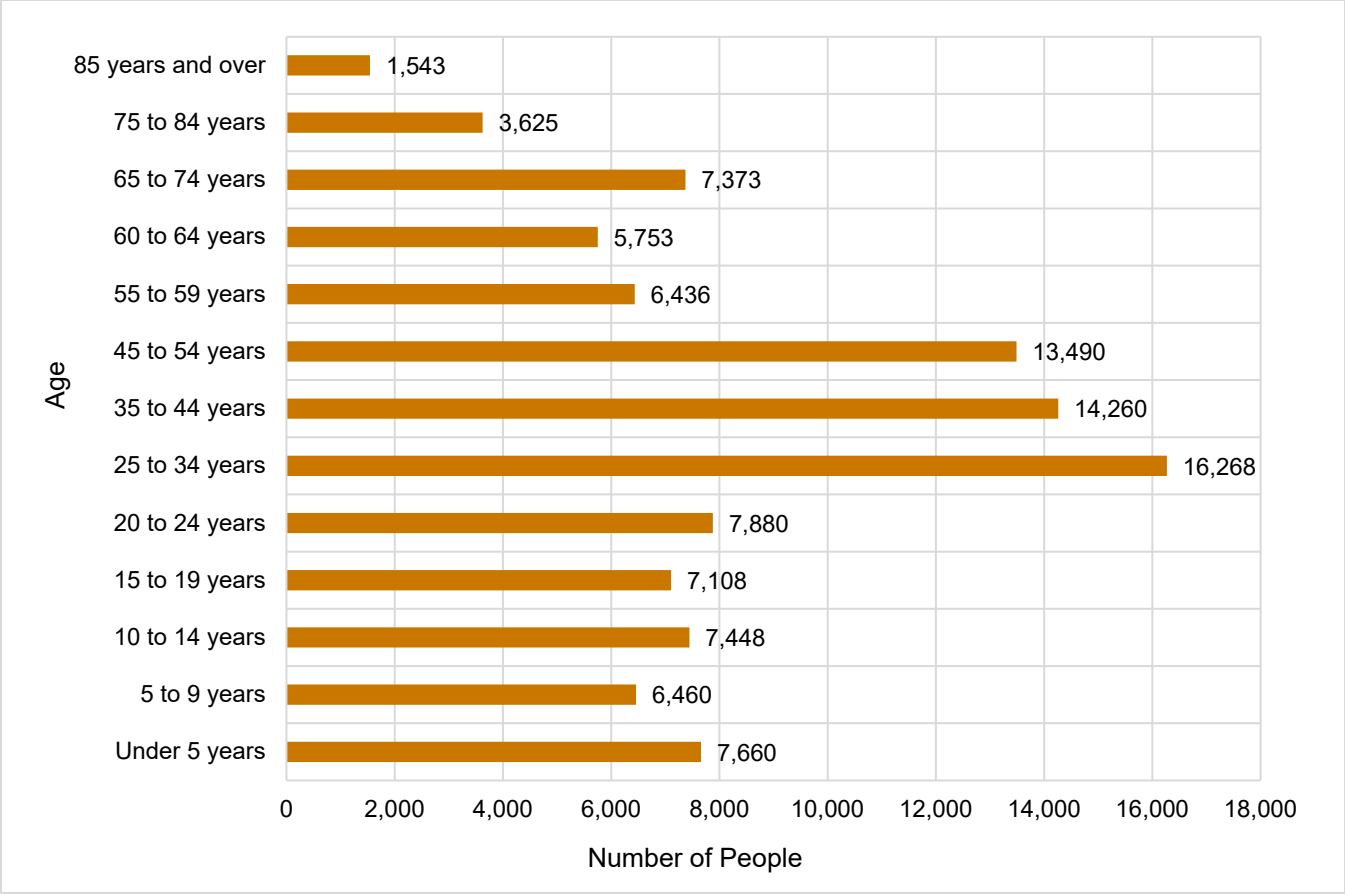


Figure 3-3. Norwalk Age Distribution

3.6.3 Race, Ethnicity, Language

Research shows that minorities are less likely to be involved in pre-disaster planning and experience higher mortality rates during a disaster event. Post-disaster recovery can be ineffective and is often characterized by cultural insensitivity. Since higher proportions of ethnic minorities live below the poverty line than the majority white population, poverty can compound vulnerability.

At the federal level, race and ethnicity in the United States are categorized separately. The most recent U.S. Census officially recognized six racial categories: White American, Black or African American, Native Americans and Alaska Native, Asian American, Native Hawaiian and Other Pacific Islander, and "two or more races." In completing the census form, each person is asked to choose from among these racial categories, so all Americans are included in the numbers reported for those categories.

Separately, the Census Bureau classifies respondents as "Hispanic or Latino" or "Not Hispanic or Latino," identifying Hispanic and Latino, the largest minority group in the nation, as an ethnicity not a race. Hispanic and Latino Americans have ethnic origins in a Spanish-speaking country or Brazil. Latin American countries are, like the United States, racially diverse. Consequently, no separate racial category exists for Hispanic and Latino Americans, as they do not constitute a race or a national group. However, the U.S. Supreme Court has unanimously held that, in law, the term "race" is not limited to Census designations but extends to all ethnicities, which may include Jewish, Arab, Italian, Hungarian, Laotian, Zulu, etc.

Any racial category may contain people of Hispanic or Latino ethnicity. For example: the White or European-American race category contains Non-Hispanic Whites and Hispanic Whites; the Black or African American category contains Non-Hispanic Blacks and Hispanic Blacks; the Asian-American category contains Non-Hispanic Asians and Hispanic Asians.

According to the 2019 5-year estimates from the U.S. Census Bureau's American Community Survey, the racial composition of Norwalk is 37.3 percent white. The City's next largest identified ethnic population is Asian at 13.7 percent. Other identified populations are Black or African American at 4.7 percent; 40 percent of the population identifies as "some other race." Figure 3-4 shows the racial distribution in the City. The census ethnicity breakdown shows that 69.7 percent of the Norwalk population is Hispanic or Latino ethnicity, compared to 18.4 percent nationwide. Figure 3-5 shows the ethnic distribution in the City.

Source: U.S. Census, 2019a

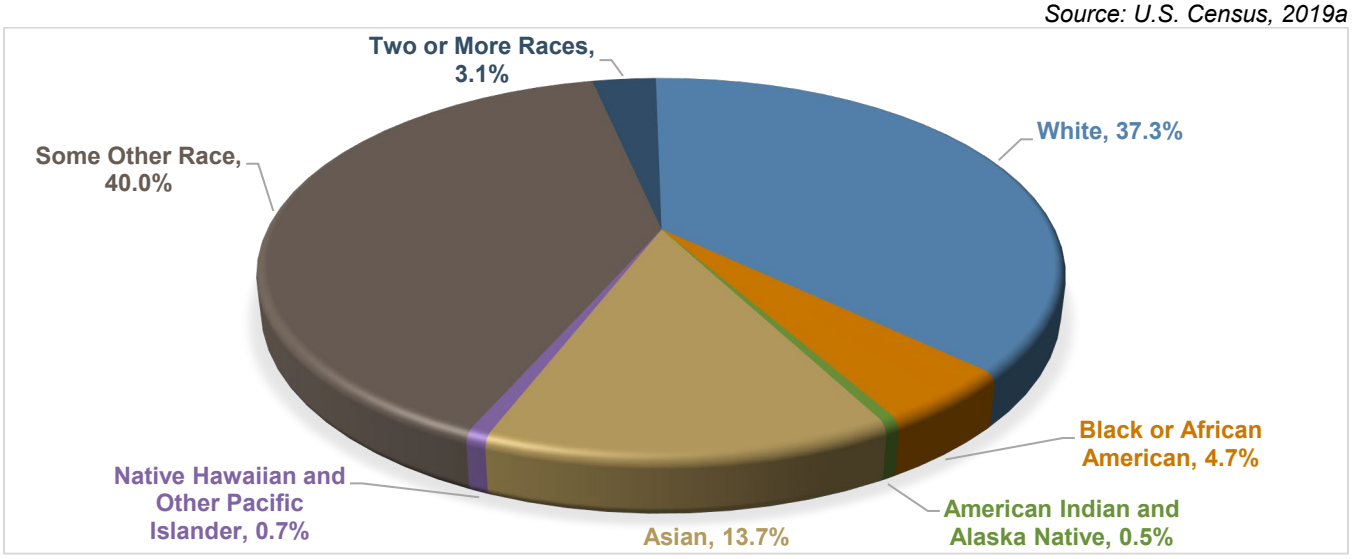


Figure 3-4. Norwalk Race Distribution

Source: U.S. Census, 2019a

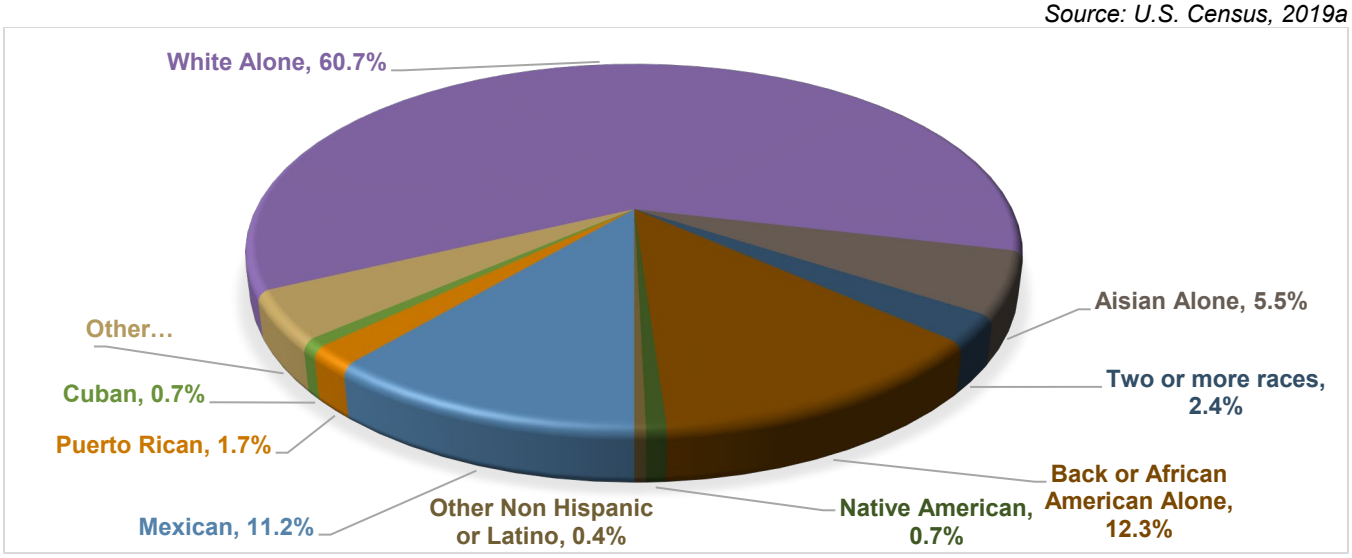


Figure 3-5. Norwalk Ethnicity Distribution

The City of Norwalk has a 34.1-percent foreign-born population. Census data indicate that more than half of the population—67 percent—speak a language other than English at home, including 54.2 percent of the total population who speak Spanish at home; another 10.6 percent speak an Asian or Pacific Islander language at home. The census estimates that 25.6 percent of the residents speak English "less than very well" (U.S. Census, 2019b).

3.6.4 Individuals with Disabilities or Access and Functional Needs

Individuals with disabilities are more likely to have difficulty responding to a hazard event than the general population. Local government is the first level of response to assist these individuals, and coordination of efforts to meet the needs of people with disabilities and those with access and functional needs is paramount to life safety efforts. It is important for emergency managers to distinguish between functional and medical needs in order to plan for incidents that require evacuation and sheltering. Knowing the percentage of population with a disability gives emergency management personnel and first responders an opportunity to ensure that emergency plans and procedures include considerations for addressing the needs of those residents.

According to the 2019 5-year American Community Survey, 10.4 percent of people under age 65 years in Norwalk have a disability. This equates to 5,979 individuals. Additional residents with access and functional needs may be unreported.

3.7 ECONOMY

3.7.1 Income

People living in California must be prepared financially to overcome the inherent risks associated with residing in the state. Some earthquake insurance, flood insurance and FEMA individual assistance programs fail to cover the costs of returning a home to pre-disaster conditions. FEMA may provide low interest loans to cover residential losses not fully compensated by insurance. Loans are available for up to $200,000 for primary residence and $40,000 for personal property, including renter losses. If a home is in a special flood hazard area, the homeowner must comply with flood insurance purchase requirements and local flood codes and requirements. There is also private insurance that is costly and conditional. For the most part, private citizens are expected to prepare for, respond to and recover from disasters with their personal resources.

People with median and low incomes may not recover from a major disaster, and those who are economically disadvantaged likely will not recover. In urban areas such Los Angeles County, the economically disadvantaged often live in older homes or apartments that may not have been retrofitted or kept current with building codes that would mitigate some of the damage from the disasters prevalent to the area. Renters have no control over the strength and stability of the buildings they live in. All people have a great deal to lose during a disaster, but those economically disadvantaged will lose the most due to their inability to recover.

About 11.3 percent of persons in the planning area live at or below the federal poverty level, compared to 13.4 percent in Los Angeles County and 11.9 percent statewide. The 2021 federal poverty level is $26,500 for a family of four, $21,960 for a family of three, $17,420 for a family of two, and $12,880 for one person. The risk assessment for this hazard mitigation plan identifies "very low income" families that live in mapped hazard areas, defined by U.S. Department of Housing and Urban Development (HUD) as families earning 50 percent or less of the median family income. The average number of persons per household in Norwalk is 3.81, so the risk assessment uses 2021 HUD median family income for a family of four. In Los Angeles County, this equates to $59,100.

3.7.2 Industry, Businesses, and Institutions

Figure 3-6 shows the breakdown of employment sectors in the planning area. Table 3-8 identifies the principal employers in the planning area (City of Norwalk, 2021).

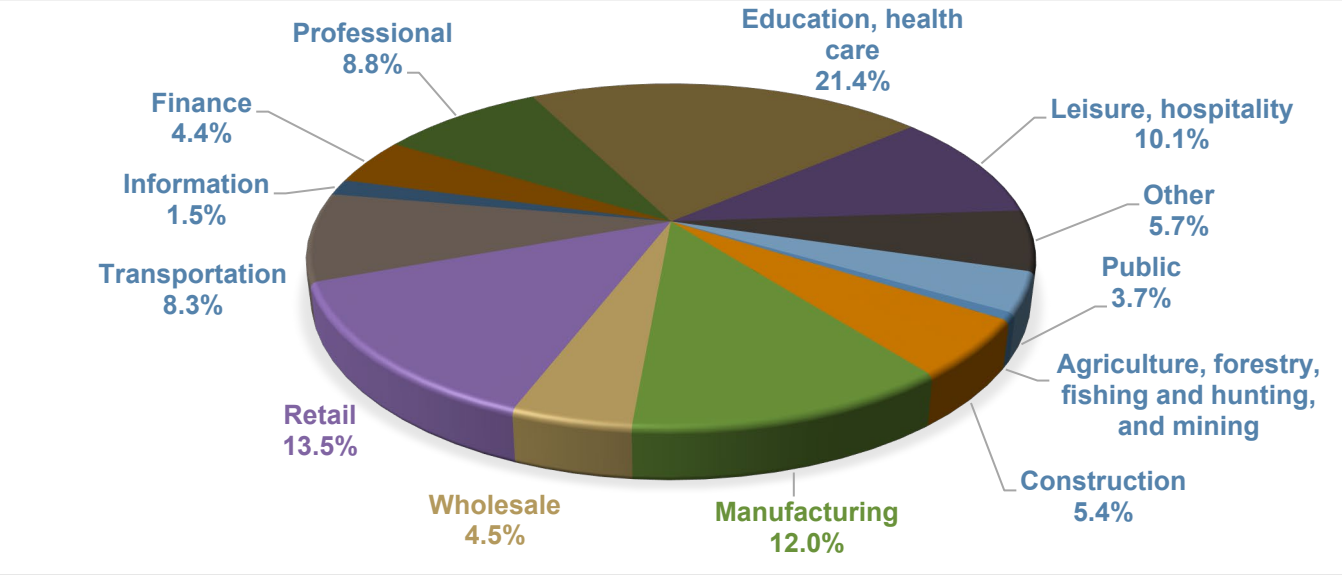


Figure 3-6. Norwalk Principal Employment Sectors

Table 3-8. Norwalk Principal Employers

Employer	Number of Employees
Norwalk-La Mirada Unified School District	4,161
Cerritos College	2,100
Metropolitan State Hospital	1,836
Los Angeles County Registrar Recorder	1,216
Bally Total Fitness Headquarters	650
Coast Plaza Doctors Hospital	500
Total	**10,463**

3.7.3 Employment Trends

According to the 5-year American Community Survey for 2019, about 82,425, or 59 percent of the City of Norwalk's population 16 years old or older, is in the labor force. Of the working-age population, 81.1 percent of men and 69.6 percent of women are in the labor force.

Figure 3-7 compares unemployment rates for California, Los Angeles County, and the City of Norwalk from 2010 through 2020. The data represents mid-year (June) samples for unemployment provided by the U.S. Department of Labor Bureau of Labor Statistics and 1-year estimates by the U.S. Census Bureau. The City of Norwalk unemployment rate peaked at 12.9 percent in 2012. The 2019 rate was the lowest in 9 years at 4.7 percent. The rate increased sharply in 2020 with the Covid-19 pandemic. In several years, the City unemployment rate has been slightly higher than the state and county.

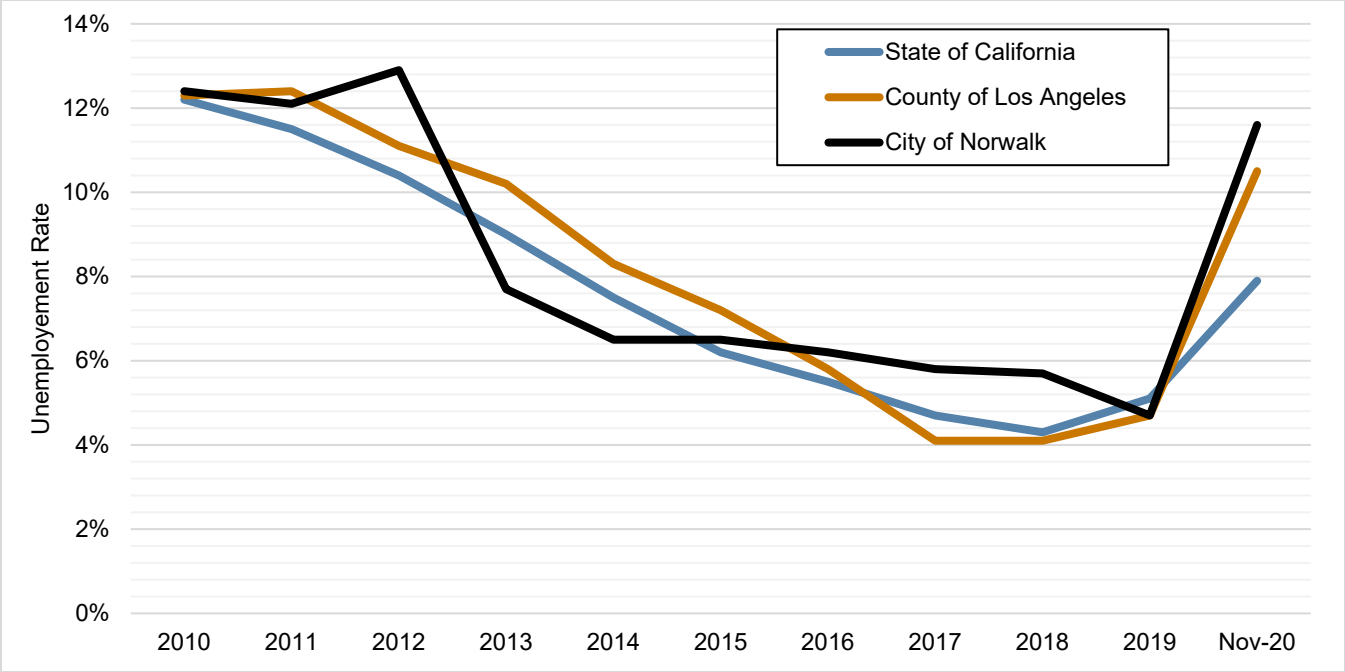


Figure 3-7. 10-Year Unemployment Rates for California, County of Los Angeles, and City of Norwalk

The 2019 U.S. Census Bureau estimates 9.4 percent of the City's population work and live in Norwalk; 90.6 percent commute to other places. In 2019, 43.6 percent of Norwalk commuters spent more than 30 minutes to travel to work.

4. REGULATIONS AND PROGRAMS

Existing laws, ordinances, plans and programs at the federal and state level can support or impact hazard mitigation actions identified in this plan. Hazard mitigation plans are required to include a review and incorporation, if appropriate, of existing plans, studies, reports, and technical information as part of the planning process (44 CFR, Section 201.6(b)(3)). This chapter presents the relevant information for laws, plans and programs at the federal, state, and local levels.

4.1 FEDERAL AND STATE

This section summarizes federal and state programs that may interface with the actions identified in this plan. Each program enhances capabilities to implement mitigation actions or has a nexus with a mitigation action in this plan. State and federal regulations and programs that need to be considered in hazard mitigation are constantly evolving. For this plan, a review was performed to determine which regulations and programs are currently most relevant to hazard mitigation planning. The findings are summarized in Table 4-1 and Table 4-2. Short descriptions of each program are provided in Appendix B.

4.2 CITY OF NORWALK

This section identifies local programs, plans, and studies that can support or enhance the core capabilities of the City. Each can be leveraged by the City to support or enhance the implementation of mitigation actions identified in this plan. These programs, plans and studies are hereby integrated into this hazard mitigation plan by reference—mitigation actions identified in any of them are considered to be fully integrated into this hazard mitigation plan by reference.

4.2.1 General Plan

The City of Norwalk General Plan indicates where various kinds of land uses are best located and how much of each use should be provided. In designating land uses, the General Plan considers all of the following:

- Existing land use and the current pattern of developed land by the type of land use
- The demand for existing and new land uses of various types
- The desired future land use best suited for different uses
- The capabilities of infrastructure such as the water supply, wastewater collection and treatment, and transportation facilities, in relation to existing and future development

Table 4-1. Summary of Relevant Federal Agencies, Programs and Regulations

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
Americans with Disabilities Act	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
Civil Rights Act of 1964	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
Clean Water Act	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
Community Development Block Grant Disaster Resilience Program	Action Plan Funding	This is a potential alternative source of funding for actions identified in this plan.
Community Rating System	Flood Hazard	This voluntary program encourages floodplain management activities that exceed the minimum National Flood Insurance Program requirements.
Disaster Mitigation Act	Hazard Mitigation Planning	This is the current federal legislation addressing hazard mitigation planning.
Emergency Relief for Federally Owned Roads Program	Action Plan Funding	This is a possible funding source for actions identified in this plan.
Emergency Watershed Program	Action Plan Funding	This is a possible funding source for actions identified in this plan.
Endangered Species Act	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
Federal Energy Regulatory Commission Dam Safety Program	Dam Failure Hazard	This program cooperates with a large number of federal and state agencies to ensure and promote dam safety.
National Dam Safety Act	Dam Failure Hazard	This act requires a periodic engineering analysis of most dams in the country
National Environmental Policy Act	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
National Flood Insurance Program	Flood Hazard	This program makes federally backed flood insurance available to homeowners, renters, and business owners in exchange for communities enacting floodplain regulations
National Incident Management System	Action Plan Development	Adoption of this system for government, nongovernmental organizations, and the private sector to work together to manage incidents involving hazards is a prerequisite for federal preparedness grants and awards
Presidential Executive Order 11988 (Floodplain Management)	Flood Hazard	This order requires federal agencies to avoid long and short-term adverse impacts associated with modification of floodplains
Presidential Executive Order 11990 (Protection of Wetlands)	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable presidential executive orders.
U.S. Army Corps of Engineers Dam Safety Program	Dam Failure Hazard	This program is responsible for safety inspections of dams that meet size and storage limitations specified in the National Dam Safety Act.
U.S. Army Corps of Engineers Flood Hazard Management	Flood Hazard, Action Plan Implementation, Action Plan Funding	The Corps of Engineers offers multiple funding and technical assistance programs available for flood hazard mitigation actions

Table 4-2. Summary of Relevant State Agencies, Programs and Regulations

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
AB 32: The California Global Warming Solutions Act	Action Plan Development	This act establishes a state goal of reducing greenhouse gas emissions to 1990 levels by 2020
AB 70: Flood Liability	Flood Hazard	A city or county may be required to partially compensate for property damage caused by a flood if it unreasonably approves new development in areas protected by a state flood control project
AB 162: Flood Planning	Flood Hazard	Cities and counties must address flood-related matters in the land use, conservation, and safety and housing elements of their general plans.
AB 747: General Plans—Safety Element	Hazard Mitigation Planning	The safety elements of cities' and counties' general plans must address evacuation routes and include any new information on flood and fire hazards and climate adaptation and resiliency strategies.
AB 2140: General Plans—Safety Element	Hazard Mitigation Planning	This bill enables state and federal disaster assistance and mitigation funding to communities with compliant hazard mitigation plans.
AB 2800: Climate Change—Infrastructure Planning	Action Plan Development	This act requires state agencies to take into account the impacts of climate change when developing state infrastructure.
Alquist-Priolo Earthquake Fault Zoning Act	Earthquake Hazard	This act restricts construction of buildings used for human occupancy on the surface trace of active faults.
California Department of Water Resources	Flood Hazard	This state department is the state coordinating agency for floodplain management.
California Division of Safety of Dams	Dam Failure Hazard	This division monitors the dam safety program at the state level and maintains a working list of dams in the state.
California Environmental Quality Act	Action Plan Implementation	This act establishes a protocol of analysis and public disclosure of the potential environmental impacts of development projects. Any project action identified in this plan will seek full California Environmental Quality Act compliance upon implementation.
California General Planning Law	Hazard Mitigation Planning	This law requires every county and city to adopt a comprehensive long-range plan for community development, and related laws call for integration of hazard mitigation plans with general plans.
California Multi-Hazard Mitigation Plan	Hazard Mitigation Planning	Local hazard mitigation plans must be consistent with their state's hazard mitigation plan.
California Residential Mitigation Program	Earthquake Hazard	This program helps homeowners with seismic retrofits to lessen the potential for damage to their houses during an earthquake.
California State Building Code	Action Plan Implementation	Local communities must adopt and enforce building codes, which include measures to improve buildings' ability to withstand hazard events.
Disadvantaged and Low-Income Communities Investments	Action Plan Funding	This is a potential source of funding for actions located in disadvantaged or low-income communities.
Division of the State Architect's AB 300 List of Seismically At-Risk Schools	Earthquake Hazard, Action Plan Development	The Division of the State Architect recommends that local school districts conduct detailed seismic evaluations of seismically at-risk schools identified in the inventory that was required by AB 300.
Governor's Executive Order S-13-08 (Climate Impacts)	Action Plan Implementation	This order includes guidance on planning for sea-level rise in designated coastal and floodplain areas for new projects.
Senate Bill 92: Public Resources Portion of Biennial Budget Bill	Dam Failure Hazard	This bill requires dams (except for low-risk dams) to have emergency action plans that are updated every 10 years and inundation maps updated every 10 years, or sooner if specific circumstances change.
Senate Bill 97: Guidelines for Greenhouse Gas Emissions	Action Plan Implementation	This bill establishes that greenhouse gas emissions and the effects of greenhouse gas emissions are appropriate subjects for California Environmental Quality Act analysis.

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
Senate Bill 99: General Plans: Safety Element: Emergency Evacuation Routes	Action Plan Implementation	This bill requires the safety element must include information to identify residential developments in hazard areas that do not have at least two emergency evacuation routes.
Senate Bill 379: General Plans: Safety Element—Climate Adaptation	Action Plan Implementation	This bill requires cities and counties to include climate adaptation and resiliency strategies in the safety element of their general plans.
Senate Bill 1000: General Plan Amendments—Safety and Environmental Justice Elements	Action Plan Implementation	Under this bill, review and revision of general plan safety elements are required to address only flooding and fires (not climate adaptation and resilience), and environmental justice is required to be included in general plans.
Senate Bill 1035: Fire, Flood, and Adaptation Safety Element Updates	Action Plan Implementation	Clarifies that revisions to the Safety Element to address fire hazards, flood hazards, and climate adaptation and resilience strategies all must occur upon each revision to a Housing Element or Local Hazard Mitigation Program.
Standardized Emergency Management System	Action Plan Implementation	Local governments must use this system to be eligible for state funding of response-related personnel costs.

The General Plan is a comprehensive set of purposes, policies and programs to guide the future form and development of the City. It is approved by the City Council and the Mayor and adopted by the Planning Commission. The General Plan is both a strategic and long-term document, broad in scope and specific in nature. It is implemented by decisions that direct the allocation of public resources and that shape private development, which affects the lives of the residents and business community.

The General Plan is prepared and maintained by the City Planning Department and must comply with the California General Planning Law, which requires specific planning elements, including land use, circulation, housing, conservation, open space, noise, safety, and air quality. The City of Norwalk's General Plan consists of the following citywide elements:

- Land Use and Land Use Map
- Circulation
- Housing
- Conservation
- Open Space
- Noise
- Safety
- Community Design
- Educational and Cultural Resources
- Utility Infrastructure
- Zoning Map

The Safety Element addresses protection from unreasonable risks associated with natural disasters, including seismic hazards, flood hazards, and manmade and urban hazards. The Safety Element includes emergency preparedness objectives, policies, and implementation programs that minimize risks from the hazards.

4.2.2 Title 17 Zoning

Norwalk Municipal Code Title 17 (Zoning) provides zoning regulations and provisions. It designates, regulates, and restricts the location and use of buildings, structures and land for agriculture, residence, commerce, trade, industry or other purposes. The zoning code regulates and limits the height and size of buildings and other structures, regulates and determines the size of yards and other open spaces, and regulates and limits the density of population. The zoning regulations aim to encourage the appropriate use of land, to conserve and stabilize the value of property, to provide adequate open spaces, to prevent undue concentration of population, and to promote the public health, safety and general welfare. Figure 4-1 shows the zoning map for Norwalk, outlining the distribution of residential, commercial, and industrial zones.

4.2.3 Multi-Hazard Related Activities of City Departments

Several city departments perform activities and collect data related to hazard mitigation issues. The following is a summary of key city activities related to hazard and risk management:

- Public Services Department
  - Emergency maintenance services when there are signal outages, regulatory signs down, oil spills, flooding, overflow of sewer manholes, debris/tree limbs in public right-of-way
  - Assess infrastructure damage through field investigations after major hazard incidents
  - Identify areas in need of frequent maintenance of the flood control system
  - Provide post-disaster debris clearance
  - Maintain FEMA Flood Insurance Rate Map data
  - Maintain a database of FEMA Repetitive Loss Properties (currently there are none in the city)
- Public Services Department, Engineering Division
  - Ensure the City has the vital infrastructure in place to meet the current and future needs of the community
  - Protect the City's physical and natural assets
  - Manage the engineering design and construction of capital improvements, reviewing land development and construction activity as it relates to public infrastructure (both privately and publicly funded)
  - Conduct traffic engineering
  - Manage environmental programs in support of this goal.
- Public Services Department, Sidewalk and Street Maintenance
  - Ensure the safe and efficient movement of vehicular and pedestrian traffic by keeping the City's public infrastructure in good condition
  - Storm drain maintenance, inspection, and cleaning of storm drain systems
  - Maintenance and care of all City-owned lots
  - Roadway repairs and patching of potholes on 187 miles of asphalt
  - Maintenance and repair of 400 miles of sidewalks, curbs, and gutters
- Public Services Department, Greenscape and Tree Maintenance
  - Maintain over 22 miles of center medians and over 17,000 trees citywide
- Public Services Department, Traffic Maintenance
  - Maintenance of roadway markings, street striping, public parking stalls, crosswalks, curb markings, and all street signage

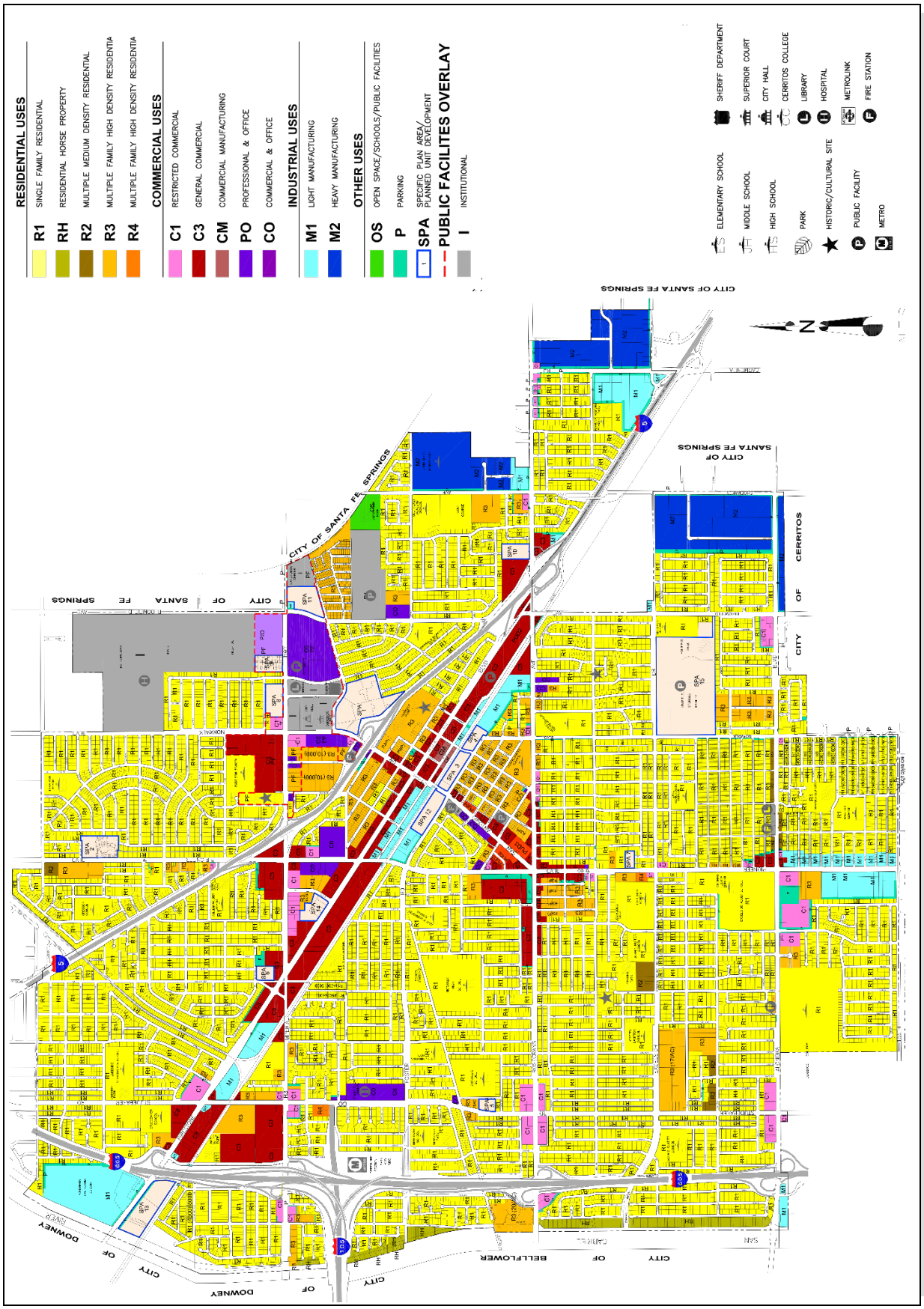


Figure 4-1. Norwalk Zoning Map

- Public Services Department, Municipal Water System
  - Provide drinking water through approximately 5,300 water service connections
  - Manage and maintain 60 miles of pipeline, three active wells, and 450 fire hydrants
  - Distribution and treatment of water to the public
- Public Services Department, Sewer System
  - Responsible for the collection of wastewater within the city limits and delivery to the trunk sewer mains of Los Angeles County Sanitation District
  - Responsible for the operation and maintenance of over 160 miles of sewer lines, more than 3,700 manholes, and three sewer lift stations within the city limits and all capital improvements
  - Contracts maintenance of 46 catch basins
- Community Development Department, Building and Safety Division
  - Promote safety through enforcement of ordinances and laws regulating construction and occupancy of all commercial, industrial and residential structures within the community
  - Facilitate the plan check process through a plan check review program
  - Track the number of building permits issued in flood risk areas
- Community Development Department, Planning Division
  - Maintain demographic, building, land use and zoning data
  - Provide descriptions of seismic and geologic hazards, flooding hazards, and hazardous materials and phases of disasters such as hazard mitigation, and multi-hazard emergency response and disaster recovery provided by the Safety Element of the General Plan
  - Assess City policy in maintaining open space and the effectiveness of regulatory and preventive standards in preventing flood damage
  - Maintain a list of natural and beneficial areas within the city such as riparian areas, sensitive areas, and habitat for rare or endangered species
- Public Safety Department, Emergency Management Office
  - Establish and maintain a comprehensive citywide planning, training/exercise and coordination effort for mitigation, preparedness, response, and recovery for multi-hazard incidents
  - Activate and operate the City Emergency Operations Center for coordination of all hazard incidents
  - Maintain emergency operations plans and associated hazard-specific and functional support annexes for the City to respond to events
  - Provide disaster awareness and emergency preparedness information to the public
  - Provide public information regarding emergency alert and warning, notifications, evacuations, and sheltering for the public and City personnel

4.2.4 Consolidated Plan

As a jurisdiction that receives U.S. Department of Housing and Urban Development (HUD) funds for housing and community development activities, the City of Norwalk is required to prepare a comprehensive five-year plan for using those funds. This "consolidated plan" is developed with the goals of securing decent housing, providing a suitable living environment, and expanding economic opportunities. An annual action plan is prepared to show how the HUD funds will be expended during the year in a way that addresses the needs, priorities and objectives contained in the City's Consolidated Plan.

The *2020-2025 City of Norwalk Consolidated Plan* (the "ConPlan") is designed to help the City assess affordable housing and community development needs and market conditions, and to make data-driven, place-based

investment decisions. The ConPlan serves as the framework for a community-wide dialogue to identify housing and community development priorities that align with HUD's block grant programs: Community Development Block Grant (CDBG) Program and HOME Investment Partnerships Program.

The ConPlan is carried out through the City's Annual Action Plan, which provides a concise summary of the actions, activities, and specific federal and non-federal resources that will be used each year to address the priority needs and specific goals identified by the ConPlan. The City annually reports accomplishments and progress toward the ConPlan goals in the *Consolidated Annual Performance and Evaluation Report*.

4.2.5 Beacon Program

The City has been accepted into the Beacon Program, sponsored by the Institute for Local Government and Statewide Energy Efficiency Collaborative. The program recognizes efforts by local governments to reduce greenhouse gas emissions, save energy, and promote sustainability.

4.2.6 Tree Planting Program

The City is committed to a tree planting program that promotes a safe, healthy, and attractive urban forest. For the 2020 Arbor Day commemoration and in keeping with the City's commitment to expand its green canopy, the City of Norwalk has collaborated with TreePeople, an environmental non-profit organization, to plant a mix of canary island pine and podocarpus trees within Gerdes Park. The 40 trees will provide shade, remove carbon dioxide from the air, release oxygen into the atmosphere, attract birds and wildlife, and improve the park's aesthetics.

4.2.7 Urban Water Management Plan

The California Urban Water Management Planning Act requires each urban water supplier in the state that directly or indirectly provides water for municipal purposes to more than 3,000 customers or supplies more than 3,000 acre-feet of water annually to prepare an urban water management plan.

4.2.8 Los Angeles County Flood Control District

The Los Angeles County Flood Control Act, adopted by the California Legislature in 1915 after a disastrous regional flood took a heavy toll on lives and property, established the Los Angeles County Flood Control District and empowered it to provide flood protection, water conservation, recreation and aesthetic enhancement within its boundaries. The Flood Control District is governed, as a separate entity, by the County of Los Angeles Board of Supervisors.

In 1984, the Flood Control District entered into an operational agreement with the Los Angeles County Department of Public Works transferring planning and operational activities to the Department of Public Works. Watershed Management Division is the planning and policy arm of the Flood Control District. Public Works Flood Maintenance and Water Resources Divisions, respectively, oversee its maintenance and operational efforts.

The Flood Control District encompasses more than 3,000 square miles, 85 cities and 2.1 million land parcels. It includes almost all drainage infrastructure within incorporated and unincorporated areas in every watershed, including 500 miles of open channel, 2,800 miles of underground storm drains, and an estimated 120,000 catch basins. The District includes portions of the City of Norwalk.

4.3 CAPABILITY ASSESSMENT

The planning team performed an inventory and analysis of existing authorities and capabilities called a "capability assessment." A capability assessment creates an inventory of a jurisdiction's codes, programs and policies, and evaluates its capacity to carry them out. It presents a toolkit for implementing the hazard mitigation plan and for identifying opportunities to increase the City's core capabilities to support mitigation actions. The assessment identifies potential gaps in core capabilities. Filling those gaps may eventually become mitigation actions in the plan. Assessment findings were shared with City departments as they developed the recommended mitigation actions. If a department identified an opportunity to add or expand a capability, then doing so has been identified as a mitigation action. The City views each core capability to be fully adaptable as needed to meet the best interests of the City. This adaptability is an overarching City capability that is acknowledged by this reference.

4.3.1 Legal and Regulatory Capabilities

Jurisdictions have the ability to develop policies and programs and to implement rules and regulations to protect and serve residents. Local policies are typically identified in a variety of community plans, implemented via a local ordinance, and enforced through a governmental body. An assessment of legal and regulatory capabilities is presented in Table 4-3.

Table 4-3. Legal and Regulatory Capability

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Codes, Ordinances & Requirements				
Building Code	Yes	No	Yes	No
Comment: City of Norwalk Municipal Code, Title 15 Buildings and Construction; 2019 California Building, Residential, Electrical, Mechanical, Plumbing, Fire, Energy, and Green Building Standards Codes.				
Zoning Code	Yes	No	Yes	No
Comment: City of Norwalk Municipal Code, Title 17 Zoning, (Ord. 21-1722 § 2), ***Integration Opportunity:*** Future updates to the City's zoning ordinance should consider the hazard extent and location data included in the plan to inform land use dictated by this ordinance.				
Subdivisions	Yes	No	Yes	No
Comment: City of Norwalk Municipal Code, Title 16 Subdivisions, (Ord. 21-1722 § 2)				
Stormwater Management	Yes	No	Yes	Yes
Comment: City of Norwalk Municipal Code, Title 18 Environment, (Ord. 21-1722 § 2; Ord. 14-1651 § 1) ***Integration Opportunity:*** City-owned facilities constructed under this code may be eligible for FEMA Hazard Mitigation Assistance grants. Future updates to this plan should consider eligible stormwater management activities as potential actions.				
Post-Disaster Recovery	No	No	No	No
Comment:				
Real Estate Disclosure	No	No	Yes	No
Comment: State of California Natural Hazards Disclosure Act, effective 6/1/1998 (California Civil Code Section 1003) states that real estate sellers and brokers are legally required to disclose if a property being sold lies within one or more state or locally mapped hazard areas.				

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Growth Management	Yes	No	Yes	Yes
Comment: The General Plan is a policy document that represents the official statement of the City regarding its social, physical, and economic goals. The adopted General Plan includes chapters on land use, circulation, housing, conservation, open space, noise, safety, community design, educational and cultural resources, and utility infrastructure. The General Plan determines the potential growth of the City, including residential, commercial, and industrial growth. It establishes goals to accommodate that growth. City of Norwalk Municipal Code, Title 17, section 17.09, Specific Plan Areas. The purpose of the specific plan areas is to facilitate the systematic implementation of the general plan and to serve as a basis for review of more detailed plans. They are intended to establish a pattern for the appropriate design, arrangement and relationship of buildings, open space, circulation, land use and other features as necessary to coordinate development and achieve a functionally and visually integrated development. ***Integration Opportunity:*** As the City develops future specific plans, the City should consider hazard extent and location data contained in this plan to support the land use direction of each specific plan.				
Site Plan Review	Yes	No	No	No
Comment: City of Norwalk, Building Division & Safety Division				
Environmental Protection	Yes	Yes, Los Angeles County	Yes	Yes
Comment: City of Norwalk General Plan, Chapter 5D Conservation Element, February 1996. Gateway Cities Council of Governments (Los Angeles County and 27 cities including Norwalk) was one of two sub-regions that developed its own Sustainable Communities Strategy for incorporation into the Southern California Association of Governments 2012-2035 RTP/SCS. ***Integration Opportunity*:** The City should consider integrating the policies and implementation actions from the Conservation Element as potential actions for this plan.				
Emergency Management	Yes	No	Yes	Yes
Comment: City of Norwalk General Plan, Chapter 5G Safety Element, February 1996. The City maintains a Standardized Emergency Management System/National Incident Management System Emergency Operation Plan and Hazard Mitigation Plan and will coordinate with local, county, state and federal agencies and organizations during emergencies and disasters. ***Integration Opportunity*:** The Norwalk Emergency Management Office is an integral part of the multi-agency emergency operations organization described in the Safety Element and is the lead department for developing this hazard mitigation plan.				
Climate Change	Yes	No	Yes	Yes
Comment: The City does not have a climate change ordinance. Per California Senate Bill SB-379, upon the next revision of a local hazard mitigation plan before January 1, 2022, the safety element must be reviewed and updated as necessary to address climate adaptation and resiliency strategies applicable to the City. ***Integration Opportunity:*** As the City achieves compliance pursuant to CA SB-379, there will be opportunities for the City to incorporate climate adaptation actions and policies into future updates to the hazard mitigation plan, and for the plan to inform future updates to the City's General Plan dictated by SB-379.				
Planning Documents				
General Plan	Yes	No	Yes	Yes
Comment: The General Plan is a policy document that represents the official statement of the City regarding its social, physical, and economic goals. The adopted General Plan includes chapters on land use, circulation, housing, conservation, open space, noise, safety, community design, educational and cultural resources, and utility infrastructure. The General Plan determines the potential growth of the City, including residential, commercial, and industrial growtt. It establishes goals to accommodate that growth. The General Plan consists of a framework last adopted in 1996 and 10 citywide elements. The housing element was updated in 2014. ***Integration Opportunity*:** Based on directives from AB-2140, SB-379 and SB-1000, the City will fully integrate this mitigation plan into the safety element of its general plan upon its next update.				

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Capital Improvement Plan	Yes	No	No	Yes
Capital facilities the plan addresses: Recent capital improvement program projects in the 2020-2021 fiscal year budget include street improvements, traffic improvements, park facilities, water, sewer, environmental services, public facilities improvements, and veteran's affordable housing improvements.				
Comment: ***Integration Opportunity:*** This integration is ongoing. In the development of the action plan for this planning process, the City reviewed its capital improvement plan to identify actions that are eligible for FEMA grant funding. All future revisions to the City's capital improvement plans will look to this plan to potentially leverage FEMA grant funding for implementation.				
Floodplain Management Plan	No	No	No	No
Comment:				
Stormwater Plans	No	No	No	No
Comment:				
Habitat Conservation Plan	No	No	No	No
Comment:				
Economic Development Plan	Yes	No	No	No
Comment: The Consolidated Plan, 2020 – 2025, submitted to the U.S. Department of Housing and Urban Development (HUD) serves as a comprehensive housing affordability strategy, community development plan and submission for funding under any of HUD's entitlement formula grant programs.				
Community Wildfire Protection Plan	No	No	No	No
Comment: The City of Norwalk is not at risk for wildfires.				
Response/Recovery Planning				
Emergency Operations Plan	Yes	No	Yes	Yes
Comment: Emergency Preparedness and Operations, 2020-21 Fiscal Year Adopted Budget Activities and Objectives ***Integration Opportunity:*** Risk and vulnerability information in the hazard mitigation plan can inform future updates to the Emergency Operation Plan.				
Threat & Hazard Identification & Risk Assessment	No	Yes, UASI	No	No
Comment: Los Angeles/Long Beach Urban Areas Security Initiative (UASI), which is composed of agencies representing the City of Los Angeles, City of Long Beach and the County of Los Angeles, developed a Threat & Hazard Identification & Risk Assessment.				
Terrorism Plan	No	Yes, Los Angeles Operational Area	No	No
Comment: Los Angeles Operational Area Terrorism Plan				
Post-Disaster Recovery Plan	No	No	No	No
Comment:				
Continuity of Operations Plan	No	No	No	No
Comment:				
Public Health Plan	No	Yes, Los Angeles County	No	No
Comment: Community Health Improvement Plan, 2015-2020; Pre-hospital Care Policy Ref. No. 842.1 Minimum EMS Resource Guidelines for Mass Gatherings and Special Events				

4.3.2 Integration Opportunity

The assessment looked for opportunities to integrate this mitigation plan with the legal/regulatory capabilities identified. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The City considered actions to implement this integration. The column in Table 4-3 labeled "Integration Opportunity" in this table identifies capabilities that can support or be supported by components of this plan. Where "yes" is indicated in this column, the City has considered actions to integrate these capabilities with the plan.

4.3.3 Administrative and Technical Capabilities

Legal, regulatory, and fiscal capabilities provide the backbone for successfully developing a mitigation strategy; however, without appropriate personnel, the strategy may not be implemented. Administrative and technical capabilities focus on the availability of personnel resources responsible for implementing all the facets of hazard mitigation. These resources include technical experts, such as engineers and scientists, as well as personnel with capabilities that may be found in multiple departments, such as grant writers. An assessment of administrative and technical capabilities is presented in Table 4-4.

Table 4-4. Administrative and Technical Capability

Staff/ Personnel Resources	Available (Yes or No)	Department or Agency (Positions)
Planners or engineers with knowledge of land development and land management practices	Yes	Community Development Department consists of three divisions: • *Building and Safety*—Focus is to enhance the quality of life in Norwalk by providing for life-safety, safeguarding property, and protecting public welfare through consistent enforcement of the adopted codes. • *Planning*—Current and advanced planning. • *Housing & Neighborhood Development*—Administers the Housing Choice Voucher Program (Section 8), Community Development Block Grant
Engineers or professionals trained in construction practices related to buildings and/or infrastructure	Yes	*Public Services Department, Engineering Division*—The Engineering Division is responsible for design, inspection, and administration of the City's infrastructure construction projects that include streets, sewers, water lines, drainage systems, and all traffic related activities. The Division produces and maintains the maps, drawings, and records of the City's facilities within the public right-of-way as well as subdivision maps and assists the public with engineering related matters. The Engineering Division issues all permits for activities within the public right-of-way that generally includes the streets, sidewalks, and grass parkway areas.
Planners or engineers with an understanding of natural hazards	Yes	Community Development Department, Planning Division
Floodplain manager	Yes	The City Manager and/or the manager designee
Surveyors	Yes	Can contract for this service
Personnel skilled or trained in GIS Applications	Yes	Community Development and Engineering have staff with GIS capabilities
Scientist familiar with local natural hazards	Yes	Community Development Department, Planning Division
Emergency manager	Yes	Public Safety Department
Grant writers	Yes	Can Contract for this service
Staff with expertise or training in benefit/cost analysis	Yes	Can Contract for this service

4.3.4 Fiscal Capabilities

Assessing a jurisdiction's fiscal capability provides an understanding of the ability to fulfill the financial needs associated with hazard mitigation projects. This assessment identifies both outside resources, such as grant-funding eligibility, and local jurisdictional authority to generate internal financial capability, such as through impact fees. An assessment of fiscal capabilities is presented in Table 4-5.

Table 4-5. Fiscal Capability

Financial Resources	Accessible or Eligible to Use (Yes or No)
Community Development Block Grants	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service	Yes
Incur Debt through General Obligation Bonds	Yes
Incur Debt through Special Tax Bonds	Yes
Incur Debt through Private Activity Bonds	No
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	No

4.3.5 Participation in Other Programs

Other programs, such as the Community Rating System and Firewise USA, can enhance a jurisdiction's ability to mitigate, prepare for, and respond to natural hazards. These programs indicate a jurisdiction's desire to go beyond minimum requirements set forth by local, state, and federal regulations in order to create a more resilient community. These programs complement each other by focusing on communication, mitigation, and community preparedness to save lives and minimize the impact of natural hazards on a community. Classifications under various community mitigation programs are presented in Table 4-6.

Table 4-6. Community Classifications

	Participating (Yes or No)	Classification	Date Classified
FIPS Code	037-52526		
DUNS Number	075279760		
Community Rating System	No	N/A	N/A
Building Code Effectiveness Grading Schedule	Yes	3/3	2013
Public Protection	Yes	2[a]	5/11/2018
Firewise	No	N/A	N/A
Storm Ready	No	N/A	N/A

a. Division 4, Los Angeles County Fire Department

4.3.6 Development and Permitting Capability

Jurisdictions regulate land use through the adoption and enforcement of zoning, subdivision and land development ordinances, building codes, building permit ordinances, floodplain, and stormwater management ordinances. When effectively prepared and administered, these regulations can lead to hazard mitigation. Development and permitting capabilities are presented in Table 4-7.

Table 4-7. Development and Permitting Capability

Criterion	Response
Does your jurisdiction issue development permits?	Yes
• If no, who does? If yes, which department?	Community Development Department, Building Division
Does your jurisdiction have the ability to track permits by hazard area?	No
Does your jurisdiction have a buildable lands inventory?	Yes

4.3.7 NFIP Compliance

Flooding is the costliest natural hazard in the United States and, with the promulgation of recent federal regulation, homeowners throughout the country are experiencing increasingly high flood insurance premiums. Community participation in the NFIP opens up opportunity for additional grant funding associated specifically with flooding issues. Assessment of the jurisdiction's current NFIP status and compliance provides planners with a greater understanding of the local flood management program, opportunities for improvement, and available grant funding opportunities. Information on NFIP compliance is presented in Table 4-8.

Table 4-8. National Flood Insurance Program Compliance

Criterion	Response
What local department is responsible for floodplain management?	Community Development, Building and Safety Division
Who is your floodplain administrator? (department/position)	City Manager and/or their Designee
Are any certified floodplain managers on staff in your jurisdiction?	No
What is the date of adoption of your flood damage prevention ordinance?	Title 15, Chapter 15.48, last adopted 10/18/2016
When was the most recent Community Assistance Visit or Community Assistance Contact?	A Community Assistance Contact (CAC) was conducted by FEMA region IX staff on 8/23/2000. The City has never received a formal Community Assistance Visit (CAV)
Does your jurisdiction have any outstanding NFIP compliance violations that need to be addressed?	None noted
• **If so, please state what they are**	N/A
Do your flood hazard maps adequately address the flood risk within your jurisdiction?	No
• **If no, please state why**	The maps do not include or address the urban drainage flood issues the City experiences
Does your floodplain management staff need any assistance or training to support its floodplain management program?	Not at this time
• **If so, what type of assistance/training is needed?**	N/A
Does your jurisdiction participate in the Community Rating System (CRS)?	No
• **If so, is your jurisdiction seeking to improve its CRS Classification?**	No
• **If not, is your jurisdiction interested in joining the CRS program?**	No

4.3.8 Public Outreach Capability

Regular engagement with the public on issues regarding hazard mitigation provides an opportunity to directly interface with community members. Assessing this outreach and education capability illustrates the connection between the government and community members, which opens a two-way dialogue that can result in a more resilient community based on education and public engagement. An assessment of education and outreach capabilities is presented in Table 4-9.

4.3.9 Adaptive Capacity

An adaptive capacity assessment evaluates a jurisdiction's ability to anticipate impacts from future conditions. By looking at public support, technical adaptive capacity, and other factors, jurisdictions identify their core capability for resilience against issues such as sea level rise. The adaptive capacity assessment provides jurisdictions with an opportunity to identify areas for improvement by ranking their capacity high, medium, or low. The community's adaptive capacity for the impacts of climate change is presented in Table 4-10.

Table 4-9. Education and Outreach

Criterion	Response
Do you have a Public Information Officer or Communications Office?	Yes
Do you have personnel skilled or trained in website development?	Yes
Do you have hazard mitigation information available on your website? • **If yes, please briefly describe.**	Yes A webpage (under Public Safety) specifically for the Hazard Mitigation Plan, including information about hazard mitigation planning (in general), FEMA resources/grants, etc.
Do you utilize social media for hazard mitigation education and outreach? • **If yes, please briefly describe.**	Yes Facebook, Instagram, and Twitter
Do you have any resident boards or commissions that address issues related to hazard mitigation?	Yes, Public Safety Commission (monthly)
Do you have any other programs already in place that could be used to communicate hazard-related information? • **If yes, please briefly describe.**	Yes Mailers, emergency notifications, youth cadets, CERT, neighborhood watch meetings, community forums
Do you have any established warning systems for hazard events? • **If yes, please briefly describe.**	Yes Nixle – Everbridge (text and email) ~2,100 users

Table 4-10. Adaptive Capacity for Climate Change

Adaptive Capacity Assessment Questions	Jurisdiction Rating
TECHNICAL CAPACITY	
Jurisdiction-level understanding of potential climate change impacts	Medium
***Comment*: The City's understanding of the potential impacts for climate change have been bolstered through the development of this plan.**	
Jurisdiction-level monitoring of climate change impacts	Low
***Comment:* Currently have no capacity of this element**	
Technical resources to assess proposed strategies for feasibility and externalities	Low
***Comment:* The City's resources for this level of assessment are limited at this time**	
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	Medium
***Comment:* The City's 2020 Vision outlines objectives to support and invest in energy efficient and environmentally friendly technologies to develop sustainable infrastructure, reduce the City's carbon footprint and lower long-term costs**	
Capital planning and land use decisions informed by potential climate impacts	Low
***Comment:* The City' General Plan and Capital Facilities program currently do not include climate change impacts as an emphasis**	
Participation in regional groups addressing climate risks	Medium
***Comment:* Norwalk is part of the Southern California Association of Governments region, and the Gateway Cities Council of Governments.**	

Adaptive Capacity Assessment Questions	Jurisdiction Rating
IMPLEMENTATION CAPACITY	
Clear authority/mandate to consider climate change impacts during public decision-making processes	Low
Comment: Recent legislation in California requires that greenhouse gas emissions and climate change be addressed by state and regional agencies, specifically greenhouse gas reduction targets established by Executive Order S-3-05, Assembly Bill 32 (AB 32), and Senate Bill 375 (SB 375).	
Identified strategies for greenhouse gas mitigation efforts	Medium
Comment: The City's 2020 Vision outlines objectives to support and invest in energy efficient and environmentally friendly technologies to develop sustainable infrastructure, reduce the City's carbon footprint and lower long-term costs	
Identified strategies for adaptation to impacts	Medium
Comment:. The City's 2020 Vision outlines objectives to support and invest in energy efficient and environmentally friendly technologies to develop sustainable infrastructure, reduce the City's carbon footprint and lower long-term costs	
Champions for climate action in local government departments	Low
Comment: At this time the City has not identified any Champions for climate actions	
Political support for implementing climate change adaptation strategies	Medium
Comment: The political support for proactive strategies will grow as the City updates its plans and programs in response to state mandates.	
Financial resources devoted to climate change adaptation	Low
Comment: The resources for mitigation the impacts at the City level are low	
Local authority over sectors likely to be negative impacted	Low
Comment: This capacity is considered to be low at this time	
PUBLIC CAPACITY	
Residents' knowledge and understanding of climate risk	Low
Comment: This knowledge and understanding is considered to be low at this time.	
Residents' support of adaptation efforts	Medium
Comment: Regionally, the public support of climate adaptation efforts is considered to be medium at this time.	
Residents' capacity to adapt to climate impacts	Low
Comment: This capacity is considered to be low at this time	
Local economy current capacity to adapt to climate impacts	Low
Comment: This capacity is considered to be low at this time	
Local ecosystems capacity to adapt to climate impacts	Low
Comment: Ecosystem service within the City of Norwalk are limited.	

PART 2—RISK ASSESSMENT

5. HAZARDS OF CONCERN, RISK ASSESSMENT METHODOLOGY

The risk assessments in this plan describe the risks associated with each identified hazard of concern. The following steps were used to define the risk of each hazard:

- **Identify and profile each hazard**—The following information is given for each hazard:
  - A summary of past events that have impacted the planning area
  - Geographic areas most affected by the hazard
  - Event frequency estimates
  - Severity descriptions
  - Warning time likely to be available for response
- **Determine exposure to each hazard**—Exposure was assessed by overlaying hazard maps with an inventory of structures, facilities, and systems to decide which of them would be exposed to each hazard.
- **Assess the vulnerability of exposed facilities**—Vulnerability of exposed structures and infrastructure was evaluated by interpreting the probability of occurrence of each event and assessing structures, facilities, and systems that are exposed to each hazard. Tools such as GIS and Hazus were used for this assessment for the dam failure, earthquake, flood, and tsunami hazards. Outputs similar to those from Hazus were generated for other hazards, using data generated through GIS.

The risk assessments performed for this plan evaluated risk countywide and for individual incorporated areas.

5.1 IDENTIFIED HAZARDS OF CONCERN

The Steering Committee considered the full range of natural hazards that could affect the planning area and then listed hazards that present the greatest concern. The process incorporated a review of state and local hazard planning documents as well as information on the frequency of, magnitude of, and costs associated with hazards that have struck the planning area or could do so. Hazards not addressed by the plan are considered to have no direct or indirect impacts on the City. Anecdotal information regarding natural hazards and the perceived vulnerability of the planning area's assets to them was also used. Based on the review, this plan addresses the following hazards of concern (presented in alphabetical order; the order of listing does not indicate the hazards' relative severity):

- Dam failure
- Drought/Extreme Heat
- Earthquake
- Flooding

The hazard mitigation plan includes a discussion of climate change, but it is not treated as a stand-alone hazard. Instead, a review is provided on the ways in which climate change could affect the planning area's exposure and vulnerability to the identified hazards of concern.

An additional chapter provides a profile of other "hazards of interest," defined as hazards that may impact the planning area but whose risk is difficult to quantify due to a lack of data or well-established assessment parameters. That chapter provides a profile of these hazards but does not assess them to the same level of detail as the primary hazards of concern. The hazards of interest are not included in the risk ranking for this plan.

5.2 RISK ASSESSMENT TOOLS

5.2.1 Mapping

National, state, county, and city databases were reviewed to locate available spatially based data relevant to this planning effort. Maps were produced using geographic information system (GIS) software to show the spatial extent and location of hazards when such datasets were available. The maps are included in the hazard profile chapters. Data used for this plan represents the best science currently available and was approved by the City of Norwalk for use in the plan. Sources and methods used to generate the maps are described in Appendix C.

5.2.2 Modeling

Overview

FEMA developed the standardized GIS-based software program Hazards U.S. (Hazus) to estimate losses caused by earthquakes, hurricanes and floods and identify areas that face the highest risk and potential for loss. Hazus is used to support risk assessments, mitigation planning, and emergency planning and response. It provides a wide range of inventory data, such as demographics, building stock, critical facilities, transportation and utility infrastructure, and multiple models to estimate potential losses from natural disasters. The program maps and calculates hazard data and damage and economic loss estimates for buildings and infrastructure. Its advantages include the following:

- Provides a consistent methodology for assessing risk across geographic and political entities
- Provides a way to save data so that they can readily be updated as population, inventory, and other factors change and as mitigation planning efforts evolve
- Facilitates review of mitigation plans because it helps to ensure that FEMA methodologies are incorporated
- Supports grant applications by calculating benefits using FEMA definitions and terminology
- Produces hazard data and loss estimates that can be used in communication with local stakeholders
- Is administered by the local government and can be used to manage and update a hazard mitigation plan throughout its implementation

Levels of Detail for Evaluation

Hazus provides default data for inventory, vulnerability, and hazards; these default data can be supplemented with local data to provide a more refined analysis. The model can carry out three levels of analysis:

- **Level 1**—All of the information needed to produce an estimate of losses is included in the software's default data. These data are derived from national databases and describe in general terms the characteristic parameters of the planning area
- **Level 2**—More-accurate estimates of losses require more detailed information about the planning area. To produce Level 2 estimates of losses, detailed information is required about local geology, hydrology, hydraulics, and building inventory, as well as data on utilities and critical facilities. This information is needed in a GIS format
- **Level 3**—This level of analysis generates the most accurate estimate of losses. It requires detailed engineering and geotechnical information to customize it for the planning area

5.3 RISK ASSESSMENT APPROACH

5.3.1 Hazard Profile Development

Hazard profiles were developed through web-based research and review of previously developed local and state reports and plans. Frequency and severity indicators include past events and the expert opinions of geologists, emergency management specialists, and others.

5.3.2 Exposure and Vulnerability

Community exposure and vulnerability to the following hazards were evaluated using Hazus:

- **Dam Failure**—A Level 2 user-defined analysis was performed for general building stock and for critical facilities. Current mapping for the planning area was used to delineate hazard areas for dam failure and estimate potential losses. To estimate damage that would result from this inundation-based hazard, Hazus uses pre-defined relationships between water depth at a structure and resulting damage, with damage given as a percent of total replacement value. Curves defining these relationships have been developed for damage to structures and for damage to typical contents within a structure. By inputting inundation depth data and known property replacement cost values, dollar-value estimates of damage were generated.
- **Earthquake**—A Level 2 analysis was performed to assess earthquake exposure and vulnerability for four scenario events and one probabilistic event:
  - A Magnitude-7.45 event on the Compton Fault with an epicenter approximately 10 miles west-northwest of Norwalk
  - A Magnitude-6.82 event on the Puente Hills Fault with an epicenter approximately 10.5 miles northeast of Norwalk
  - A Magnitude-6.98 event on the Whittier Fault with an epicenter approximately 16 miles east of Norwalk
  - The standard Hazus 100-year probabilistic event.
- **Flood**—Historical datasets were not adequate to use Hazus to model future losses for flood. However, areas and inventory susceptible to the flood hazard were mapped by other means to evaluate exposure.

5.3.3 Drought and Extreme Heat

The risk assessment methodologies used for this plan focus on damage to structures. The risk assessment for drought and extreme heat was more limited and qualitative than the assessment for the other hazards of concern because this hazard does not affect structures. Historical datasets were not adequate to model future losses. A qualitative analysis was conducted using the best available data and professional judgment.

5.4 SOURCES OF DATA USED

5.4.1 Building and Cost Data

Replacement cost is the cost to replace an entire structure with one of equal quality and utility. Replacement cost is based on industry-standard cost-estimation models published in the 2021 *RS Means Square Foot Costs*. It is calculated using the RS Means square foot cost for a structure, which is based on the Hazus occupancy class (i.e., multi-family residential or commercial retail trade), multiplied by the square footage of the structure from the tax assessor data. The construction class and number of stories for single-family residential structures also factor into determining the square foot costs.

Replacement cost values and detailed structure information derived from parcel and tax assessor data provided by Los Angeles County were loaded into Hazus. When available, an updated inventory was used in place of the Hazus defaults for critical facilities and infrastructure.

5.4.2 Hazus Data Inputs

The following hazard datasets were used for the Hazus Level 2 analysis conducted for the risk assessment:

- **Dam Failure**—Dam failure inundation area boundaries and depth grids data for the Whittier Narrows Dam were provided by the U.S. Army Corps of Engineers. The depth grid was integrated into the Hazus model
- **Earthquake**—Earthquake ShakeMaps and probabilistic data prepared by the U.S. Geological Survey (USGS) were used for the analysis of this hazard. A National Earthquake Hazard Reduction Program (NEHRP) soils map from the California Department of Conservation and liquefaction zones data from the California Geological Survey were also integrated into the Hazus model

5.4.3 Other Local Hazard Data

No GIS-format datasets for the planning area were identified for drought or extreme heat. Unless otherwise indicated, climate-change-related projections, data and visualization tools were provided by Cal-Adapt, an online resource for information on how climate change could affect local communities in California. The data available on Cal-Adapt is from a variety of organizations in the scientific community and represents peer-reviewed science.

5.4.4 Data Source Summary

Table 5-1 summarizes the data sources used for the risk assessment for this plan.

Table 5-1. Hazus Model Data Documentation

Data	Source	Date	Format
Property parcel data	Los Angeles County Assessor	2021	Digital (GIS)
Secured basic file abstract (Contains building information such as use code, year built, square footage, number of stories.)	Los Angeles County Assessor	2021	Digital (GIS)
Building footprints	City of Norwalk	Unknown	Digital (GIS)
Building replacement (square foot) costs	RS Means	2021	Digital (pdf)
Whittier Narrows Dam Western Embankment Breach Pool Elevation 239.9 Feet NAVD	U.S. Army Corps of Engineers	2018	Digital (GIS)
ShakeMap – Compton M7.45	USGS	2017	Digital (GIS)
ShakeMap – Puente Hills (Coyote Hills) M6.82	USGS	2017	Digital (GIS)
ShakeMap – Whittier Alt2 M6.98	USGS	2017	Digital (GIS)
NEHRP soils (VsMapV3_Geology)	California Department of Conservation	2015	Digital (GIS)
Seismic Hazard Zone Maps for Liquefaction	California Geological Survey	2017	Digital (GIS)
Digital Flood Insurance Rate Map (DFIRM) – Los Angeles County effective 6/12/2019	FEMA	2019	Digital (GIS)
City of Norwalk HMP critical facilities list	City of Norwalk	2021	Digital (text)
City of Norwalk potable water system	City of Norwalk	2021	Digital (GIS)
Norwalk Municipal Water Master Plan 2014 maps	City of Norwalk	2014	Digital (pdf)
Electric substations	California Energy Commission	Downloaded 2020	Digital (GIS)
Power plants	California Energy Commission	Downloaded 2020	Digital (GIS)
Local bridges	California Department of Transportation	Downloaded 2020	Digital (GIS)
State bridges	California Department of Transportation	Downloaded 2020	Digital (GIS)
FDIC insured banks	Homeland Infrastructure Foundation-Level Data	Downloaded 2020	Digital (GIS)

5.5 LIMITATIONS

Loss estimates, exposure assessments, and hazard-specific vulnerability evaluations rely on the best available data and methodologies. Uncertainties are inherent in any loss estimation methodology and arise in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from the following:

- Approximations and simplifications necessary to conduct a study
- Incomplete or outdated inventory, demographic, or economic parameter data
- The unique nature, geographic extent, and severity of each hazard
- Mitigation measures already employed
- The amount of advance notice residents have to prepare for a specific hazard event

These factors can affect loss estimates by a factor of two or more. Therefore, potential exposure and loss estimates are approximate and should be used only to understand relative risk.

6. DAM FAILURE

6.1 GENERAL BACKGROUND

6.1.1 Definition and Classification of Dams

A dam is an artificial barrier that can store water, wastewater, or liquid-borne materials for many reasons—flood control, human water supply, irrigation, livestock water supply, energy generation, containment of mine tailings, recreation, or pollution control. Many dams fulfill a combination of these functions. They are an important resource in the United States (ASDSO, 2021). In California, dams are regulated by the State of California Division of Safety of Dams. Additional regulatory oversight of dams is cited in Chapter 5 and described in Appendix B.

The California Water Code (Division 3) defines a dam as any artificial barrier, together with appurtenant works, that does or may impound or divert water, and that either:

- Has a height of more than 6 feet and it impounds 50 acre-feet or more of water, or
- Has a height of 25 feet or higher and impounds more than 15 acre-feet of water

Dams can be classified according to their purpose, the construction material or methods used, their slope or cross-section, the way they resist the force of the water pressure, or the means used for controlling seepage. Materials used to construct dams include earth, rock, tailings from mining or milling, concrete, masonry, steel, timber, plastic, rubber, and combinations of these.

6.1.2 Causes of Dam Failure

Partial or full failure of dams has the potential to cause massive destruction to the ecosystems and communities located downstream. Partial or full failure can occur as a result of one or a combination of the following reasons (FEMA, 2021b):

- Overtopping caused by floods that exceed the dam capacity (inadequate spillway capacity)
- Prolonged periods of rainfall and flooding
- Deliberate acts of sabotage (terrorism)
- Structural failure of materials used in dam construction
- Movement and/or failure of the foundation supporting the dam
- Settlement and cracking of concrete or embankment dams
- Piping and internal erosion of soil in embankment dams

- Inadequate or negligent operation, maintenance, and upkeep
- Failure of upstream dams on the same waterway
- Earthquake (liquefaction/landslides)

Many dam failures in the United States have been secondary results of other disasters. The most common causes are earthquakes, landslides, extreme storms, equipment malfunction, structural damage, foundation failures, and sabotage. Poor construction, lack of maintenance and repair, and deficient operational procedures are preventable or correctable by a program of regular inspections. Terrorism and vandalism are serious concerns that all operators of public facilities must plan for; these threats are under continuous review by public safety agencies.

6.1.3 Planning Requirements

State of California

All dams whose inundation areas may impact the planning area have emergency action plans (EAPs) on file. The EAPs must include the following (Cal OES, 2018a):

- Emergency notification flow charts
- Information on a four-step response process
- Description of agencies' roles and actions in response to an emergency incident
- Description of actions to be taken in advance of an emergency
- Inundation maps
- Additional information such as revision records and distribution lists

After the EAPs are approved by the state, the law requires dam owners to send the approved EAPs to relevant stakeholders. Local public agencies can then adopt emergency procedures that incorporate the information in the EAP in a manner that conforms to local needs and includes methods and procedures for alerting and warning the public and other response and preparedness related items (State of California, 2021).

Federal Energy Regulatory Commission

Dams that fall under the jurisdiction of the Federal Energy Regulatory Commission (FERC) also have specified planning requirements. FERC has the largest dam safety program in the United States. It cooperates with a large number of federal and state agencies to ensure and promote dam safety and, more recently, homeland security. FERC requires licensees to prepare emergency action plans and conducts training sessions on how to develop and test these plans. The plans are designed to serve as an early warning system if there is a potential for, or a sudden release of water from, a dam failure or accident to the dam. The plans include operational procedures that may be used, such as reducing reservoir levels and reducing downstream flows and procedures for notifying affected residents and agencies responsible for emergency management. These plans are frequently updated and tested to ensure that in emergency situations everyone knows what to do, thus saving lives and minimizing property damage.

6.1.4 Rating Dam Hazards

Dam failure can be catastrophic to all life and property downstream. California's Division of Safety of Dams has developed a hazard potential classification system for state-jurisdiction dams, as shown on Table 6-1. This system is modified from federal guidelines, which recommend three-tier classification. The California system adds a fourth hazard classification of "extremely high." Dams classified as extremely high hazard may impact highly populated areas or critical infrastructure or have short evacuation warning times.

Table 6-1. State of California Downstream Hazard Potential Classification

Downstream Hazard Potential Classification	Potential Downstream Impacts to Life and Property
Low	No probable loss of human life and low economic and environmental losses. Losses are expected to be principally limited to the owner's property.
Significant	No probable loss of human life but can cause economic loss, environmental damage, impacts to critical facilities, or other significant impacts.
High	Expected to cause loss of at least one human life.
Extremely High	Expected to cause considerable loss of human life or would result in an inundation area with a population of 1,000 or more.

Source: *California Division of Safety of Dams, 2020*

6.1.5 Secondary Hazards

Dam failure can cause secondary hazards of landslides, bank erosion, and destruction of downstream habitat. Dam failure may worsen the severity of a drought by releasing water that might have been used as a potable water source.

6.2 HAZARD PROFILE

6.2.1 Past Events

There have been no dam failure events that have directly impacted the City of Norwalk. According to the Association of State Dam Safety Officials, "no one knows precisely how many dam failures have occurred in the U.S., but they have been documented in every state. From January 2005 through June 2013, state dam safety programs reported 173 dam failures and 587 incidents—episodes that, without intervention, would likely have resulted in dam failure." The historical record indicates that California has had about 45 failures of non-federal dams. Below is a partial list of significant dam failures in California.

Oroville Dam, 2017

In February 2017, heavy rain in Northern California caused the water level in the Oroville Dam to rise to a dangerous level. The state released water down the main spillway to relieve some of the pressure. On February 7, a crack in the spillway appeared and soon grew into a 250-foot crater. To prevent further damage, officials shut off water to the main spillway, but the reservoir continued to fill. The state released small amounts of water – which eroded the spillway's hole by another 50 feet and began to erode the hillside. The erosion threatened to undercut the entire dam, which could cause a collapse and send a 30-foot wall of water into the valley and communities below; 188,00 people were ordered to evacuate the Feather River basin. Officials further released

100,000 cubic feet per second of water down the main spillway, damaging it further. The dam held, and the reservoir eventually dropped below 850 feet.

1994 Pacoima Dam

The Pacoima Dam was damaged during the 1994 Northridge earthquake. The dam received enormous ground accelerations, which reached a peak level of twice the force of gravity (Los Angeles Times, 1994). The dam's location was approximately 8 miles from the epicenter. Thirteen additional dams in the greater Los Angeles area moved or cracked during the earthquake, however, none were severely damaged, in part due to completion of retrofitting pursuant to the 1972 State Dam Safety Act.

1971 Multiple Dams, San Fernando Earthquake

On February 9, 1971, the San Fernando earthquake (also known as the Sylmar earthquake) occurred in the foothills of the San Gabriel Mountains. Damage was reported to the following dams:

- **Lower San Fernando Dam—**Perched above the densely populated San Fernando Valley, the 142-foot-high, 2,100-foot-long Lower San Fernando Dam held a reservoir 1.6 miles long, and up to 130 feet deep. The quake shook loose a massive slide in the upstream slope of the Lower San Fernando Dam that lowered the crest about 30 feet and carried away much of upstream concrete facing of the dam. Eighty-thousand people were evacuated from an 11-square-mile area while the water behind the earthen dam was lowered over a three-day period. The dam could not be repaired to safely hold its water supply and the $33 million Los Angeles Dam was built to replace it in 1975-76.
- **Van Norman Dam—**Van Norman Lake reportedly sank 1 foot, causing the evacuation of several thousand people from their homes south of the dam in Mission Hills. A 60-foot section of the concrete dam at the lake's southern edge collapsed, and portions were reported as still crumbling during the evacuation. The dam held back more than 6 billion gallons of water.
- **Hansen Dam—**The Hansen Dam, located on Sepulveda Boulevard in Lakeview Terrace, suffered cracks during the earthquake.

1963 Baldwin Hills Reservoir Collapse

On December 14, 1963, the dam at the head of Cloverdale Road broke in the Baldwin Hills section of Los Angeles. Lost homes, ruined property, and even death resulted from a river of rushing water from the broken dam. Automobiles, fragments of houses, and chunks of concrete were carried along the flood's path and deposited on the ruins of Village Green. Eighteen persons were rescued by helicopter and flown out to a safety.

1928 St. Francis Dam

The most catastrophic dam failure in California's history was that of the St. Francis Dam in Los Angeles County in March 1928. This failure resulted in the deaths of more than 450 people and destruction of nearly 1,000 homes and buildings. Numerous roads and bridges were destroyed or damaged beyond repair. California's Division of Safety of Dams came into existence as a direct result of this catastrophe.

6.2.2 Location

Whittier Narrows Dam

According to California's Division of Safety of Dams, there is one dam—the Whittier Narrows Dam—that has an inundation area that extends into the planning area and is rated as extremely high risk under the state's classification system. The Whittier Narrows Dam was constructed in 1957 at the gap between the Puente Hills to the east and the Montebello Hills to the west, forming the southern boundary of the San Gabriel Valley. Both the Rio Hondo River and San Gabriel River flow through this gap and are impounded by the reservoir. The dam is the central element of the Los Angeles County Drainage Area flood control system and collects runoff from the uncontrolled drainage areas upstream, along with releases into the San Gabriel River from the Santa Fe Dam.

Whittier Narrows Dam is a 56-foot-tall earthen dam built, owned, and operated by the Corps of Engineers Los Angeles District. Table 6-2 presents the National Inventory of Dams information for the Whittier Narrows Dam (U.S. Army Corps of Engineers, 2021). The location of the dam is within the City of Pico Rivera.

Table 6-2. National Inventory of Dams Detail Report on Whittier Narrows Dam

Dam Name	Whittier Narrows Dam	**River**	San Gabriel River
Other Name	Whittier Narrows Reservoir	**City**	Pico Rivera
ID	CA10027	**County**	Los Angeles
Owner Type	Federal	Inspection Date	06/27/2017
Owner Name	CESPL	**Permitting Authority**	N
Height	56 feet	**Inspection Authority**	N
Storage	66,702 acre-feet	**Enforcement Authority**	N
Primary Purpose	Flood Control	**Emergency Action Plan Last Date**	08/01/2014
Dam Type	Earth	**Data Current as of**	September 30, 2018

Inundation Mapping

A key element for EAPs required for dams in California is a map defining the potential downstream inundation should the dam fail. For this risk assessment, digital data suitable for a quantitative assessment of dam failure risk was available for the Whittier Narrows Dam. The risk assessment's evaluation of exposure and vulnerability used the dam failure inundation area shown in Figure 6-1. City emergency management officials have the revised Emergency Action Plan developed by the Corps of Engineers. Questions regarding exposure of specific properties to the dam failure inundation zone should be directed to the City of Norwalk Emergency Management Office.

6.2.3 Frequency

Large-scale dam failure events are infrequent and usually coincide with events that cause them, such as earthquakes and excessive rainfall. A Stanford University study found an average of about 10 dam failures per year nationwide over a period of record from 1848 through 2017 (Stanford University, 2017).

All dams face a "residual risk" of failure, which represents the risk that conditions may exceed those for which the dam was designed. For example, dams may be designed to withstand a "probable maximum precipitation," defined as the greatest depth of precipitation for a given duration that is expected at a particular location. The chance of a precipitation event of a greater magnitude than that represents residual risk for such dams. This represents a theoretical probability of future occurrence for a dam failure event, though the probability of an event exceeding the assumed maximum is not generally calculated as part of dam design.

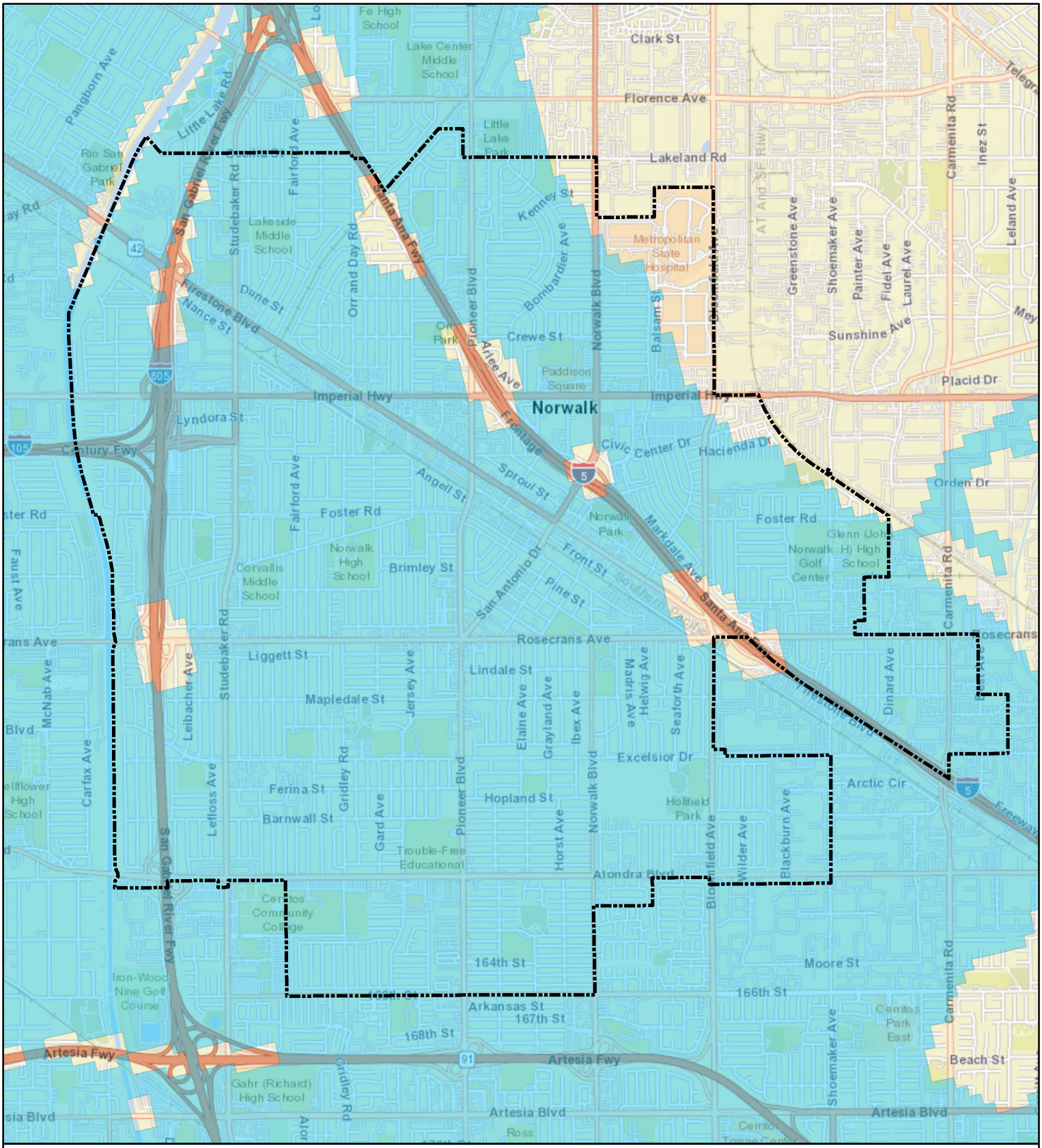


Figure 6-1. Dam Failure Inundation Area Used for Risk Assessment

6.2.4 Severity

In May 2016, the Corps of Engineers changed the risk characterization of the Whittier Narrows Dam from high urgency to very high urgency. New findings identified premature opening of the automatic spillway gates, backward erosion piping of the foundation and overtopping of the dam as the risk-driving failure modes.

Based on a Dam Safety Modification Study on the structure, the Whittier Narrows Dam was given the classification of Dam Safety Action Class 1, which identifies it as "one of the highest priority dam safety projects in the Corps of Engineers portfolio of dams." The Corps considers the incremental risk—the combination of life or economic consequences with the likelihood of failure—to be very high.

The City of Norwalk lies about 7 miles downstream of the dam; the inundation zone covers most of the city, including all property west of Norwalk Boulevard. In the event of a complete failure of the dam while the reservoir is at peak capacity, water depth in the City of Norwalk could approach 6 feet above ground level. The population at risk encompasses 1.25 million people living in municipalities downstream of the dam extending 19.6 miles to the Pacific Ocean. An estimated 680,000 to 970,000 people would be directly affected by a peak maximum flood inundation depending on the time of day (U.S. Army Corps of Engineers, 2021).

6.2.5 Warning Time

The potential for personal injury or loss of life in the event of a dam failure is affected by the amount of warning time and the capacity of evacuation routes available to those living in inundation areas. Warning time depends on the cause of the failure. In case of extreme precipitation, evacuations can be implemented with sufficient time. In the event of a structural failure due to earthquake, there may be no warning time. The USGS Earthquake Hazards Program has several dam-safety related earthquake programs, including dam-specific earthquake monitoring programs in California to help monitor safety concerns following seismic events.

A dam's structural type affects warning time. Earthen dams do not tend to fail completely or instantaneously. Once a breach is initiated, discharging water erodes the breach until the reservoir is empty or the breach resists further erosion. Concrete dams also tend to begin with a partial breach. The time of breach formation ranges from a few minutes to a few hours (U.S. Army Corps of Engineers, 2014).

In the event of a complete failure of the Whittier Narrows Dam while the reservoir is at peak capacity, the City of Norwalk would be affected within 6 hours; peak inundation would occur in about 19 hours.

6.3 EXPOSURE

6.3.1 Population and Property

Table 6-3 summarizes the estimated population and property exposure in the mapped Whittier Narrows dam failure inundation area. The distribution of exposed structures by occupancy class is shown in Figure 6-2.

Table 6-3. Exposed Population and Property in Dam Failure Inundation Zone

Population	
Population Exposed	101,685
% of Total Planning Area Population	96.3%
Property	
Inundated area (acres)	5,732
Number of Buildings Exposed	22,428
Value of Exposed Structures	$8,368,798,449
Value of Exposed Contents	$6,044,932,726
Total Exposed Property Value	**$14,413,731,174**
Total Exposed Value as % of Planning Area Total	94.1%

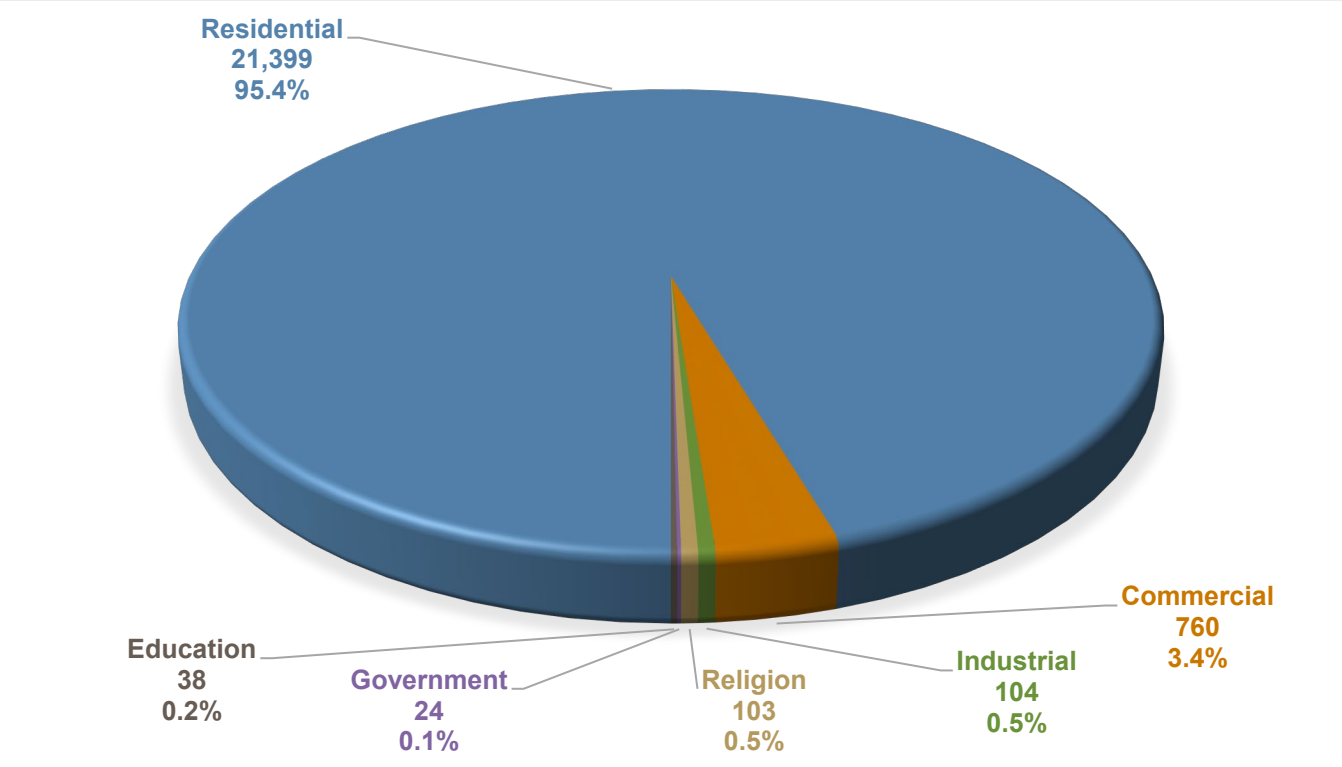


Figure 6-2. Distribution of Exposed Structures in the Dam Failure Inundation Zone by Occupancy Class

6.3.2 Critical Facilities

Figure 6-3 summarizes critical facilities located in the dam failure inundation zone. The total count of critical facilities in the dam failure inundation zone (92) represents 84 percent of the planning area total of 109.

6.3.3 Environment

Almost all environmental areas of the planning area are within the mapped dam failure inundation zone.

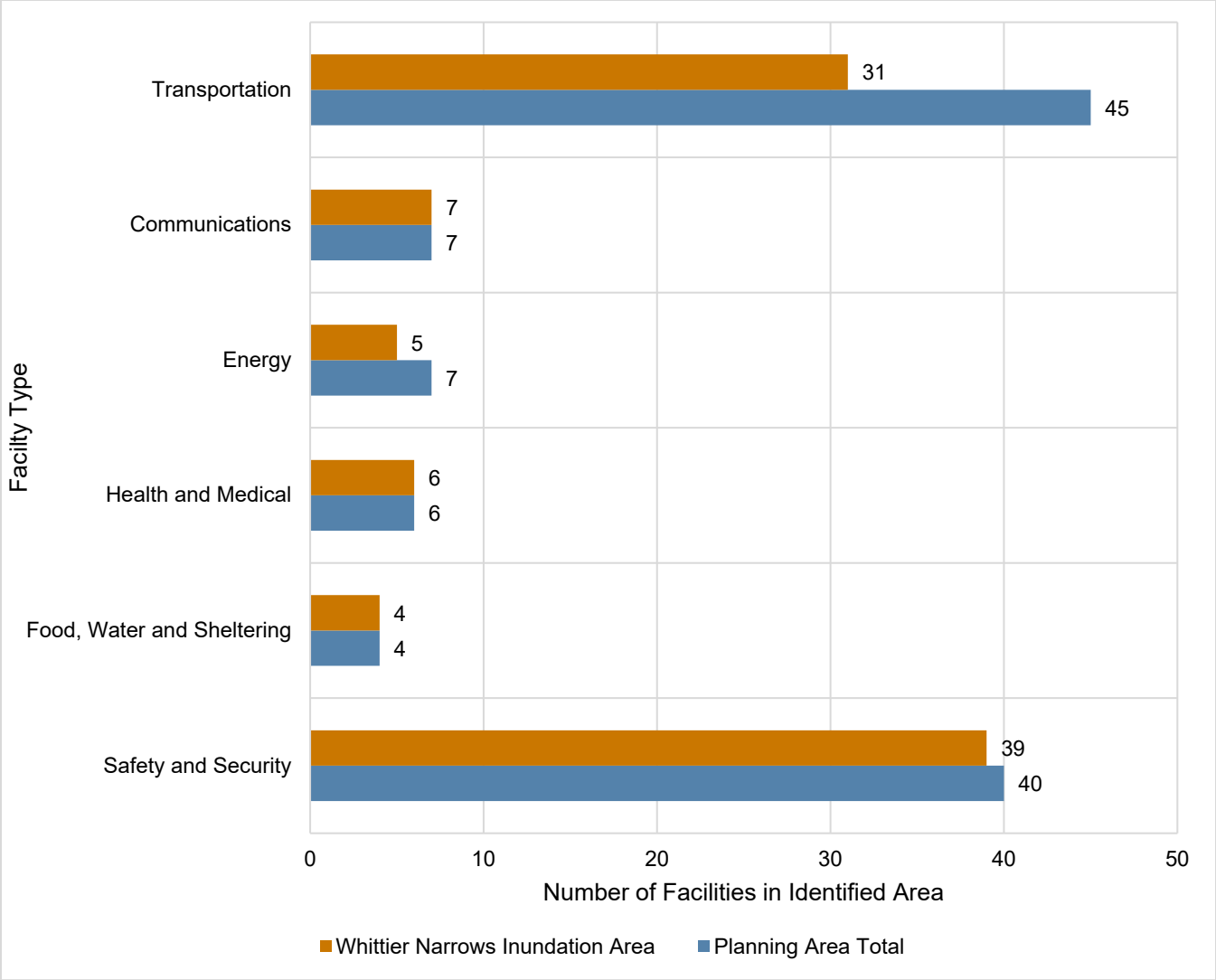


Figure 6-3. Critical Facilities in Dam Failure Inundation Zones and Citywide

6.4 VULNERABILITY

6.4.1 Population

Socially Vulnerable Populations

Socially vulnerable populations include the elderly and young, who may be unable to get themselves out of the inundation zone, as well as low-income populations who may lack resources to be informed about a dam failure or to evacuate quickly. Socially vulnerable populations exposed to the dam failure hazard were estimated based on data for the Census-defined blocks that lie at least partially within the mapped dam failure inundation zone. Because many of those Census blocks extend outside the inundation zone, the estimates are greater than the actual exposed populations, but they provide reasonable relative data for use in mitigation planning. Table 6-4 summarizes the results.

Table 6-4. Estimated Dam Failure Vulnerability of Persons and Households

	Number[a]	% of Total in Hazard Area
Exposed Population by Age		
Over 65 Years	10,384	9.9%
Under 16	29,119	27.8%
Exposed Number of Households by Income		
Households with Income Below $60,000 (very low income[b])	13,672	50.4%
Totals Used for Calculating Percentages[a]		
Population	105,549	
Households	27,130	

a. Note that the methodology used for this analysis overestimates exposed population and households. Results presented in this table should be used to evaluate relative exposure between groups rather than absolute numbers of exposed persons or households.
b. See Section 3.7.1 for a discussion of "very low income" as used in this risk assessment.

Disasters in general also disproportionately affect individuals with disabilities, seniors, children, those with limited English proficiency, and those with limited transportation options. These people will need assistance such as alerting and warning in their native language, evacuation assistance, or sheltering that meets the individual needs of each person. Estimates for key populations of these groups in Norwalk are as follows:

- 67 percent of the population live in a home where a language other than English is spoken
- 6.5 percent of the population have a disability
- 10.6 percent of the population do not have health insurance

Estimated Impacts on Persons and Households

Vulnerable populations include anyone downstream from a dam failure who is incapable of escaping the area within the allowable time frame. Those who live on properties closest to the dam would have the least amount of time to evacuate. Impacts on all exposed persons and households were estimated through Hazus as follows:

- Number of Displaced Residents: 101,685
- Number of Residents Requiring Short-Term Shelter: 7,959

6.4.2 Property

Hazus calculates losses to structures from dam failure inundation by looking at depth of flooding and type of structure. Using historical flood insurance claim data, Hazus estimates the percentage of damage to structures and their contents by applying established damage functions to an inventory. For this analysis, local data on facilities was used instead of the default inventory data provided with Hazus. The Hazus analysis also estimated the quantity of debris that would be caused by a dam failure. Hazus-estimated dam failure impacts on structures in the planning area are shown in Table 6-5.

Table 6-5. Loss Estimates for Dam Failure

Number of Structures Impacted	22,417
Estimated Loss	
Structures	$1,803,253,000
Contents	$2,224,487,000
Total	***$4,027,740,000***
% of Total Planning Area Replacement Value	26.3%
Debris	214,460 tons

6.4.3 Critical Facilities

Hazus was used to estimate the level of potential damage to critical facilities exposed to the dam failure inundation risk, using depth/damage function curves to estimate the percent of damage to the building and contents of critical facilities. Figure 6-4 summarizes the Hazus results.

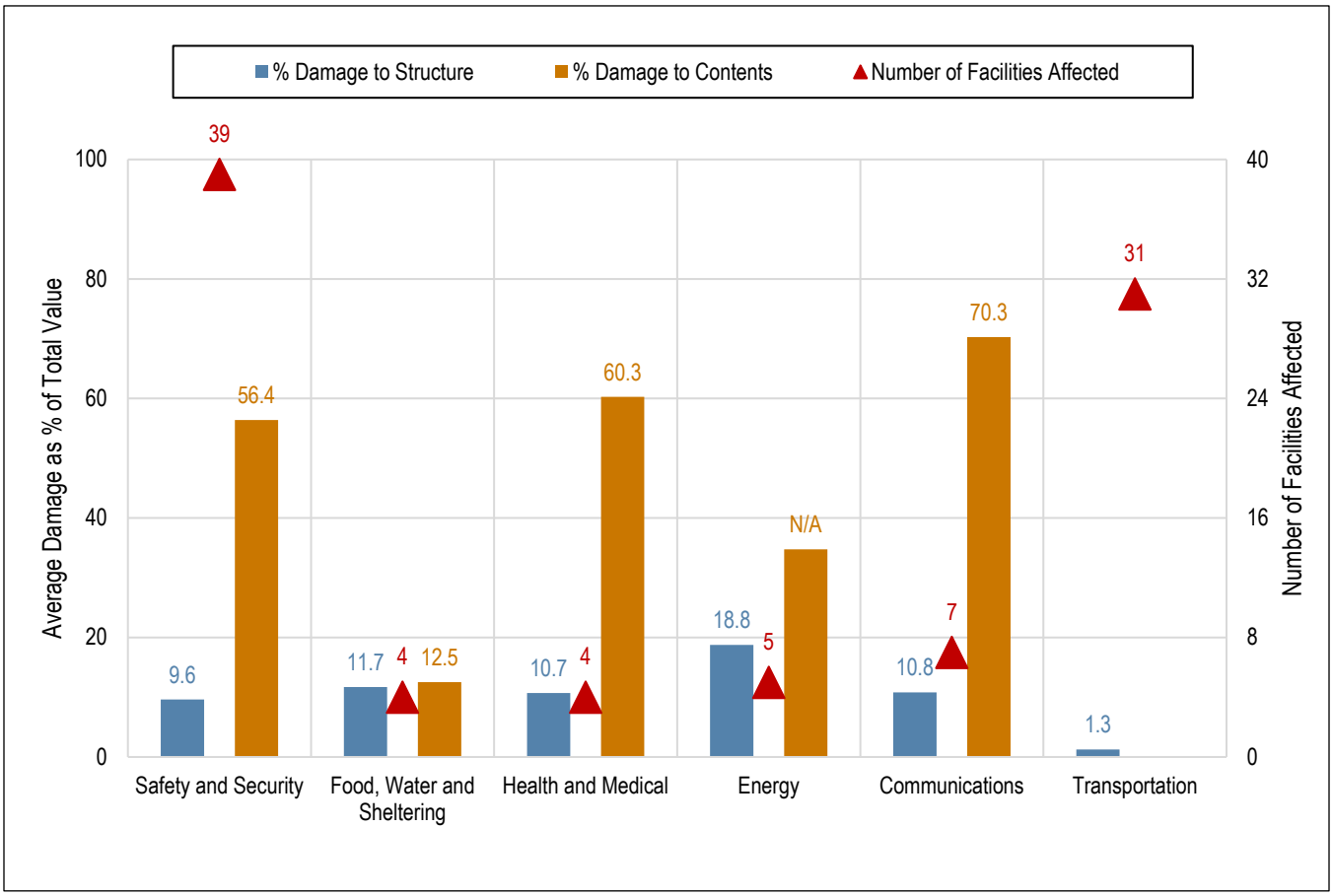


Figure 6-4. Estimated Damage to Critical Facilities from Dam Failure

Transportation routes are vulnerable to dam inundation and have the potential to be destroyed, trapping evacuees in the dam inundation zone. This includes all roads, railroads, and bridges in the path of the dam inundation. Bridges in need of repair may be vulnerable during a dam failure and not withstand the water surge. Critical electrical, communications, gas and water infrastructure also could be damaged.

6.4.4 Environment

The environment would be vulnerable to a number of risks in the event of dam failure. The inundation could introduce foreign elements into local waterways. This could result in destruction of downstream habitat and could have detrimental effects on many species of animals.

6.5 FUTURE TRENDS IN DEVELOPMENT

The City of Norwalk has no areas targeted for expansion of the city limits. All future development within the city will be the development "buildable" lands within the existing city limits or redevelopment. Future land use will be directed by the City's General Plan and zoning ordinance. The City participates in the National Flood Insurance Program (NFIP) and has adopted codes and standards as required for that participation, but the entire City has been mapped as a "Zone C" flood risk. These are areas considered to be of minimal risk, not subject to regulation under the City's adopted flood damage prevention ordinance.

While the potential risk from dam failure inundation is mentioned in the Safety Element, it is not currently addressed as a stand-alone hazard. Neither the City's General Plan nor the zoning ordinance cites policy or regulation within identified dam failure inundation areas. Dam failure is considered to be a low-probability but high-consequence event. The risk is significant, and future updates to the General Plan and zoning ordinance should consider addressing that risk.

The probability of flooding associated with changes in dam operational parameters in response to extreme rainfall events is higher than the probability of dam failure. Dam designs and operations are based on hydrographs from historical records. If these hydrographs change significantly over time due to effects of climate change, current dam designs and operations may become overwhelmed. Specified release rates and impound thresholds may have to be changed, which could result in increased discharges downstream of these facilities, thus increasing probability and severity of inundation

6.6 SCENARIO

A worst-case dam failure scenario for the City of Norwalk would be the "probable maximum flood" (PMF) as depicted on the Emergency Action Plan for the Whittier Narrows Dam. The Probable Maximum Flood (PMF) is defined as the flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions. A PMF event for Whittier Narrows Dam could impact over 98% of the structures within the City of Norwalk with flood depths between 4 and 6 feet. The City would be affected within 6 hours of failure, with peak inundation at 91.25 hours (City of Norwalk General Plan). This event could lead to significant displacement from the vastly residential exposure as well as function downtime for impacted critical facilities and infrastructure. The estimated losses for this type of event could exceed 26.3 percent of the total assessed valuation for the City of Norwalk.

6.7 ISSUES

The most significant issue associated with dam failure involves the exposed population and property throughout the city. Depending on the amount of water behind the dam, inundation from a failure could be catastrophic. There is often limited warning time for dam failure. These events are frequently associated with other natural

hazard events such as earthquakes, which limits their predictability and compounds the hazard. Important issues associated with dam failure hazards include the following:

- The City's current policies and standards do not address the risk associated with failure of Whittier Narrows Dam.
- Federally regulated dams have oversight and sophistication in the development of emergency action plans in the unlikely event of failure. The protocol for notification of downstream residents of imminent failure is the responsibility of the City of Norwalk and the Los Angeles Sheriff's Department.
- Most dam failure mapping required at federal levels requires determination of the probable maximum flood. While the probable maximum flood represents a worst-case scenario, it is generally the event with the lowest probability of occurrence.
- The concept of residual risk associated with structural flood control projects should be considered in the design of capital projects and the application of land use regulations.
- Addressing security concerns and the need to inform the public of the risk associated with dam failure is a challenge for public officials.
- California's AB 2800 enacts legislation that will require engineers and climate scientists to collaborate to help the state design and build infrastructure that will withstand the unavoidable impacts of a changing climate.

7. DROUGHT & EXTREME HEAT

7.1 GENERAL BACKGROUND

7.1.1 Drought

Periods of low precipitation and high temperature do not generally pose risks to structures, but they can have significant impacts on the people and economy of the affected area.

Drought is a significant decrease in water supply relative to what is typical in a given location. It is a normal phase in the climate cycle of most regions, originating from a deficiency of precipitation over an extended period of time, usually a season or more. This leads to a water shortage for some activity, group or environmental sector. Drought can be characterized based on various impacts or measurements:

- Meteorological measurements such as rainfall deficit compared to normal or expected rainfall
- Agricultural impacts due to reduced rainfall and water supply (e.g., crop loss, herd culling, etc.)
- Hydrological measurements of stream flows, groundwater, and reservoir levels relative to normal conditions
- Direct and indirect socio-economic impacts on society and the economy (e.g., increased unemployment due to failure of an industry because of drought)

Droughts are climatic patterns that occur over long periods of time as the result of many causes. Global weather patterns that produce persistent, upper-level high-pressure systems along the West Coast result in warm, dry air and reduced precipitation. Anomalies of precipitation and temperature may last from several months to several decades. How long they last depend on interactions between the atmosphere and the oceans, soil moisture and land surface processes, topography, internal dynamics, and the accumulated influence of global weather systems.

Monitoring and Categorizing Drought

NOAA Drought Indices

The National Oceanic and Atmospheric Administration (NOAA) has developed several indices to measure drought impacts and severity and to map their extent and locations:

- The ***Palmer Crop Moisture Index*** measures short-term drought weekly to assess impacts on agriculture.
- The ***Palmer Z Index*** measures short-term drought on a monthly scale.

- The ***Palmer Drought Index*** is based on long-term weather patterns. The intensity of drought in a given month is dependent on current weather plus the cumulative patterns of previous months. Weather patterns can change quickly, and the Palmer Drought Severity Index can respond fairly rapidly.
- The ***Palmer Hydrological Drought Index*** quantifies hydrological effects (reservoir levels, groundwater levels, etc.), which take longer to develop and last longer. This index responds more slowly to changing conditions than the Palmer Drought Index.
- The ***Standardized Precipitation Index*** considers only precipitation. A value of zero indicates the median precipitation amount; the index is negative for drought and positive for wet conditions. The Standardized Precipitation Index is computed for time scales ranging from one month to 24 months.

Maps of these indices show drought conditions nationwide at a given point in time. They are not necessarily indicators of any given area's long-term susceptibility to drought. The most current versions of the maps at the time of this plan's preparation are shown on Figure 7-1 through Figure 7-5.

Source: NOAA National Centers for Environmental Information, 2021a

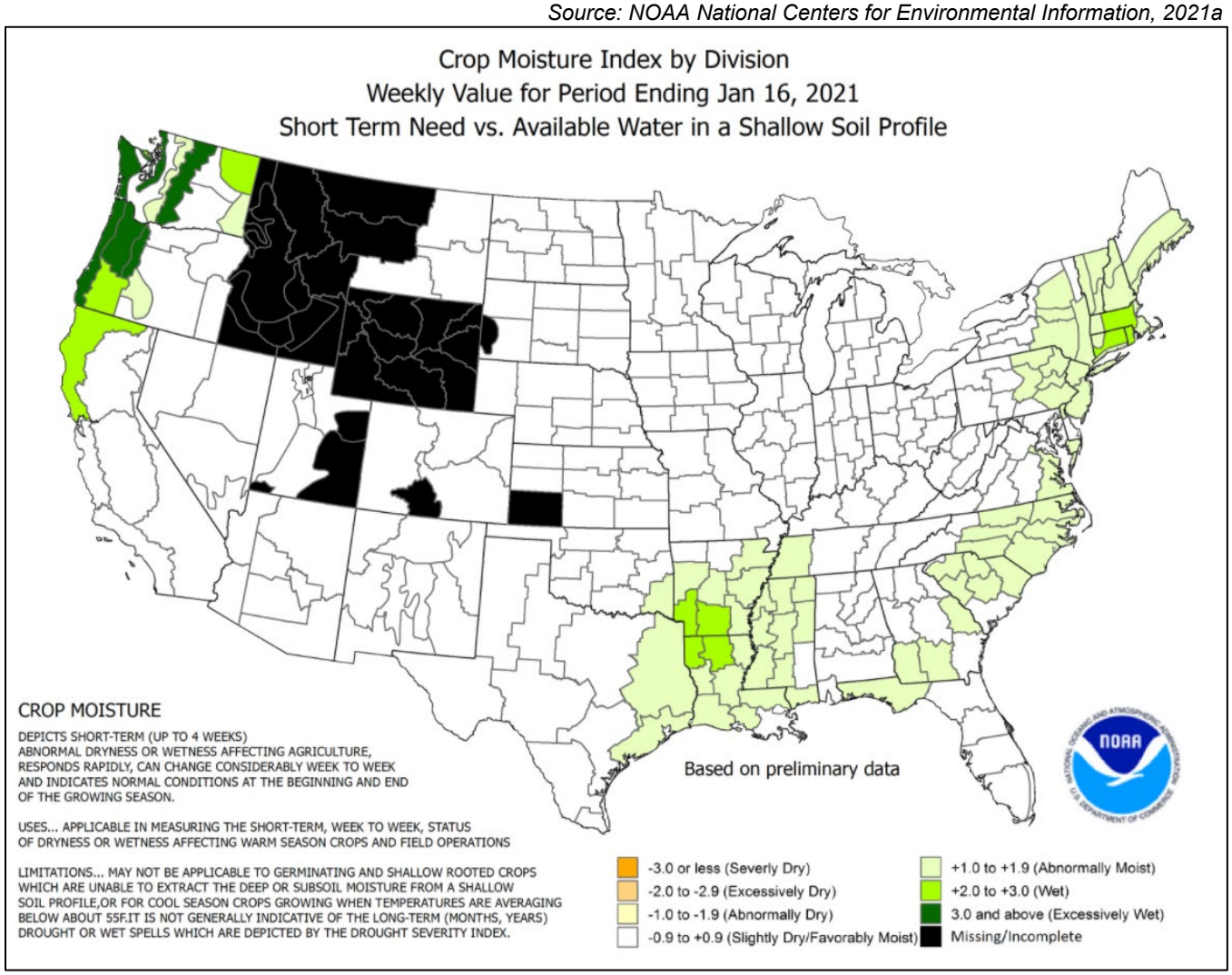


Figure 7-1. Palmer Crop Moisture Index (Week Ending January 16, 2021)

Source: NOAA National Centers for Environmental Information, 2021

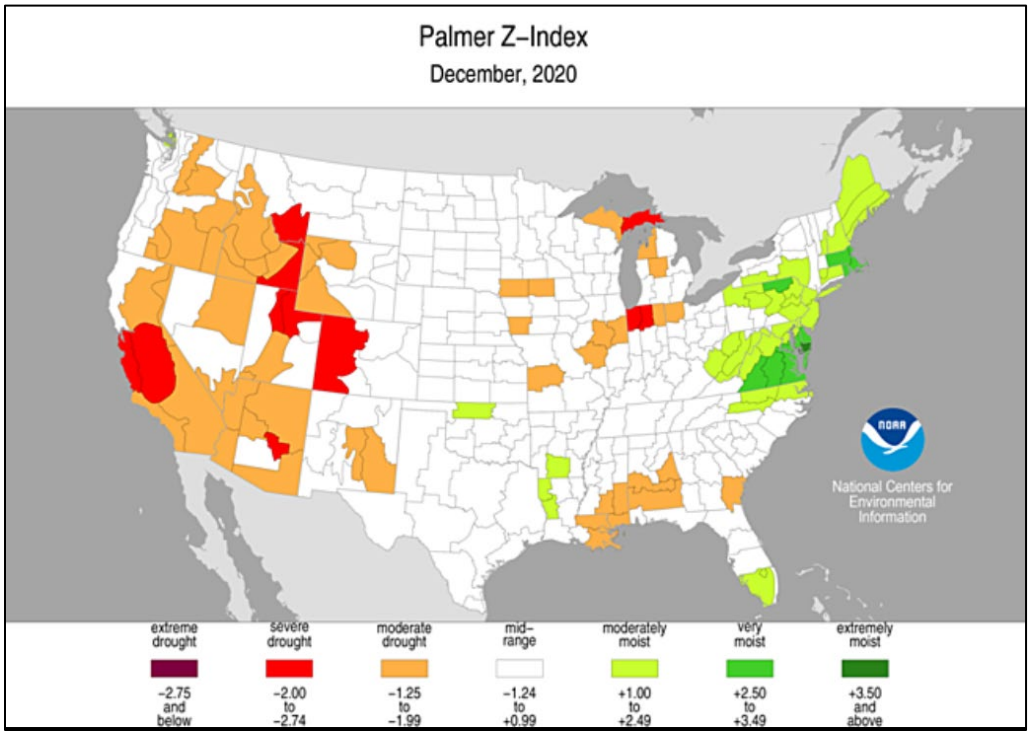


Figure 7-2. Palmer Z Index Short-Term Drought Conditions (December 2020)

Source: NOAA National Centers for Environmental Information, 2021

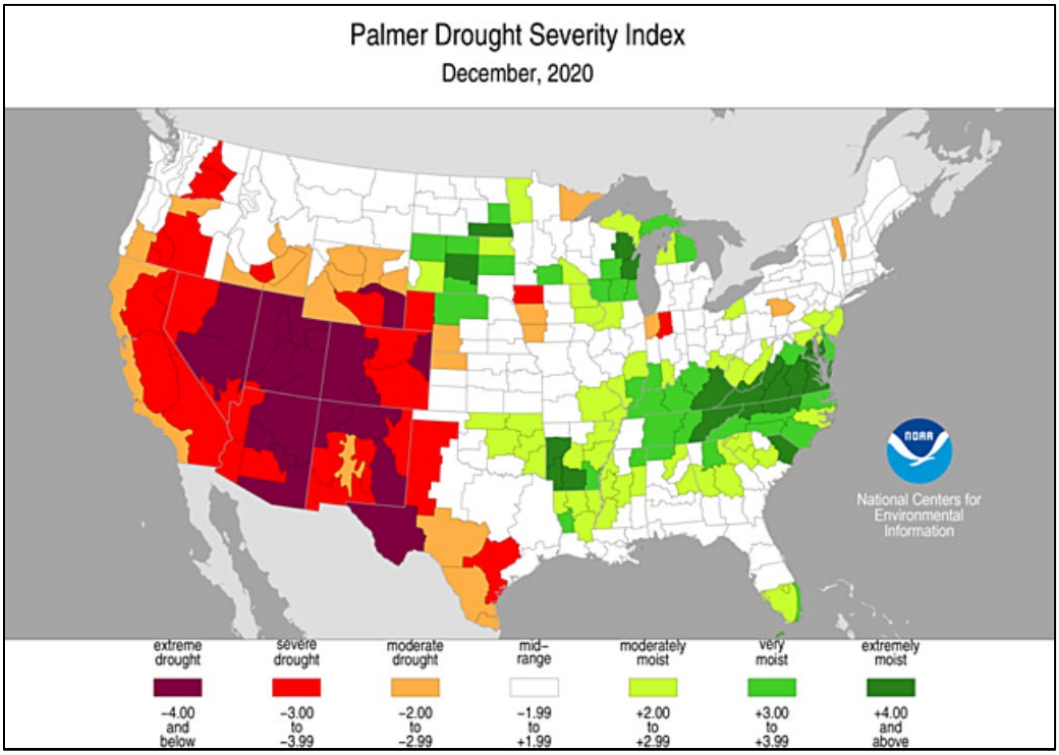


Figure 7-3. Palmer Drought Index (December 2020)

Source: NOAA National Centers for Environmental Information, 2021

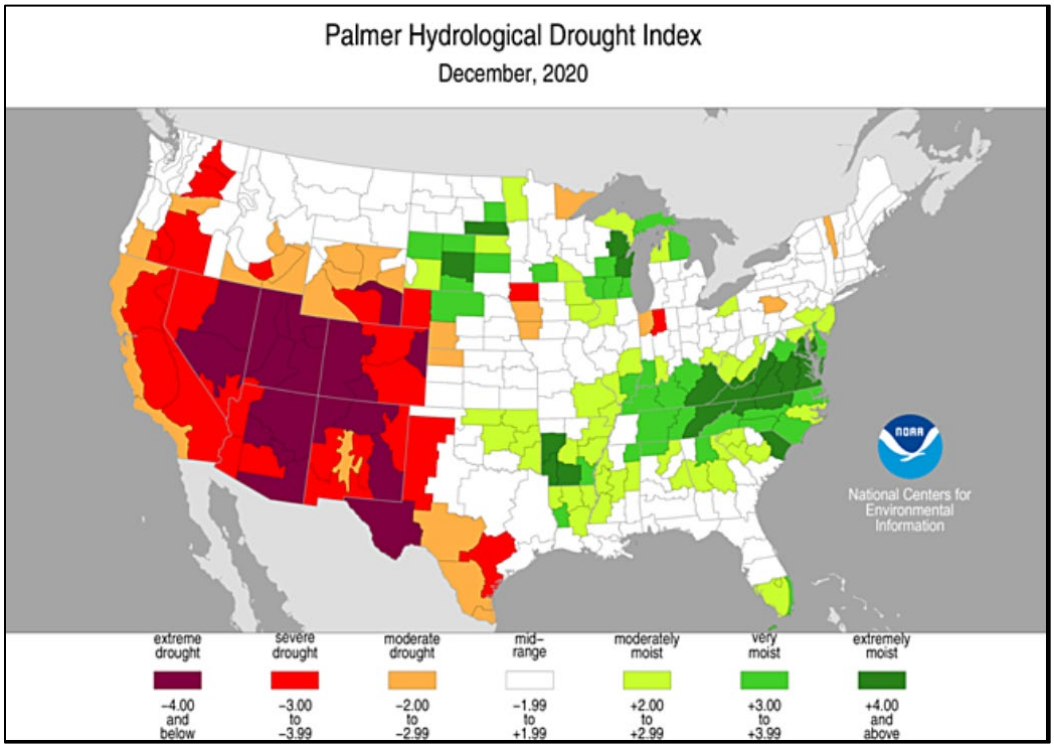


Figure 7-4. Palmer Hydrological Drought Index (December 2020)

Source: NOAA National Centers for Environmental Information, 2021

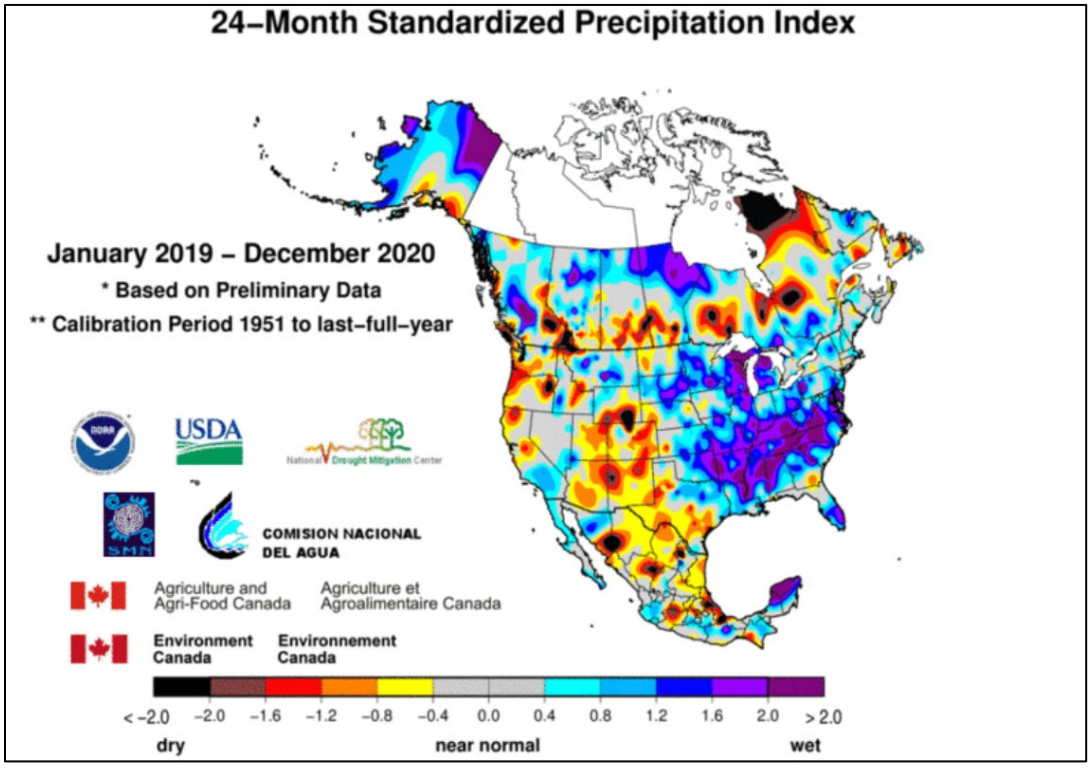


Figure 7-5. 24-Month Standardized Precipitation Index Ending December 2020

U.S. Drought Monitor

The U.S. Drought Monitor (USDM) is a map that is updated weekly to show the location and intensity of drought across the country. The USDM uses a five-category system (NIDIS, 2020):

- D0—Abnormally Dry
  - Short-term dryness slowing planting, growth of crops
  - Some lingering water deficits
  - Pastures or crops not fully recovered
- D1—Moderate Drought
  - Some damage to crops, pastures
  - Some water shortages developing
  - Voluntary water-use restrictions requested
- D2—Severe Drought
  - Crop or pasture loss likely
  - Water shortages common
  - Water restrictions imposed
- D3—Extreme Drought
  - Major crop/pasture losses
  - Widespread water shortages or restrictions
- D4—Exceptional Drought
  - Exceptional and widespread crop/pasture losses
  - Shortages of water creating water emergencies

The USDM categories show experts' assessments of conditions related to drought. These experts check variables including temperature, soil moisture, water levels in streams and lakes, snow cover, and meltwater runoff. They also check whether areas are showing drought impacts such as water shortages and business interruptions. Associated statistics show what proportion of various geographic areas are in each category of dryness or drought, and how many people are affected. U.S. Drought Monitor data go back to 2000.

Drought Impacts

Drought can have a widespread impact on the environment and the economy, although it typically does not result in loss of life or damage to structures, as do other natural disasters.

The National Drought Mitigation Center uses three categories to describe likely drought impacts:

- **Economic Impacts**—These impacts of drought cost people (or businesses) money. Farmers' crops are destroyed; low water supply necessitates spending on irrigation or drilling of new wells; water-related businesses (such as sales of boats and fishing equipment) may experience reduced revenue.
- **Environmental Impacts**—Plants and animals depend on water. When a drought occurs, their food supply can shrink, and their habitat can be damaged.
- **Social Impacts**—Social impacts include public safety, health, conflicts between people when there is not enough water to go around, and changes in lifestyle.

The demand that society places on water systems and supplies—such as expanding populations, irrigation, and environmental needs—contributes to drought impacts. Drought can lead to difficult decisions regarding the allocation of water, as well as stringent water use restrictions, water quality problems, and inadequate water supplies for fire suppression. There are also issues such as growing conflicts between agricultural uses of surface water and in-stream uses, surface water and groundwater interrelationships, and the effects of growing water demand on uses of water.

Vulnerability of an activity to drought depends on its water demand and the water supplies available to meet the demand. The impacts of drought vary between sectors of the community in both timing and severity:

- **Water supply—**The water supply sector encompasses urban and rural drinking water systems that are affected when a drought depletes ground water supplies due to reduced recharge from rainfall.
- **Agriculture and commerce—**Impacts on the agriculture and commerce sectors include the reduction of crop yield and livestock sizes due to insufficient water supply for crop irrigation and maintenance of ground cover for grazing.
- **Environment, public health, and safety—**The environmental, public health, and safety sector focuses on wildfires that are both detrimental to the forest ecosystem and hazardous to the public. It also includes the impact of desiccating streams, such as the reduction of in-stream habitats for native species.

California Drought Response

Defined Drought Stages

During critically dry years, the California State Water Resources Control Board can mandate water entitlements on water right holders to address statewide water shortages. Table 7-1 shows the state drought management program stages mandated to water right holders.

Table 7-1. State Drought Management Program

Drought Stage	State Mandated Customer Demand Reduction	Rate Impacts
Stage 0 or 1	<10%	Normal rates
Stage 2	10 to 15%	Normal rates; Drought surcharge
Stage 3	15 to 20%	Normal rates; Drought surcharge
Stage 4	>20%	Normal rates, Drought surcharge

Future Water Conservation in California

California's 2018 Water Plan Update indicates that water demand in the state will increase through 2050. The Department of Water Resources predicts a modest decrease in agricultural water use, but an urban water use increases of 1 to 7 million acre-feet per year (DWR, 2018). The 2018 update to the Water Plan explores measures, benchmarks, and successes in increasing agricultural and urban water use efficiency.

Assembly Bill 1668 and Senate Bill 606, both passed in 2018, are jointly designed to overhaul California's approach to conserving water. Both bills were enacted with contingencies toward each other—addressing water conservation and drought resilience across the state. Both were adopted in response to the governor's Executive Order B-37-16 "Making Water Conservation a California Way of Life" which directs permanent changes to use water more wisely, eliminate water waste, strengthen local drought resistance, and improve agricultural water use efficiency and drought planning. With an aim to make water conservation a way of life in California, Executive Order B-37-16 requires the following:

- The State Water Resources Control Board will maintain urban water use reporting requirements and prohibitions on wasteful practices such as watering during or after rainfall, hosing off sidewalks and irrigating ornamental turf on public street medians.
- The state will continue its work to coordinate a statewide response on the bark beetle outbreak in drought-stressed forests that has killed millions of trees across California.

SB 606 requires the State Water Resources and Control Board and DWR to adopt water efficiency regulations, outlines requirements for urban water suppliers, including urban drought risk assessments, and implements penalties for violations. The law contains directives on water shortage planning and water loss reporting for urban wholesale water suppliers and offers a bonus incentive for potable reuse water.

AB 1668 requires the State Water Resources Control Board, in coordination with the DWR, to adopt water efficiency standards and regulations; drought and water shortage contingency plan guidance; specified standards for per capita daily indoor residential water use; and performance measures for commercial, industrial, and institutional water use.

Long-term urban water use efficiency standards must be established by June 30, 2022. Those standards will include components for indoor residential use, outdoor residential use, water losses and other uses. Regarding indoor residential use, the new laws set a standard of 55 gallons per person, per day through January 1, 2025. After that date, the amount will be incrementally reduced over time.

The legislation also specifies penalties on local water suppliers for violations to these standards. Starting in 2027, local water suppliers' failure to comply with the Water Resources Control Board's adopted long-term standards could result in fines of $1,000 per day during non-drought years and $10,000 per day during declared drought emergencies and certain dry years.

7.1.2 Extreme Heat

In most of the United States, extreme heat is defined as a period (two to three days) of high heat and humidity with temperatures above 90 ºF. In extreme heat, evaporation is slowed, and the body must work extra hard to maintain a normal temperature, which can lead to death by overworking the human body. Extreme heat can cause heat exhaustion, in which the body becomes dehydrated, resulting in an imbalance of electrolytes. Without intervention, heat exhaustion can lead to collapse and heatstroke. Heatstroke occurs when perspiration cannot occur, and the body overheats. Without intervention, heatstroke can lead to confusion, coma, and death.

Extreme heat often results in the highest number of annual deaths among all weather-related hazards. Older adults, children, and sick or overweight individuals are at greater risk from extreme heat. According to the California Climate Adaptation Strategy, heat waves have claimed more lives in California than all other declared disaster events combined. It can take several days of oppressive heat for a heat wave to have a significant or quantifiable impact. Heat waves do not strike victims immediately, but their cumulative effects slowly cause harm to vulnerable populations.

Extreme heat is the primary weather-related cause of death in the United States. In a 10-year record of weather fatalities across the nation from (2006-2015), excessive heat claimed more lives each year than floods, lightning, tornadoes, and hurricanes. Extreme heat events do not typically impact buildings; however, losses may be associated with the urban heat island effect and overheating of heating, ventilation, and air conditioning systems.

These extreme heat events can lead to drought, impact water supplies, and lead to an increase in heat-related illnesses and deaths.

7.1.3 Secondary Hazards

The secondary impact most commonly associated with drought is wildfire. A prolonged lack of precipitation dries out vegetation, which becomes increasingly susceptible to ignition as the duration of the drought extends. Drought is also often accompanied by extreme heat, exposing people to the risk of sunstroke, heat cramps and heat exhaustion. Pets are also vulnerable to heat-related injuries.

A secondary impact of extreme heat is poor air quality, which can occur during summer, when stagnant atmospheric conditions trap humid air and pollutants near the ground and closer to residents. Ozone, a major component of smog, is created in the presence of sunlight via reactions between chemicals in gasoline vapors and industrial smokestacks. Hot weather can increase ozone levels. High ozone levels often cause or worsen respiratory problems.

7.2 HAZARD PROFILE

7.2.1 Local Water Supply

According to the May 2017 update of the 2015 Urban Water Management Plan, the City of Norwalk is served by five retail water agencies:

- Norwalk Municipal Water System
- Liberty Utilities
- Golden State Water Company
- City of Santa Fe Springs (through Norwalk Municipal Water System)
- City of Cerritos (through Norwalk Municipal Water System)

The City relies on a combination of imported water, local groundwater, and recycled water to meet its water needs. The City works with the Metropolitan Water District and the Central Basin Municipal Water District to ensure a safe and reliable water supply that will continue to serve the community in periods of drought and shortage. The sources of imported water supplies include the Colorado River and the State Water Project, provided by the Metropolitan Water District and delivered through Central Basin Municipal Water District, the City of Cerritos, and the City of Santa Fe Springs. Figure 7-6 shows the service area for each supplier.

The City of Norwalk's Urban Water Management Plan complies with California's Urban Water Management Planning Act and promotes water conservation and ensures water is being used wisely.

7.2.2 Past Events

The California Department of Water Resources has historical state hydrologic data back to the early 1900s (DWR, 2017). The hydrologic data show multi-year droughts from 1912 to 1913, 1918 to 1920, 1922 to 1924 and 1928 to 1934. The following sections describe droughts in California since then, all of which impacted the City of Norwalk to some degree.

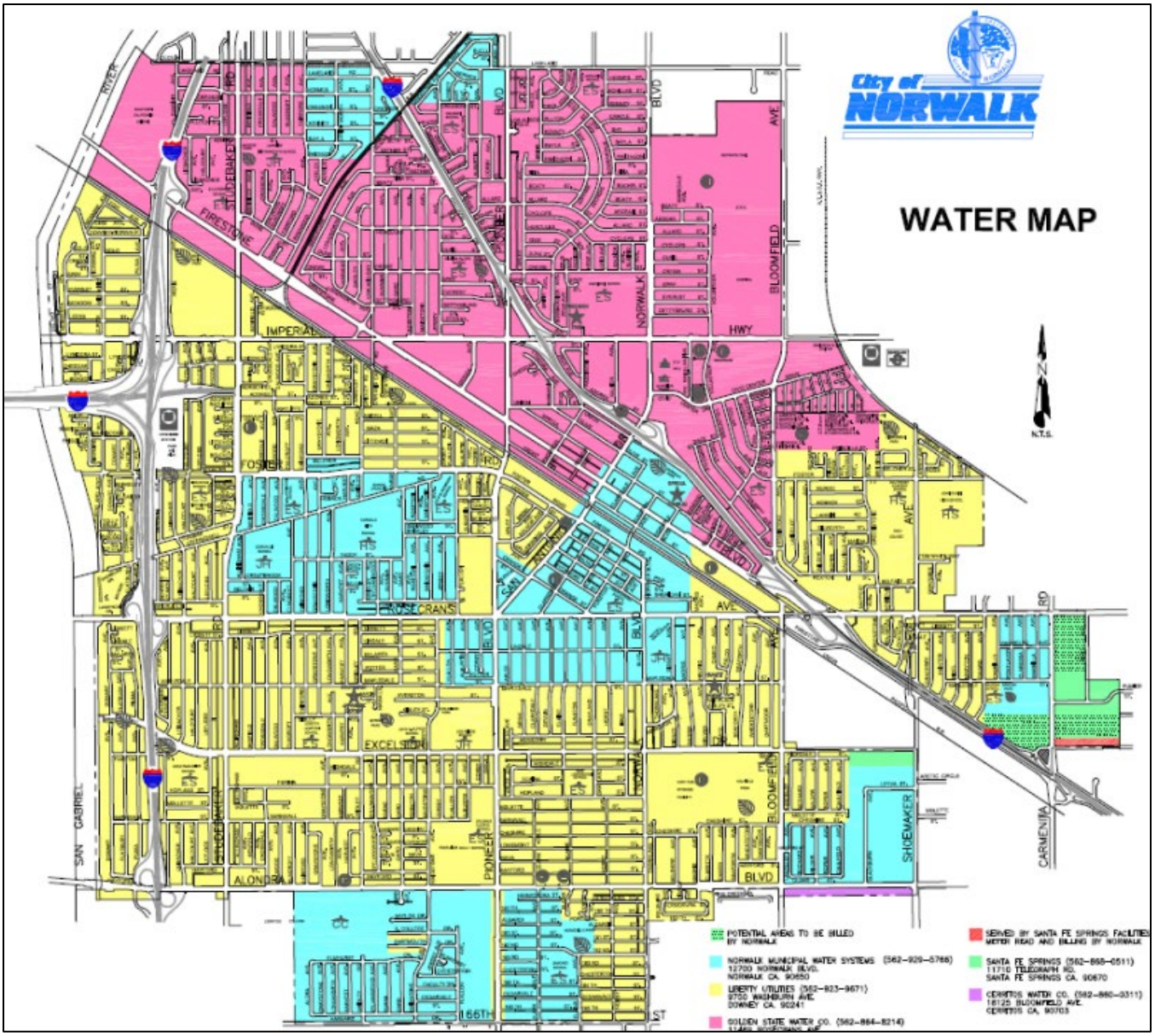


Figure 7-6. Norwalk Local Water Suppliers Jurisdiction

2012 to 2016 Drought

California's most recent drought set several records:

- The period from 2012 to 2014 ranked as the driest three consecutive years for statewide precipitation.
- 2014 set new climate records for statewide average temperatures and for record-low water allocations in the State Water Project and federal Central Valley Project.
- 2013 set minimum annual precipitation records for many communities.

On January 17, 2014, the governor declared a state of emergency for drought throughout California. This declaration followed release of a report that stated that California had experienced the least amount of rainfall in

its 163-year history. Californians were asked to voluntarily reduce their water consumption by 20 percent. Drought conditions worsened into 2015. On April 1, 2015, following the lowest snowpack ever recorded, the governor announced actions to save water, increase enforcement to prevent wasteful water use, streamline the state's drought response, and invest in new technologies to make California more drought resilient. The governor directed the State Water Resources Control Board to implement mandatory water reductions in cities and towns across California to reduce water usage by 25 percent on average.

The statewide hydrologic drought from 2012 through 2016 included the driest four-year statewide precipitation on record (2012-2015) and the smallest Sierra-Cascades snowpack on record (2015, with 5 percent of average). It was marked by extraordinary heat: 2014, 2015 and 2016 were California's first, second and third warmest years in terms of statewide average temperatures.

On April 7, 2017, the governor ended the drought state of emergency in most of California, following unprecedented water conservation and plentiful winter rain and snow.

2007 to 2009 Drought

The governor proclaimed a statewide drought emergency on June 4, 2008 after spring 2008 was the driest spring on record and snowmelt runoff was low. On February 27, 2009, the governor proclaimed a state of emergency for the entire state as the severe drought conditions continued widespread impacts and the largest court-ordered water restriction in state history (at the time).

1987 to 1992 Drought

California received precipitation well below average levels for four consecutive years. By February 1991, all 58 counties in California were suffering from drought conditions. Urban areas as well as rural and agricultural areas were impacted.

1976 to 1977 Drought

California had a severe drought due to lack of rainfall during the winters of 1976 and 1977. 1977 was the driest period on record in California to that time, with the previous winter recorded as the fourth driest. The cumulative impact led to widespread water shortages and severe water conservation measures throughout the state. Only 37 percent of the average Sacramento Valley runoff was received. A federal disaster declaration was declared, but it did not apply to Los Angeles County.

Extreme Heat

A storm event database maintained by NOAA's National Centers for Environmental Information lists the following excessive heat events in the Los Angeles County area:

- **July 2006**—In July 2006, California and Nevada were impacted by a heat wave with especially high nighttime minimums, great area extent (it simultaneously impacted both northern and Southern California), and very high humidity levels (Los Angeles Times, 2006). The event caused 163 deaths in California. A temperature of 119 ºF was recorded in Woodland Hills, with high humidity.
- **August 30 – September 3, 2007**—A combination of above normal temperatures and relative humidity produced excessive heat across Los Angeles County. Eight fatalities were related to the heat. Heat index values were between 105 ºF and 112 ºF.

- **June 20 – 21, 2008**—A combination of strong high pressure over Arizona and weak offshore flow generated extreme heat conditions across Central and Southern California. Across many sections of the Los Angeles basin, afternoon temperatures climbed to between 100 ºF and 114 ºF, setting numerous high temperature records. The extreme heat resulted in several power outages due to excessive electrical use.
- **August 2017**—The Los Angeles County Health Officer declared a heat emergency for the areas of Antelope Valley, downtown Los Angeles, Pomona, San Gabriel Valley and Santa Clarita Valley. The National Weather Service also issued an excessive heat warning for Southwestern California (which included Norwalk).
- **August 2020**—An excessive heat event across Los Angeles County caused temperatures to rise into the triple digits, but due to closures from the COVID-19 pandemic, typical refuge areas such as cool movie theaters, indoor malls, and public pools were unavailable to the public.

7.2.3 Location

Drought and extreme heat are a regional phenomenon. Drought and heat that affect the planning area would affect the entirety of the area simultaneously and has the potential to impact every person directly or indirectly in the city as well as adversely affect the local economy. Extreme heat events may be exacerbated in the City where reduced air flow, reduced vegetation, and increased generation of waste heat can contribute to temperatures that are several degrees higher than in surrounding less urbanized areas.

7.2.4 Frequency

Drought has a high probability of occurrence in the planning area. From January 2000 to January 2021, some part of Los Angeles County experienced a USDM rating of D1 or higher in 623 out of 1,099 weeks—well over half of the weeks (see Figure 7-7). The planning area has also been included in USDA drought disaster declarations in seven of the last nine years. Historical drought data for the planning area indicate there have been three significant multi-year droughts in the last 30 years (1987 to 2017), amounting to a severe drought every 10 years on average.

Source: U.S. Drought Monitor, 2021

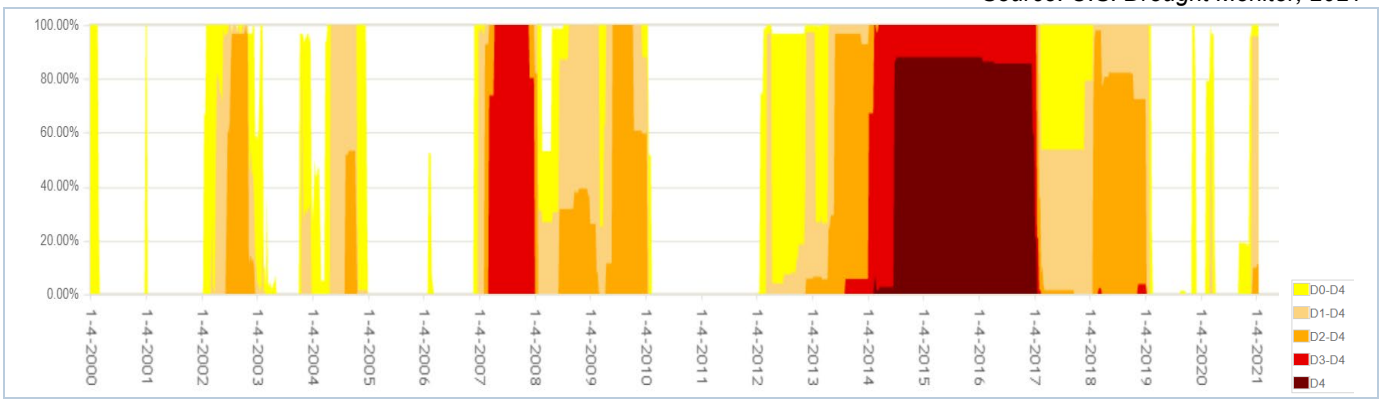


Figure 7-7. Percent of Los Angeles County Affected by Each USDM Rating, 2000 – 2021

According to the Western Regional Climate Center, the planning area averages 20 days a year with temperatures over 90° F, and those days may be included in a heat wave event.

7.2.5 Severity

The severity of any given drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. The longer the duration of the drought and the larger the area impacted, the more severe the potential impacts.

The Los Angeles basin is experiencing hotter weather and more heat waves. Over the past 100 years, the average annual maximum temperature has warmed by 5.0° F, and the average annual minimum temperature has warmed by 4.2 °F. The greatest rate of change was during the summer for both maximum and minimum temperature, with late fall and early winter having the least rates of change. There was also an increase in heat wave duration. Heat waves lasting longer than six days occurred regularly after the 1970s, but were nonexistent from 1906 until 1956, when the first six-day heat wave was recorded (Tamrazian et al., 2008).

Climate change is likely to bring hotter temperatures, more hot days, and more frequent heat waves. As the population ages and climate change brings more extreme heat events, rates of heat-related impairments and deaths may rise.

U.S. Drought Monitor Ratings

Los Angeles County has a history of severe droughts. As shown in Figure 7-7, at least part of the county has experienced extreme (D3) or exceptional (D4) droughts more than once since 2000.

Drought Impact Reporter

The National Drought Mitigation Center developed the Drought Impact Reporter in response to the need for a national drought impact database for the United States. Information comes from a variety of sources: on-line, drought-related news stories and scientific publications, members of the public who visit the website and submit a drought-related impact for their region, members of the media, and staff of government agencies. The database is being populated beginning with the most recent impacts and working backward in time.

The Drought Impact Reporter indicates 151 impacts from drought that specifically affected Los Angeles County from 2010 through January 2021 (National Drought Mitigation Center, 2021a). Most (95 percent) are based on media reports. The following are the reported numbers of impacts by category (some incidents are assigned to more than one impact category):

- Agriculture—31
- Business and Industry—11
- Energy—3
- Fire—16
- Plants and Wildlife—29
- Relief, Response, and Restrictions—76
- Society and Public Health—44
- Tourism and Recreation—9
- Water Supply and Quality—84

7.2.6 Warning Time

Drought

Droughts are climatic patterns that occur over long periods of time. Only generalized warning can take place due to the numerous variables that scientists have not pieced together well enough to make accurate and precise predictions.

Empirical studies conducted over the past century have shown that meteorological drought is never the result of a single cause. It is the result of many causes, often synergistic in nature. These include global weather patterns that produce persistent, upper-level high-pressure systems along the West Coast with warm, dry air resulting in less precipitation.

At this time, scientists do not know how to predict drought more than a month in advance for most locations. Predicting drought depends on the ability to forecast precipitation and temperature. Anomalies of precipitation and temperature may last from several months to several decades.

Extreme Heat

The National Weather Service (NWS) Heat Risk forecast (see Figure 7-8) provides a quick view of heat risk potential over the upcoming seven days. The heat risk is portrayed in a numeric (0 – 4) and color (green, yellow, orange, red, magenta) scale, which is similar in approach to the Air Quality Index or the UV Index. It provides one value each day that indicates the approximate level of heat risk concern for any location, along with identifying the groups who are most at risk.

Category	Level	Meaning
Green	0	No Elevated Risk
Yellow	1	Low Risk for those extremely sensitive to heat, especially those without effective cooling and/or adequate hydration
Orange	2	Moderate Risk for those who are sensitive to heat, especially those without effective cooling and/or adequate hydration
Red	3	High Risk for much of the population, especially those who are heat sensitive and those without effective cooling and/or adequate hydration
Magenta	4	Very High Risk for entire population due to long duration heat, with little to no relief overnight

Figure 7-8. National Weather Service Heat Risk Forecasting System

The NWS issues excessive heat watches, excessive heat warnings and heat advisories to warn of extreme heat events within the next 36 hours. If NWS forecasters predict an excessive heat event beyond 36 hours, then the NWS will issue messaging in the form of a special weather statement, emails, and social media in the three- to seven-day timeframe. The NWS uses the Heat Risk Forecasting System to determine if an excessive heat watch/warning or heat advisory is warranted. The NWS issues the following types of heat-related advisories:

- **Heat Advisory**—Tied to events where Heat Risk output is on the orange/red (Level 2 – 3) thresholds (orange will not be an automatic heat advisory).
- **Excessive Heat Watch/Warning**—Tied to events where Heat Risk output is on the red/magenta (Level 3 – 4) thresholds.

The NWS issues an excessive heat watch generally two to three days in advance. An excessive heat watch is a way to give the public and emergency officials a warning that extreme temperatures are expected. If significantly hot temperatures remain in the forecast for 24 to 28 hours, the excessive heat watch will be upgraded to an excessive heat warning, indicating that extreme heat has either arrived or is expected soon.

The State of California *Contingency Plan for Excessive Heat Emergencies* may be followed in an extreme heat situation in Norwalk.

7.3 EXPOSURE AND VULNERABILITY

All of the City of Norwalk is exposed and vulnerable to drought and extreme heat events. Drought can affect a wide range of economic, environmental, and social activities. Its impacts can span many sectors of the economy because water is integral to the ability to produce goods and provide services. The impacts can reach well beyond the area undergoing physical drought and heat. Vulnerability of an activity to drought depends on its water demand and the water supplies available to meet the demand.

7.3.1 Population

Drought and extreme heat can affect people's health and safety, including health problems related to low water flows, poor water quality, or dust and pollution. Drought can also lead to loss of human life (National Drought Mitigation Center, 2021b). Extreme heat events claim more lives each year than any other weather-related disaster. Other possible impacts include recreational risks; effects on air quality; diminished living conditions related to energy, air quality, and hygiene; compromised food and nutrition; and increased incidence of illness and disease (CDC, 2021). Droughts can also lead to reduced local firefighting capabilities.

The Norwalk Municipal Water System, Liberty Utilities, Golden State Water, and other stakeholders have devoted considerable time and effort to protect life, safety, and health during times of consecutive dry years. Provisions and measures have been taken to analyze and account for anticipated water shortages. With coordination with residents in the planning area, the City's water system can minimize and reduce impacts on residents and water consumers in the City.

According to the EPA, those at greater risk to the adverse effects of excessive heat events are individuals with physical or mobility constraints, cognitive impairments, economic constraints, and social isolation. Such populations include the elderly, young children, low-income people, people with life-threatening illnesses and those who are overweight. Power outages can be life threatening to those dependent on electricity for life support. Outdoor recreational users may also be more vulnerable to severe weather events.

The homeless are particularly vulnerable to extreme heat during the summer when increased humidity keeps nighttime temperatures above 80 °F. The cumulative effects over several days of continuous exposure to heat, without relief, put the homeless at serious risk of heat stroke or worse. Others at significant risk are low-income populations who do not have access to air conditioning. This population, like the homeless, would lack nighttime relief from the heat, elevating their risk of heat stroke or other complications.

Cal OES and the County of Los Angeles have established plans and taken measures to protect the community during extreme heat events.

7.3.2 Property

No structures will be directly affected by drought conditions. Droughts can have significant impacts on landscapes, which could cause a financial burden to property owners. However, these impacts are not considered critical in planning for impacts from the drought hazard.

Typically, the only impact extreme heat has on general building stock is increased demand on air conditioning equipment, which may cause strain on electrical systems.

7.3.3 Critical Facilities

Critical facilities as defined for this plan will continue to be operational during droughts and extreme heat events. A benefit of water conservation in the City is delaying the need for sewer facility expansions by reducing wastewater discharge into the sewer collection and treatment system. The risk to the planning area's critical facilities inventory will be largely aesthetic. For example, when water conservation measures are in place, landscaped areas will not be watered and may die. These aesthetic impacts are not considered significant.

Extreme heat poses a risk to ground transportation infrastructure. For instance, high temperatures can cause railroad tracks and wires, and pavement and joints on roads and bridges, to crack, buckle, or sag, resulting in service disruptions, potentially hazardous travel conditions, and the need for costly repairs. Power outages or roaming blackouts may occur as a result of extreme heat events that strain and overheat circuits. During a blackout, all critical facilities and infrastructure that are reliant upon electricity for power will be severely impacted unless they are connected to a backup power source.

7.3.4 Environment

Groundwater and Streams

Drought and extreme heat generally do not affect groundwater sources as quickly as surface water supplies, but groundwater supplies generally take longer to recover. Reduced precipitation during a drought means that groundwater supplies are not replenished at a normal rate. This can lead to a reduction in groundwater levels and problems such as reduced pumping capacity or wells going dry. Shallow wells are more susceptible than deep wells. Reduced replenishment of groundwater affects streams. Much of the flow in streams comes from groundwater, especially during the summer when there is less precipitation and after snowmelt ends. Reduced groundwater levels mean that even less water will enter streams when stream flows are lowest. Where stream flows are reduced, development that relies on surface water may seek to establish new groundwater wells, which could further increase groundwater depletion.

Other Potential Losses

Environmental losses from drought and heat are associated with damage to plants, animals, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some of the effects are short-term and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent. Although environmental losses are difficult to quantify, growing public awareness and concern for environmental quality has forced public officials to focus greater attention and resources on these effects. The following are potential impacts of drought:

- Wildlife habitat may be degraded through the loss of wetlands, lakes and vegetation. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity.
- Drought conditions greatly increase the likelihood of wildfires, the major threat to timber resources.
- Water shortages and severe drought conditions would have a significant impact on Native American tribes' way of life in fishing and farming subsistence.
- Scenic resources in the City are vulnerable to the increased likelihood of wildfires associated with droughts.
- Drying up or dying off of forests could reduce ecological and eco-tourist values.
- Any shortage of water supply can have significant economic impacts.

7.3.5 Economic Impact

Economic impact from drought will be largely associated with industries that use water or depend on water for their business. For example, landscaping businesses were affected in the droughts of the past as the demand for service significantly declined because landscaping was not watered. Agricultural industries will be impacted if water usage is restricted for irrigation.

A prolonged drought and extreme heat can affect a community's economy significantly. Increased demand for water and electricity may result in shortages and higher costs of these resources. Industries that rely on water for business may be impacted the most (e.g., landscaping businesses). Although most businesses will still be operational, they may be affected aesthetically—especially the recreation and tourism industry. Moreover, droughts within another area could affect food supply and price for City residents.

7.4 FUTURE TRENDS IN DEVELOPMENT

The City of Norwalk has a General Plan that includes policies directing land use and dealing with issues of water supply and the protection of water resources. This plan provides the capability at the local level to protect future development from the impacts of drought. The City of Norwalk reviewed its General Plan under the capability assessment performed for this effort. Deficiencies identified by this review can be addressed by mitigation actions to increase the capability to deal with future trends in development.

7.5 SCENARIO

An extreme, multiyear drought associated with record-breaking rates of low precipitation and high temperatures—such as the most recent drought across the State of California—is the worst-case scenario. Combinations of low precipitation and high temperatures could occur over several consecutive years. Intensified by such conditions, water use could exceed the reserve supply in the planning area. If such conditions persisted for several years, the economy of the City could experience setbacks, especially in water dependent industries.

7.6 ISSUES

The planning team has identified the following drought- and extreme heat-related issues:

- Identification and development of alternative water supplies

- Large residential populations stressing the water supply
- Utilization of groundwater recharge techniques to stabilize the groundwater supply
- The probability of increased multi-year drought and durations due to climate change, and the associated need to consider long-term conservation measures
- Loss of much of the water transported from aqueducts to leaks and evaporation
- Recycled water opportunities
- The capture and storage of urban runoff
- The City may need to open cooling stations during extreme temperature events
- Redundancy of power supply and communications equipment must be evaluated
- The capacity for backup power generation is limited
- Dead or dying trees as a result of drought conditions are more susceptible to falling during severe storm events
- Extreme heat events are likely to increase as a result of climate change impacts

8. EARTHQUAKE

8.1 GENERAL BACKGROUND

An earthquake is the vibration of the earth's surface following a release of energy in the earth's crust. This energy can be generated by a sudden dislocation of the crust or by a volcanic eruption. Most destructive quakes are caused by dislocations of the crust. The crust may first bend and then, when the stress exceeds the strength of the rocks, break and snap to a new position. In the process of breaking, vibrations called "seismic waves" are generated. These waves travel outward from the source of the earthquake at varying speeds.

8.1.1 Earthquake Location

The location of an earthquake is commonly described by its focal depth and the geographic position of its epicenter. The focal depth of an earthquake is the depth from the Earth's surface to the region where an earthquake's energy originates (the focus or hypocenter). The epicenter of an earthquake is the point on the Earth's surface directly above the hypocenter.

8.1.2 Earthquake Geology

Tectonic Plates

The Earth's crust, which is the rigid outermost shell of the planet, is broken into seven or eight major tectonic plates (depending on how they are defined) and many minor plates. Where the plates meet, they move in one of three ways along their mutual boundary: convergent (two plates moving together), divergent (two plates moving apart), or transform (two plates moving parallel to one another). Earthquakes, volcanic activity, mountain-building, and oceanic trench formation occur along these plate boundaries. Subduction is a geological process that takes place at convergent boundaries of tectonic plate, in which one plate moves under another. Regions where this process occurs are known as subduction zones, and they have the potential to generate highly damaging earthquakes.

California is seismically active because of movement of the North American Plate, east of the San Andreas Fault, and the Pacific Plate to the west, which includes the state's coastal communities. The transform (parallel) movement of these tectonic plates against one another creates stresses that build as the rocks are gradually deformed. The rock deformation, or strain, is stored in the rocks as elastic strain energy. When the strength of the rock is exceeded, rupture occurs along a fault. The rocks on opposite sides of the fault slide past each other as they spring back into a relaxed position. The strain energy is released partly as heat and partly as elastic waves called seismic waves. The passage of these seismic waves produces the ground shaking in earthquakes.

Faults

Geologists have found that earthquakes reoccur along faults, which are zones of weakness in the earth's crust. When a fault experiences an earthquake, there is no guarantee that all the stress has been relieved. Another earthquake can still occur. In fact, relieving stress along one part of a fault may increase it in another part.

Faults are more likely to have future earthquakes on them if they have more rapid rates of movement, have had recent earthquakes along them, experience greater total displacements, and are aligned so that movement can relieve the accumulating tectonic stresses. Geologists classify faults by their relative hazards. "Active" faults, which represent the highest hazard, are those that have ruptured to the ground surface during the Holocene period (about the last 11,000 years). "Potentially active" faults are those that displaced layers of rock from the Quaternary period (the last 1,800,000 years) (California Department of Conservation, 2003).

Determining if a fault is "active" or "potentially active" depends on geologic evidence, which may not be available for every fault. The majority of the seismic hazards are on well-known active faults. However, inactive faults, where no displacements have been recorded, also have the potential to reactivate or experience displacement along a branch sometime in the future. An example of a fault zone that has been reactivated is the Foothills Fault Zone. The zone was considered inactive until evidence of an earthquake (approximately 1.6 million years ago) was found near Spenceville, California. Then, in 1975, an earthquake occurred on another branch of the zone near Oroville, California (now known as the Cleveland Hills Fault). The State Division of Mines and Geology indicates that increased earthquake activity throughout California may cause tectonic movement along currently inactive fault systems.

8.1.3 Earthquake-Related Hazards

According to the U.S. Geological Survey (USGS) Earthquake Hazards Program, an earthquake hazard is anything associated with an earthquake that may affect people's normal activities. This includes the following:

- **Surface Faulting**—Displacement that reaches the earth's surface during slip along a fault. Commonly occurs with shallow earthquakes, those with an epicenter less than 20 kilometers.
- **Ground Motion (shaking)**—The movement of the earth's surface from earthquakes or explosions. Ground motion or shaking is produced by waves that are generated by sudden slip on a fault or sudden pressure at the explosive source and travel through the earth and along its surface.
- **Landslid**e—A movement of surface material down a slope.
- **Liquefaction**—A process by which water-saturated sediment temporarily loses strength and acts as a fluid. Earthquake shaking can cause this effect.
- **Tectonic Deformation**—A change in the original shape of a material due to stress and strain.
- **Tsunami**—A sea wave of local or distant origin that results from large-scale seafloor displacements associated with large earthquakes, major submarine slides, or violent underwater volcanic eruptions.

8.1.4 Earthquake Classifications

Earthquakes are typically classified in one of two ways: By the amount of energy released, measured as magnitude; or by the impact on people and structures, measured as intensity.

Magnitude

An earthquake's magnitude is a measure of the energy released at the source of the earthquake. Magnitude is commonly expressed by ratings on the moment magnitude scale (M_w), the most common scale used today (USGS, 2017). This scale is based on the total moment release of the earthquake (the product of the distance a fault moved, and the force required to move it). The scale is as follows:

- Great—Mw > 8
- Major—Mw = 7.0 – 7.9
- Strong—Mw = 6.0 – 6.9
- Moderate—Mw = 5.0 – 5.9
- Light—Mw = 4.0 – 4.9
- Minor—Mw = 3.0 – 3.9
- Micro—w < 3

Intensity

The most commonly used intensity scale is the modified Mercalli intensity scale. Ratings of the scale as well as the perceived shaking and damage potential for structures are shown in Table 8-1. The modified Mercalli intensity scale is generally represented visually using ShakeMaps (see Section 8.1.6), which show the expected ground shaking at any given location produced by an earthquake with a specified magnitude and epicenter. An earthquake has only one magnitude and one epicenter, but it produces a range of ground shaking at sites throughout the region, depending on the distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the earth's crust. A ShakeMap shows the variation of ground shaking in a region immediately following significant earthquakes (for technical information about ShakeMaps see USGS, 2018).

Table 8-1. Mercalli Scale and Peak Ground Acceleration Comparison

Modified Mercalli Scale	Perceived Shaking	Potential Structure Damage		Estimated PGA[a] (%g)
		Resistant Buildings	Vulnerable Buildings	
I	Not Felt	None	None	<0.17%
II-III	Weak	None	None	0.17% - 1.4%
IV	Light	None	None	1.4% - 3.9%
V	Moderate	Very Light	Light	3.9% - 9.2%
VI	Strong	Light	Moderate	9.2% - 18%
VII	Very Strong	Moderate	Moderate/Heavy	18% - 34%
VIII	Severe	Moderate/Heavy	Heavy	34% - 65%
IX	Violent	Heavy	Very Heavy	65% - 124%
X – XII	Extreme	Very Heavy	Very Heavy	>124%

a. PGA = peak ground acceleration. Measured in percent of g, where g is the acceleration of gravity

Sources: USGS, 2008; USGS, 2010

8.1.5 Ground Motion

Earthquake hazard assessment is based on expected ground motion. During an earthquake when the ground is shaking, it also experiences acceleration. The peak acceleration is the largest increase in velocity recorded by a particular station during an earthquake. Estimates are developed of the annual probability that certain ground motion accelerations will be exceeded; the annual probabilities can then be summed over a time period of interest.

The most commonly mapped ground motion parameters are horizontal and vertical peak ground accelerations (PGA) for a given soil type. PGA is a measure of how hard the earth shakes, or accelerates, in a given geographic area. Instruments called accelerographs record levels of ground motion due to earthquakes at stations throughout a region. PGA is measured in g (the acceleration due to gravity) or expressed as a percent acceleration force of gravity (%g). These readings are recorded by state and federal agencies that monitor and predict seismic activity.

Maps of PGA values form the basis of seismic zone maps that are included in building codes such as the International Building Code. Building codes that include seismic provisions specify the horizontal force due to lateral acceleration that a building should be able to withstand during an earthquake. PGA values are directly related to these lateral forces that could damage "short period structures" (e.g. single-family dwellings). Longer period response components determine the lateral forces that damage larger structures with longer natural periods (apartment buildings, factories, high-rises, bridges). Table 8-1 lists damage potential and perceived shaking by PGA factors, compared to the Mercalli scale.

8.1.6 USGS Earthquake Mapping Programs

ShakeMaps

The USGS Earthquake Hazards Program produces maps called ShakeMaps that map ground motion and shaking intensity following significant earthquakes. ShakeMaps focus on the ground shaking caused by the earthquake, rather than on characteristics of the earthquake source, such as magnitude and epicenter. An earthquake has only one magnitude and one epicenter, but it produces a range of ground shaking at sites throughout the region, depending on the distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the earth's crust.

A ShakeMap shows the extent and variation of ground shaking immediately across the surrounding region following significant earthquakes. Such mapping is derived from peak ground motion amplitudes recorded on seismic sensors, with interpolation where data are lacking based on estimated amplitudes. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and Modified Mercalli intensity. In addition to the maps of recorded events, the USGS creates the following:

- Scenario ShakeMaps of hypothetical earthquakes of an assumed magnitude on known faults.
- Probabilistic ShakeMaps, based on predicted shaking from all possible earthquakes over a 10,000-year period. In a probabilistic map, information from millions of scenario maps are combined to make a forecast for the future. The maps indicate the ground motion at any given point that has a given probability of being exceeded in a given timeframe, such as a 100-year (1-percent-annual chance) event.

National Seismic Hazard Map

National maps of earthquake shaking hazards provide information for creating and updating seismic design requirements for building codes, insurance rate structures, earthquake loss studies, retrofit priorities and land use planning. After thorough review of the studies, professional organizations of engineers update the seismic-risk maps and seismic design requirements contained in building codes (Brown et al., 2001). The USGS updated the National Seismic Hazard Maps in 2018. New seismic, geologic, and geodetic information on earthquake rates and associated ground shaking were incorporated into these revised maps. The 2018 map, shown in Figure 8-1, represents the best available data as determined by the USGS.

Source: USGS, 2018

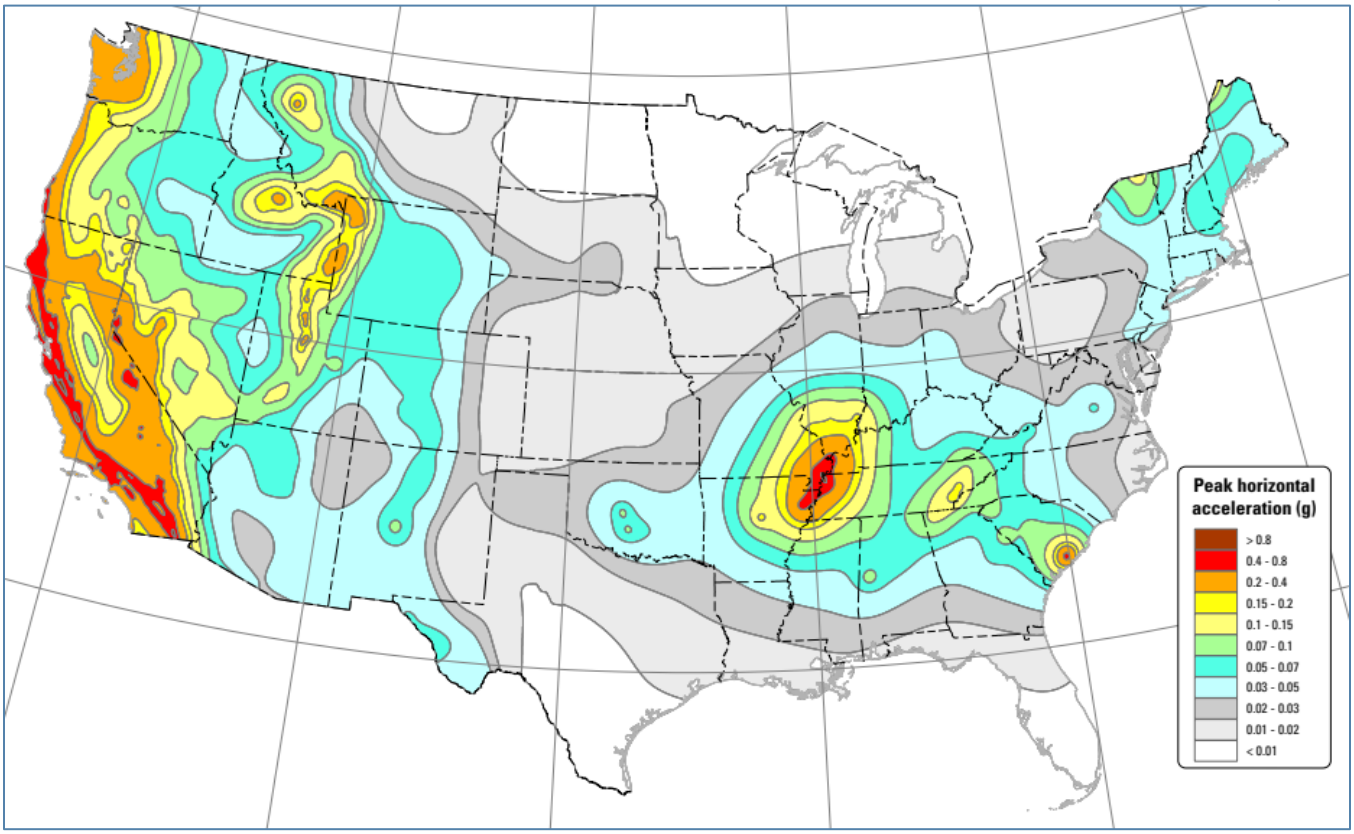


Figure 8-1. Peak Acceleration (g) with 10% Probability of Exceedance in 50 Years on NEHRP B/C Soils

8.1.7 Liquefaction and Soil Types

Soil liquefaction occurs when water-saturated sands, silts or gravelly soils are shaken so violently that the individual grains lose contact with one another and float freely in the water, turning the ground into a pudding-like liquid. Building and road foundations lose load-bearing strength and may sink into the ground.

A program called the National Earthquake Hazard Reduction Program (NEHRP) creates maps based on soil characteristics to help identify locations subject to liquefaction. NEHRP soil types define the locations that will be significantly impacted by an earthquake. Table 8-2 summarizes NEHRP soil classifications. NEHRP Soils B and C typically can sustain ground shaking without much effect, dependent on the earthquake magnitude. The areas that are commonly most affected by ground shaking have NEHRP Soils D, E and F. In general, these areas are also most susceptible to liquefaction.

8.1.8 Secondary Hazards

Earthquakes can cause large and sometimes disastrous mudslides. Building and road foundations can lose load-bearing strength and may sink into what was previously solid ground. Earthen dams and levees are highly susceptible to seismic events, and the impacts of their failures can be considered secondary risks for earthquakes.

Table 8-2. NEHRP Soil Classification System

NEHRP Soil Type	Description	Mean Shear Velocity to 30 m (m/s)
A	Hard Rock	1,500
B	Firm to Hard Rock	760-1,500
C	Dense Soil/Soft Rock	360-760
D	Stiff Soil	180-360
E	Soft Clays	< 180
F	Special Study Soils (liquefiable soils, sensitive clays, organic soils, soft clays >36 m thick)	

Unless properly secured, hazardous materials can be released, causing significant damage to the environment and people. Hazardous materials releases can occur during an earthquake from fixed facilities or transportation-related incidents. During an earthquake, structures storing these materials could rupture and leak into the surrounding area or an adjacent waterway, having a disastrous effect on the environment. Transportation corridors can be disrupted during an earthquake, leading to the release of materials to the surrounding environment.

8.2 HAZARD PROFILE

8.2.1 Past Events

Norwalk was included in three Los Angeles countywide FEMA declarations for earthquakes: the 1994 Northridge Earthquake (DR-1008), the 1987 Whittier Narrows Earthquake (DR-799), and the 1971 San Fernando Earthquake (DR-299). Table 8-3 lists the 4.0 or greater magnitude earthquakes that have occurred within 100 miles of Norwalk.

2010 Pico Rivera Earthquake

Pico Rivera was the epicenter of a magnitude 4.4 earthquake on March 16, 2010, which occurred at 4:04 a.m. The earthquake struck about 1.5 miles northeast of Pico Rivera at a depth of 11.7 miles, which is considered shallow. The USGS stated that the quake was likely from the Puente Hills thrust fault. The epicenter was about 4.5 miles south of the epicenter of the 1987 Whittier Narrows earthquake. Both earthquakes exhibited thrust faulting. However, the 2010 earthquake strike rotated clockwise, suggesting that a different thrust system was activated. There were no injuries or major damage, but plenty of people felt the shaking. It was reported to have been felt from San Bernardino County to Santa Monica, and as far south as San Diego. The California Institute of Technology (Caltech) seismologists stated the quake indicates stresses building up for an even bigger earthquake.

1994 Northridge Earthquake

The 1994 Northridge Earthquake was the costliest seismic event in California since the 1906 San Francisco Earthquake. The infrastructure of the metropolitan area was severely disrupted. Freeways collapsed, power systems for the city and linked communities as far away as Oregon were temporarily blacked out, and communications were disrupted. The California *State Hazard Mitigation Plan* reports the Northridge Earthquake caused over $40 billion of disaster losses, 57 deaths, and 11,846 injuries (Cal OES, 2018).

Table 8-3. Earthquakes Within 100-mile Radius of Norwalk

Date	Magnitude	Epicenter Location	Fault Line
09/19/2020	4.5	Near South El Monte	Unknown
07/30/2020	4.2	Near Pacoima	Unknown
04/04/2020	4.9	Southeast of Anza	Unknown
01/02/2020	4.0	Near Oxnard	Unknown
06/05/2019	4.3	South of San Clemente Island	Unknown
06/05/2019	4.3	South of San Clemente Island	Unknown
05/08/2018 Cabazon Earthquake	4.5	Near Cabazon	Unknown
04/05/2018 Santa Cruz Island Earthquake	5.3	Near Santa Cruz Island	Unknown
01/25/2018 Trabuco Earthquake	4.0	Near Trabuco Canyon	Unknown
03/29/2014 Brea Earthquake	5.1	Near Brea, CA	Puente Hills fault
03/16/2010 Pico Rivera Earthquake	4.4	Pico Rivera, CA	(Likely) Puente Hills fault
05/18/2009 Inglewood	4.7	Inglewood, CA	Newport-Inglewood fault
07/29/2008 Chino Hills Earthquake	5.4	Near Chino Hills, CA	Whittier fault
01/17/1994 Northridge Earthquake	6.7	20 miles west-northwest of Los Angeles	Northridge Thrust fault
06/28/1991 Sierra Madre Earthquake	5.8	12 miles northeast of Pasadena, CA	Clamshell-Sawpit Canyon fault
02/28/1990 Upland Earthquake	7.9	30 miles east of Los Angeles	San Jose fault
06/12/1989 Montebello	4.8 / 4.5	6 miles west of Montebello	(Likely) Puente Hills fault
01/18/1989 Malibu Earthquake	5.0	20 miles south of Malibu, CA	Unknown
12/03/1988 Pasadena Earthquake	5.0	Below City of Pasadena, CA	Raymond fault
06/26/1988 Upland Earthquake	7.9	30 miles east of Los Angeles	San Jose fault
06/10/1988 Tejon Ranch Earthquake	6.8	Northeast of Frazier Park, CA	Unknown
10/01/1987 Whittier Narrows Earthquake	5.9	Southeast of Pasadena	Puente Hills fault
01/01/1979 Malibu Earthquake	5.2	South of Malibu, CA	Unknown
08/13/1978 Santa Barbara Earthquake	5.1	Southeast of Santa Barbara, CA	Unknown
02/21/1973 Point Mugu Earthquake	5.3	Near Oxnard, 45 miles west of Los Angeles	San Fernando fault
02/09/1971 San Fernando Earthquake	6.5	Near Sylmar, CA	San Fernando fault
12/4/1948 Desert Hot Springs Earthquake	6.0	Near Desert Hot Springs, 100 miles east of Los Angeles	S. Branch San Andreas fault
6/30/1941 Santa Barbara Earthquake	5.5	6 miles ESE of Santa Barbara, CA	unknown
3/10/1933 Long Beach Earthquake	6.4	3 miles south of Huntington Beach, CA	Newport-Inglewood fault

Source: Southern California Earthquake Data Center, 2021

Officially lasting approximately 30 seconds, and with a magnitude of 6.7, this earthquake caused significant damage to buildings. Of 57 fatalities attributed to this quake, 16 were a result of the collapse of a single structure—the Northridge Meadows apartment building. The ground motion was measured throughout Southern California, including intensity readings of 1.82 g near the Ventura Freeway in the Tarzana area. Ground motions as strong as 1.21 g were measured as far away as Inglewood (approximately 25 miles from Northridge). One "g" of ground motion is enough to make unsecured buildings hop off their foundations.

According to the USGS and the Southern California Earthquake Center, the Northridge Earthquake raised nearby mountains by as much as 70 centimeters. The fault, which was previously unknown, appears to be truncated by the fault that broke in the similarly sized 1971 San Fernando Earthquake, the two faults abutting at a depth of 5 miles.

The Northridge Earthquake caused many times more damage than the 1971 event, primarily because its fault is directly under the densely populated valley, whereas the 1971 fault lies under the mountains.

8.2.2 Location

Major Faults

The City of Norwalk is within a region that is well known for its many active faults. The San Andreas Fault is a major tectonic boundary about 28 miles northeast of Norwalk. It is the primary feature of the tectonic boundary between the Pacific and North American tectonic plates and is the longest fault in California. It can cause powerful Magnitude 8 earthquakes. The California Earthquake Authority reports there are over a hundred smaller active faults in the Los Angeles region that can cause damaging earthquakes like the Northridge earthquake in 1994. These faults include the Raymond fault, the Santa Monica fault, the Hollywood fault, the Newport-Inglewood fault, the Puente Hills fault, and the San Jacinto and Elsinore faults. Figure 8-2 is a map showing the regional earthquake faults closest to Norwalk.

Compton

The Compton thrust fault (blind) extends below the western Los Angeles Basin, lying entirely within Mesozoic metamorphic basement (Shaw and Suppe, 1996). Most of the thrust fault is a ramp that rises to the southwest from depths of 3 to 6 miles. The ramp connects the Central Basin Decollement, a thrust flat below the Los Angeles Basin, with shallower parts of the thrust fault near its tip below the Palos Verdes Peninsula. The Compton blind thrust fault is active and has generated at least six large-magnitude earthquakes (Mw 7.0 to 7.4) during the past 14,000 years, with an estimated thrust fault slip rate of 1.2+0.5, -0.3 millimeters per year (Leon et al., 2009).

Puente Hills

The Puente Hills fault, also known as the Puente Hills thrust system, is an active geological fault that runs about 25 miles in three discrete sections from the Puente Hills region in the southeast to just south of Griffith Park in the northwest. The fault is known as a blind thrust fault due to the lack of surface features normally associated with thrust faults. This fault is capable of producing an earthquake with a magnitude between 7.0 and 7.5.

Whittier Fault

The Whittier Fault trends roughly east-west through the southern portion of the Puente Hills (a chain of hills in an unincorporated area in eastern Los Angeles County) east of Norwalk, near the communities of Yorba Linda, Hacienda Heights and Whittier. The Whittier fault is geologically young, but recent activity along this fault documents that it is active. This fault is capable of producing an earthquake with a magnitude of 6.0 to 7.2.

NEHRP Soil Type and Liquefaction Mapping

Figure 8-3 shows NEHRP soil classifications in Los Angeles County. Figure 8-4 shows areas that have been identified as susceptible to liquefaction.

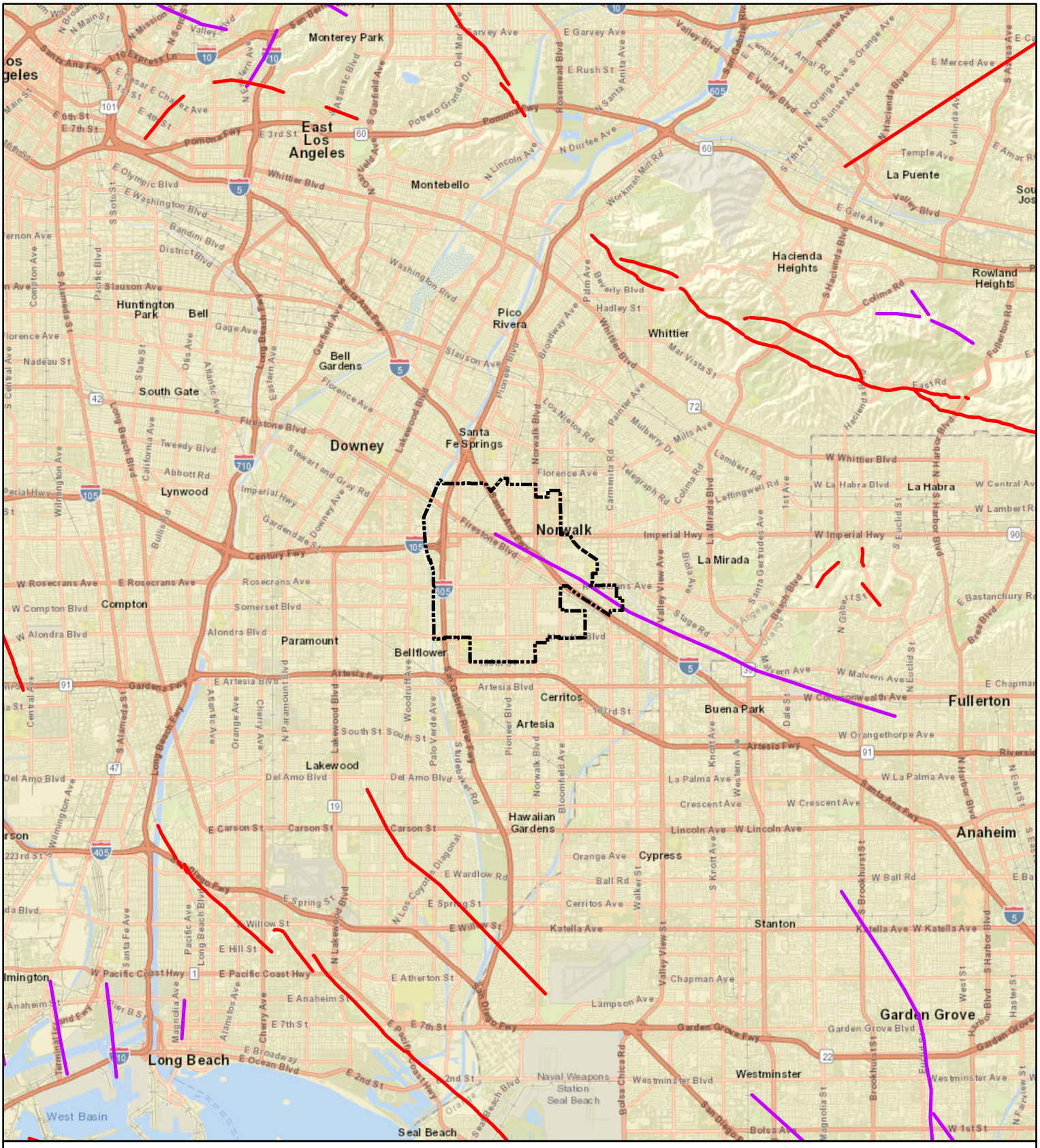


Figure 8-2. Earthquake Faults

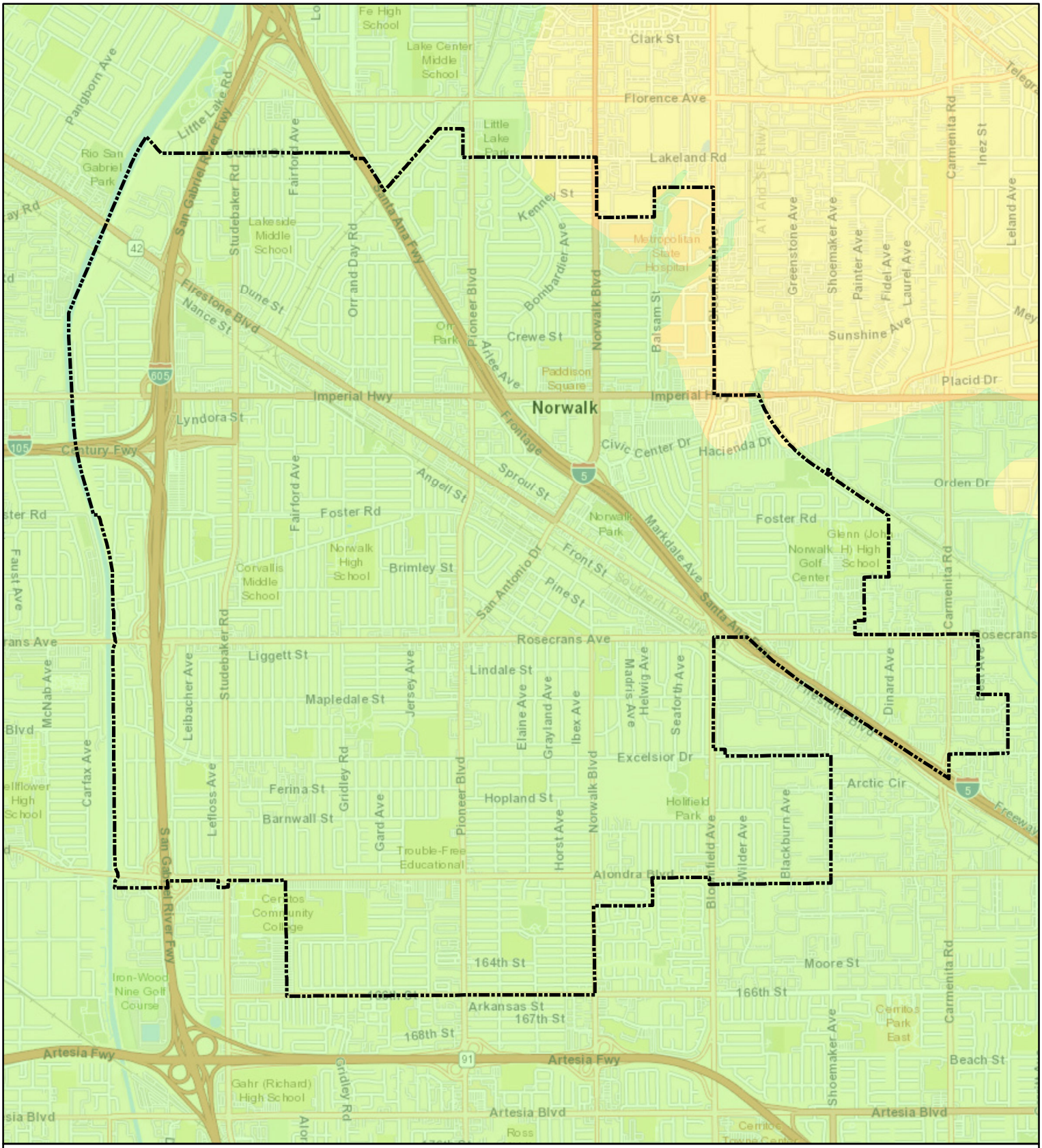


Figure 8-3. NEHRP Soil Class

C (Dense soil/soft rock)

D (Stiff soil)

City Boundary

N

0 0.4 0.8 Miles

Data Sources: Esri, City of Norwalk, CGS

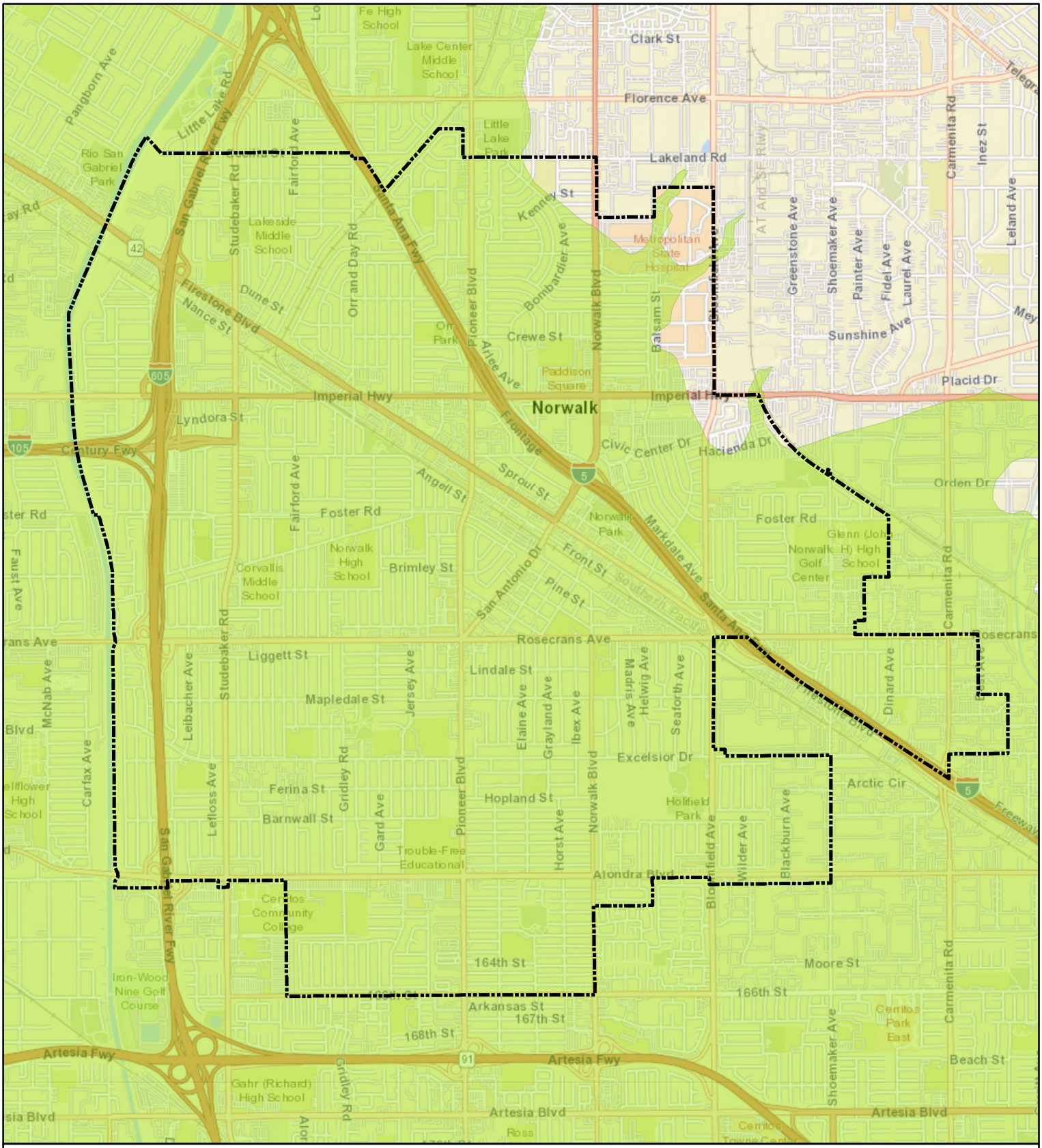


Figure 8-4. Liquefaction Zone

Liquefaction Zone

City Boundary

N

0 0.4 0.8 Miles

Data Sources: Esri, City of Norwalk, CGS

Frequency

California experiences hundreds of earthquakes each year, most with magnitudes below 3.0 and minimal damage. Earthquakes that cause moderate damage to structures occur several times a year. According to the USGS, a strong earthquake measuring greater than Magnitude 5.0 occurs statewide every two to three years, and major earthquakes of more than Magnitude 7.0 occur once a decade. The San Andreas Fault has the potential for experiencing major to great events.

Based on the most recent earthquake forecast model for California, scientists estimate that in the next 30 years the Los Angeles region has a 60-percent probability of an earthquake of Magnitude 6.7 or greater, a 46-percent probability of an earthquake of Magnitude 7 or greater, and a 31 percent probability of an earthquake of Magnitude 7.5 (USGS, 2021).

The Uniform California Earthquake Rupture Forecast, Version 3 (UCERF3) predicts the probability of an earthquake of Magnitude 6.7 or greater over the next 30 years as shown in Figure 8-5.

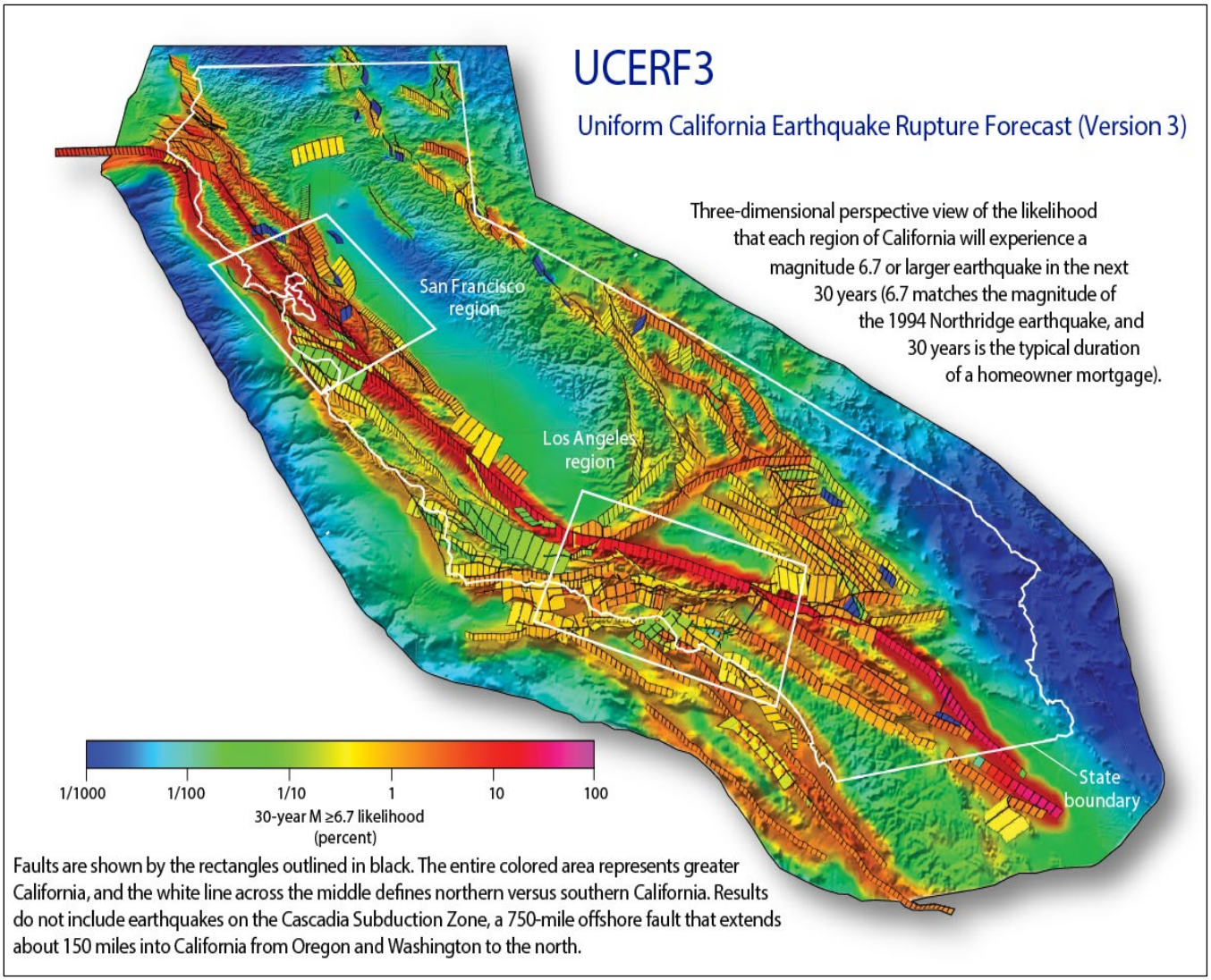


Figure 8-5. UCERF3 Forecast for Magnitude 6.7 or Larger Earthquake in the Next 30 Years

The UCERF3 also defined the following recurrence intervals for the deterministic earthquake scenarios used for the risk assessment in this hazard mitigation plan:

- Compton M7.45 = 1,906.49 years
- Puente Hills M6.95 = 3,094.92 years
- Whittier M6.98 = 1,402.56 years
- 100-Year Probabilistic = 1 percent annual chance

8.2.3 Severity

The USGS has created ground motion maps based on current information about fault zones. These maps show the PGA that has a certain probability (2 percent or 10 percent) of being exceeded in a 50-year period. The maps were most recently updated in 2014 with new seismic, geologic, and geodetic information on earthquake rates and ground shaking, representing the best currently available data. The 2014 map for California shows that for Norwalk and the greater Los Angeles area, the PGA with a 10-percent probability of exceedance in 50 years is 0.2g to 0.4g (see Figure 8-6). USGS scenario based and probabilistic ShakeMaps also indicate expected ground acceleration for earthquake events that have the potential to occur for a given area.

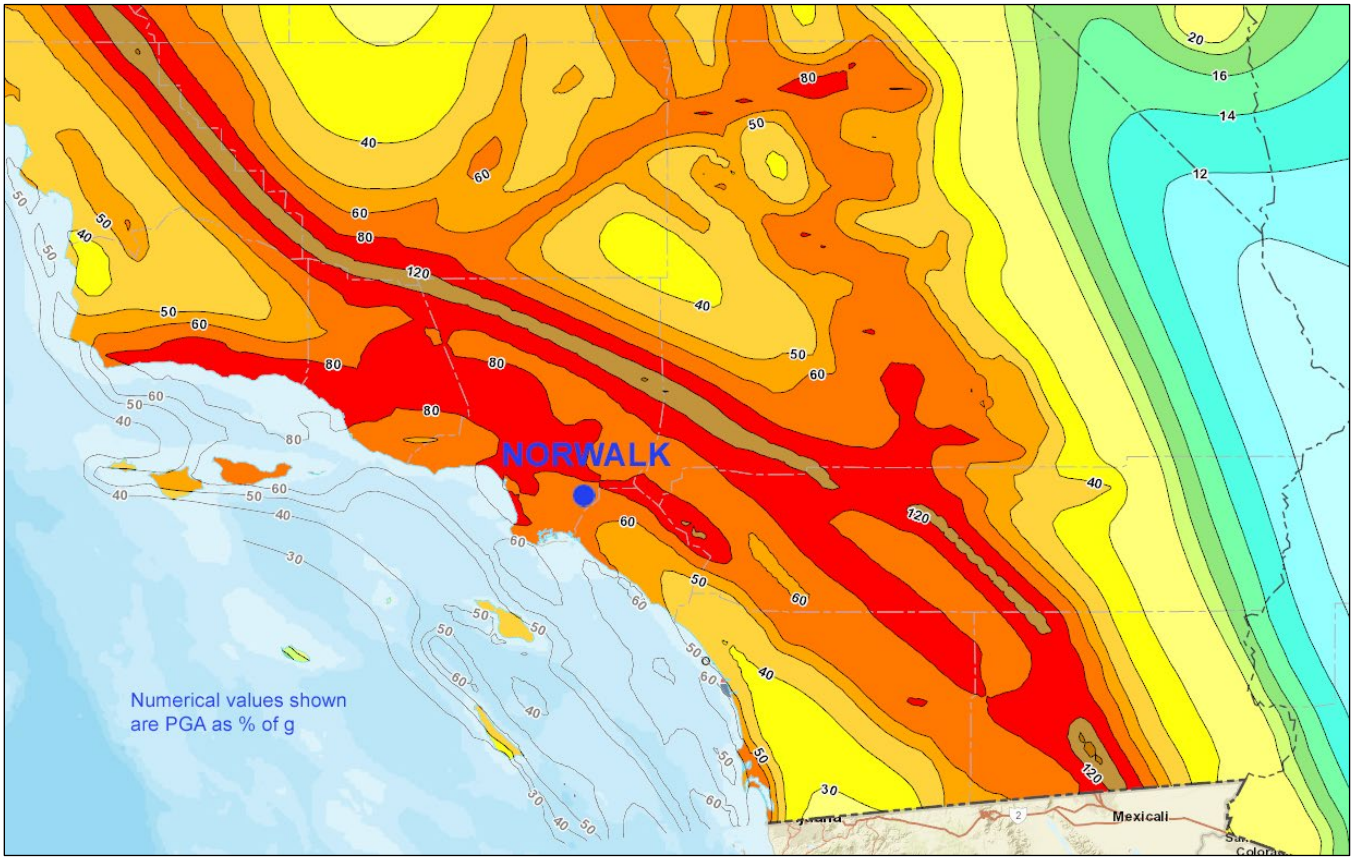


Figure 8-6. PGA with 2-Percent Probability of Exceedance in 50 Years

8.2.4 Warning Time

There is currently no reliable way to predict the day or month that an earthquake will occur at any given location. Earthquake early warning systems use earthquake science and the technology of monitoring systems to alert devices and people when shaking waves generated by an earthquake are expected to arrive at their location. Strong seismic shaking from an earthquake travels at about 2 miles per second, so it is possible to detect a large earthquake near its source and broadcast a warning of imminent strong shaking to more distant areas before the shaking arrives. The seconds to minutes of advance warning can allow people and systems to take actions to protect life and property from destructive shaking.

8.3 EXPOSURE

The entire planning area is exposed to the earthquake hazard, so an earthquake has the potential to affect the entire population of 105,549, all 23,248 buildings in the planning area, with a total replacement value of $15.3 billion, all 109 of the planning area's identified critical facilities, and the entire environment of the planning area.

8.4 VULNERABILITY

Earthquake vulnerability data for the risk assessment was generated using a Hazus Level 2 (user-defined) analysis for the scenario events listed in Table 8-4. The analysis results are summarized in the sections below.

Table 8-4. Earthquakes Modeled for Risk Assessment

Event	Magnitude	Focal Depth	Epicenter Location	Map Figure
Compton Fault	7.45	11.9 km	N33.95, W118.24	Figure 8-7
Puente Hills Fault	6.82	10.4 km	N34.01, W117.95	Figure 8-8
Whittier Fault	6.98	9.0 km	N33.94, W117.81	Figure 8-9
100-Year Probabilistic	N/A	N/A	N/A	Figure 8-10

8.4.1 Population

Depending on the severity of the earthquake some people may be directly injured or killed. In addition, homes and businesses may be damaged, resources and supplies may be scarce, business interruptions may keep people from working, utilities may have outages, schools may be temporarily closed, and road closures may cause extra time and travel. All of these indirect effects could impact people who suffered no direct harm from the earthquake. Thus, the entire population must deal with the consequences of earthquakes to some degree.

Socially Vulnerable Populations

Socially vulnerable populations include the elderly and young, who may be physically unable to evacuate quickly, as well as low-income populations who may lack resources to do so. Socially vulnerable populations exposed to the earthquake hazard were estimated based on data for the Census-defined blocks that lie at least partially within the mapped NEHRP D soil zone or liquefaction susceptibility zone. Because many of those Census blocks extend outside those zones, the estimates are greater than the actual exposed populations, but they provide reasonable relative data for use in mitigation planning. Table 8-5 summarizes the results.

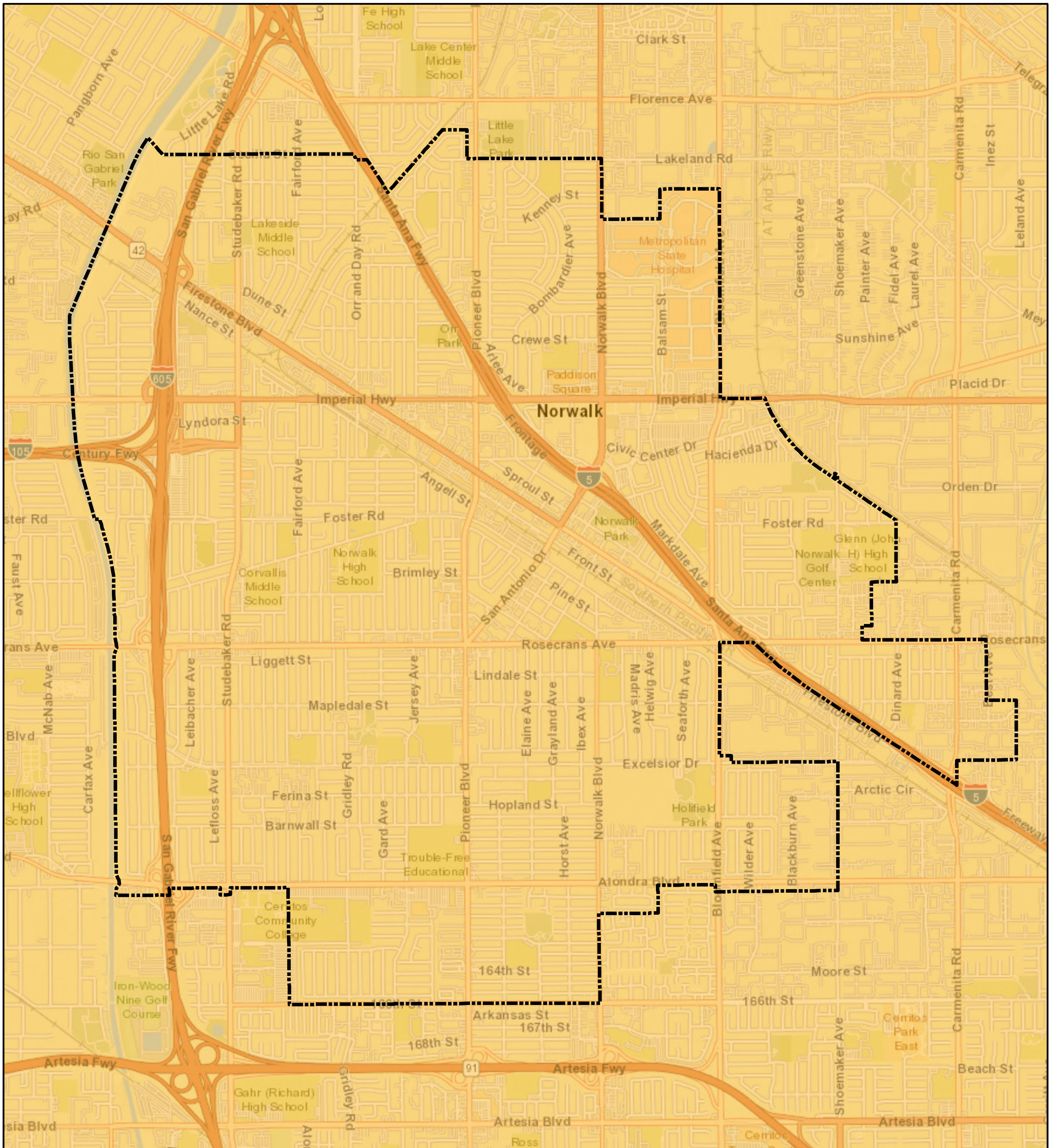


Figure 8-7. Compton M7.45 Earthquake Scenario

Mercalli Intensity Scale

VIII (Severe/Moderate-Heavy)

City Boundary

Intensity scale described as: (perceived shaking / potential damage)

N

0 0.4 0.8 Miles

Data Sources: Esri, City of Norwalk, USGS

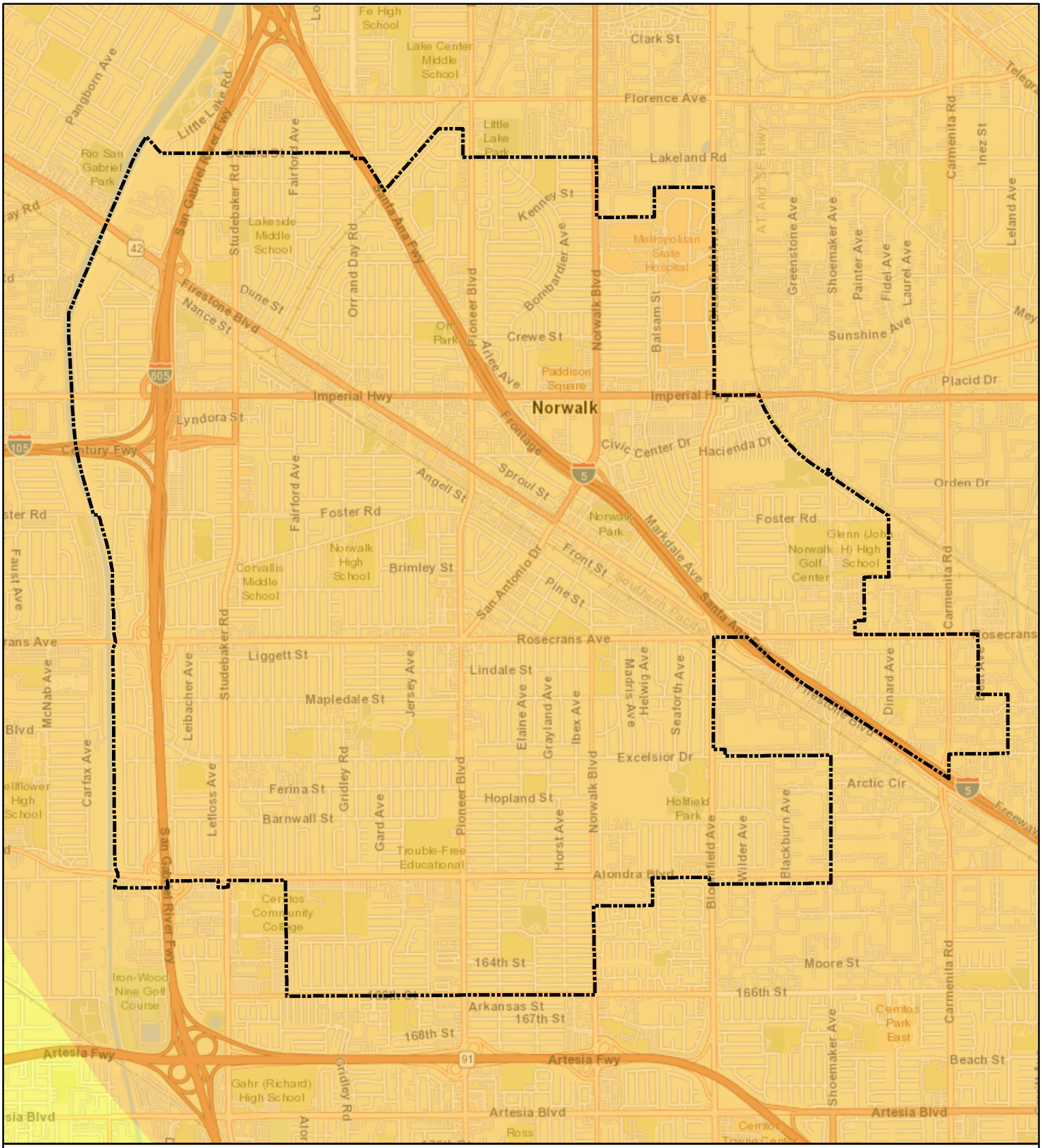


Figure 8-8. Puente Hills M6.82 Earthquake Scenario

Mercalli Intensity Scale

- **VII (Very Strong/Moderate)**
- **VIII (Severe/Moderate-Heavy)**
- **City Boundary**

Intensity scale described as: (perceived shaking / potential damage)

N

0 0.4 0.8 Miles

Data Sources: Esri, City of Norwalk, USGS

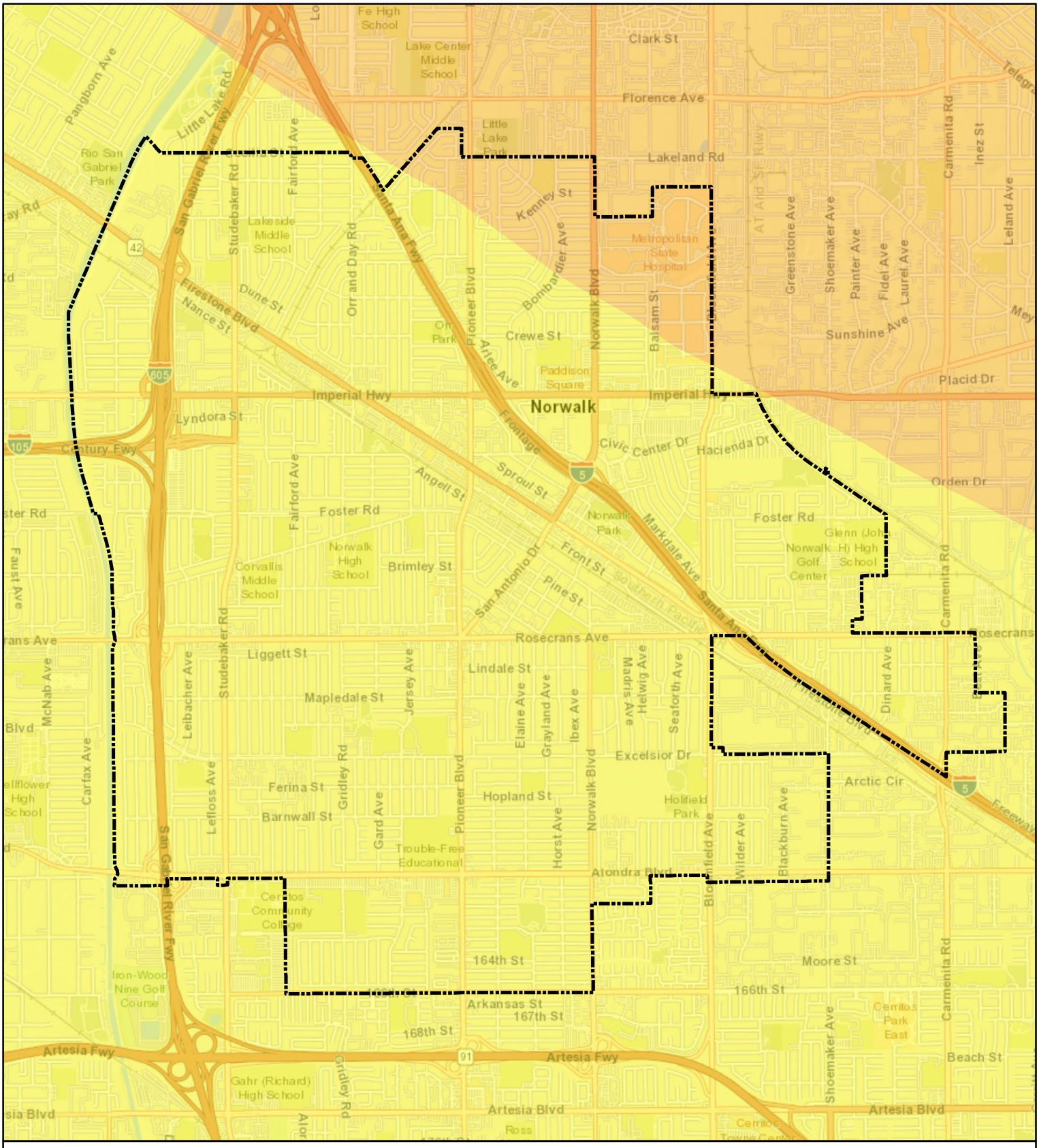


Figure 8-9. Whittier M6.98 Earthquake Scenario

Mercalli Intensity Scale

- **VII (Very Strong/Moderate)**
- **VIII (Severe/Moderate-Heavy)**
- **City Boundary**

Intensity scale described as: (perceived shaking / potential damage)

N

0 0.4 0.8 Miles

Data Sources: Esri, City of Norwalk, USGS

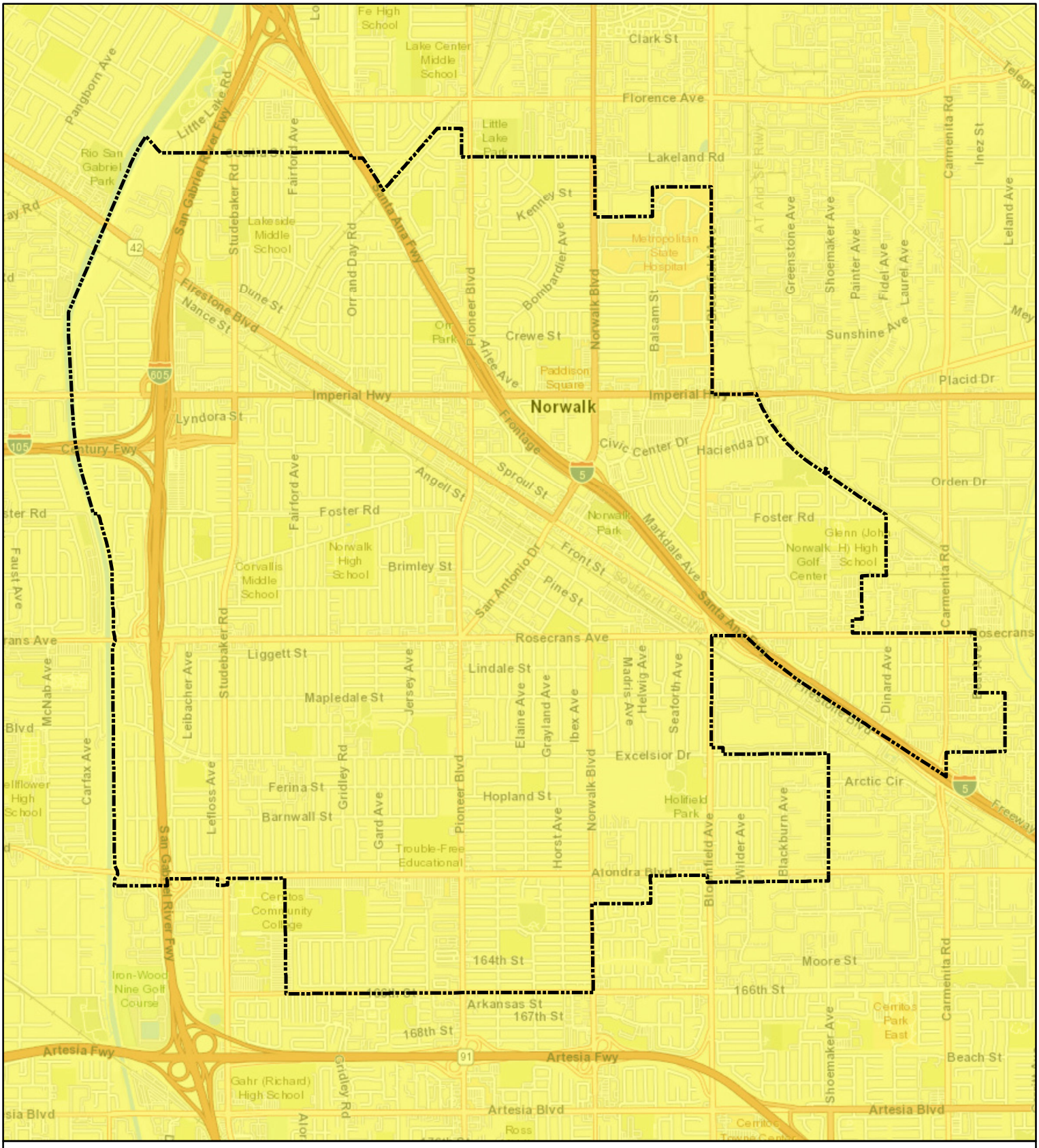


Figure 8-10. 100-Year Probabilistic Earthquake Scenario

Mercalli Intensity Scale

VII (Very Strong/Moderate)

City Boundary

Intensity scale described as: (perceived shaking / potential damage)

N

0 0.4 0.8 Miles

Data Sources: Esri, City of Norwalk, USGS

Table 8-5. Estimated Persons and Households in Liquefaction or NEHRP Class D Soils Zones

	Number[a]	% of Total in Hazard Area
Exposed Population by Age		
Over 65 Years	10,363	9.9%
Under 16	29,059	27.8%
Exposed Number of Households by Income		
Households with Income Below $60,000 (very low income[b])	13,622	50.4%
Totals Used for Calculating Percentages[a]		
Population	104,631	
Households	27,034	

a. Note that the methodology used for this analysis overestimates exposed population and households. Results presented in this table should be used to evaluate relative exposure between groups rather than absolute numbers of exposed persons or households.
b. See Section 3.7.1 for a discussion of "very low income" as used in this risk assessment.

Disasters in general also disproportionately affect individuals with disabilities, seniors, children, those with limited English proficiency, and those with limited transportation options. These people will need assistance such as alerting and warning in their native language, evacuation assistance, or sheltering that meets the individual needs of each person. Estimates for key populations of these groups in Norwalk are as follows:

- 67 percent of the population live in a home where a language other than English is spoken
- 6.5 percent of the population have a disability
- 10.6 percent of the population do not have health insurance

Estimated Impacts on Persons and Households

Impacts on persons and households in the planning area were estimated for the scenario events assessed through the Level 2 Hazus analysis. Table 8-6 summarizes the results.

Table 8-6. Estimated Earthquake Impact on Persons and Households

Earthquake Scenario	Number of Displaced Households	Number of Persons Requiring Short-Term Shelter
Compton	1,771	1,741
Puente Hills	1,056	1,042
Whittier	416	409
100-Year Probabilistic	137	135

8.4.2 Property

Building Age

Table 8-7 identifies significant milestones in building and seismic code requirements that directly affect the structural integrity of development. Using these time periods, the planning team used Hazus to identify the number of structures in the planning area by date of construction.

Table 8-7. Age of Structures in Planning Area

Time Period	Number of Current Structures Built in Period	Significance of Time Frame
Pre-1933	530	Before 1933, there were no explicit earthquake requirements in building codes. State law did not require local governments to have building officials or issue building permits.
1933-1940	224	In 1940, the first strong motion recording was made.
1941-1960	18,472	In 1960, the Structural Engineers Association of California published guidelines on recommended earthquake provisions.
1961-1975	1,814	In 1975, significant improvements were made to lateral force requirements.
1976-1994	1,681	In 1994, the Uniform Building Code was amended to include provisions for seismic safety.
1994 – present	527	Seismic code is currently enforced.
Total	**23.248**	

The number of structures does not reflect the number of total housing units, as many multi-family units and attached housing units are reported as one structure. Only about 2 percent of the planning area's structures were constructed after the Uniform Building Code was amended in 1994 to include seismic safety provisions. Approximately 2.3 percent were built before 1933 when there were no building permits or seismic standards.

Loss Potential

Property losses were estimated through the Level 2 Hazus analysis for the assessed earthquake fault scenarios. Table 8-8 shows the estimates for damage to structures and building contents with the percent of total replacement value.

Table 8-8. Loss Estimates for Fault Scenarios

	Estimated Loss Associated with Earthquake			% of Total
	Structure	Contents	Total	Replacement Value
Compton	$2,629,072,831	$1,069,928,793	$3,699,001,624	24.2
Puente Hills	$1,877,386,785	$732,575,433	$2,609,962,218	17
Whittier	$1,346,296,002	$527,732,168	$1,874,028,170	12.2
100-Year Probabilistic	$791,825,818	$342,728,688	$1,134,554,506	7.4

The Hazus analysis also estimated the amount of earthquake-caused debris in the planning area for the assessed events, as summarized in Table 8-9.

Table 8-9. Estimated Earthquake-Caused Debris

	Debris to Be Removed (tons)
Compton	952,050
Puente Hills	625,450
Whittier	287,730
100-Year Probabilistic	80,910

8.4.3 Critical Facilities

Level of Damage

Hazus classifies the vulnerability of critical facilities to earthquake as no damage, slight damage, moderate damage, extensive damage, or complete damage. Hazus was used to assign a category to each critical facility in the planning area for the three earthquake fault scenarios. Figure 8-11 through Figure 8-14 summarize the results.

Time to Restore Critical Facilities to Functionality

Hazus estimates the time to restore critical facilities to fully functional use. Results are presented as probability of being functional at specified time increments: 1, 3, 7, 14, 30 and 90 days after the event. For example, Hazus may estimate that a facility has 5 percent chance of being fully functional at Day 3, and a 95-percent chance of being fully functional at Day 90. The analysis of critical facilities in the planning area was performed for the three scenario events assessed. The results are summarized in Figure 8-15 through Figure 8-18.

Environment

Secondary hazards associated with earthquakes will likely have damaging effects on the environment. It is possible for streams to be rerouted after an earthquake. This can change the water quality, possibly damaging habitat and feeding areas. There is a possibility of streams fed by groundwater drying up because of changes in underlying geology.

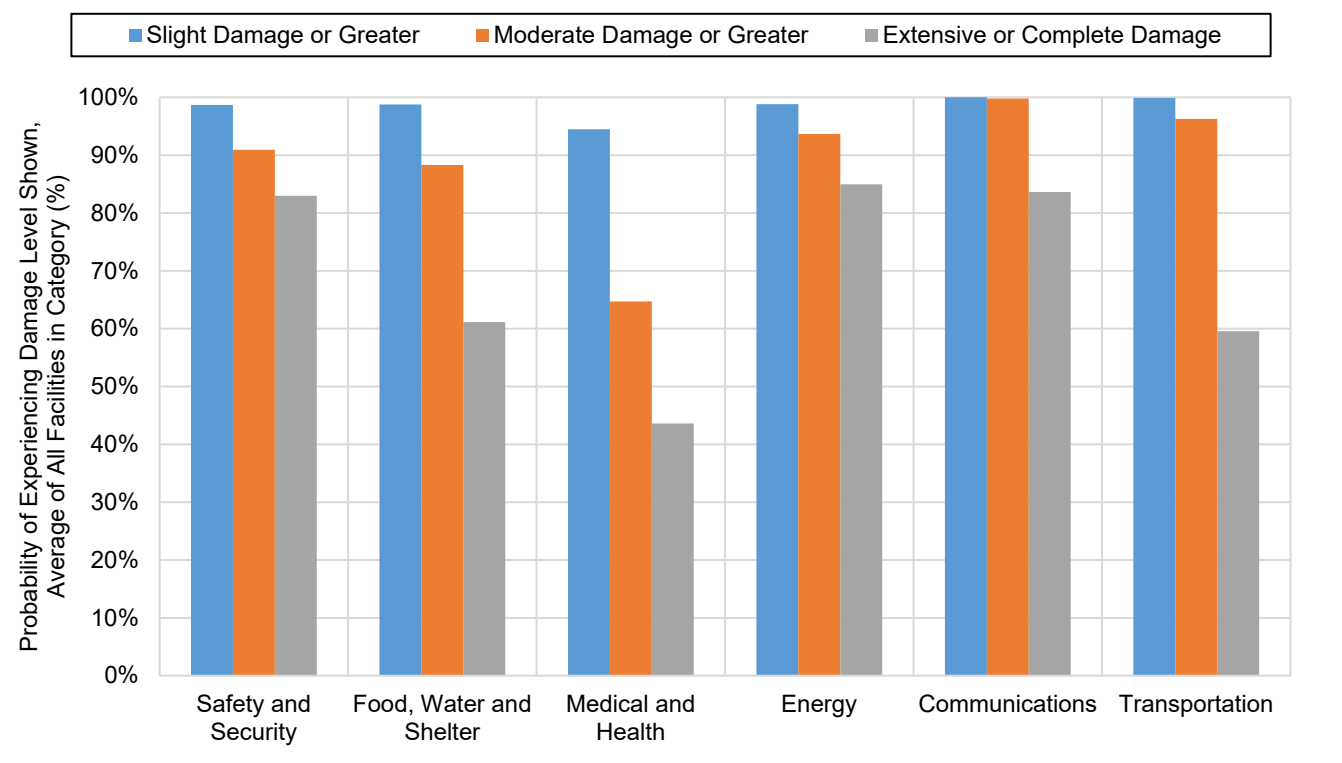


Figure 8-11. Critical Facility Damage Potential, Compton Fault Scenario

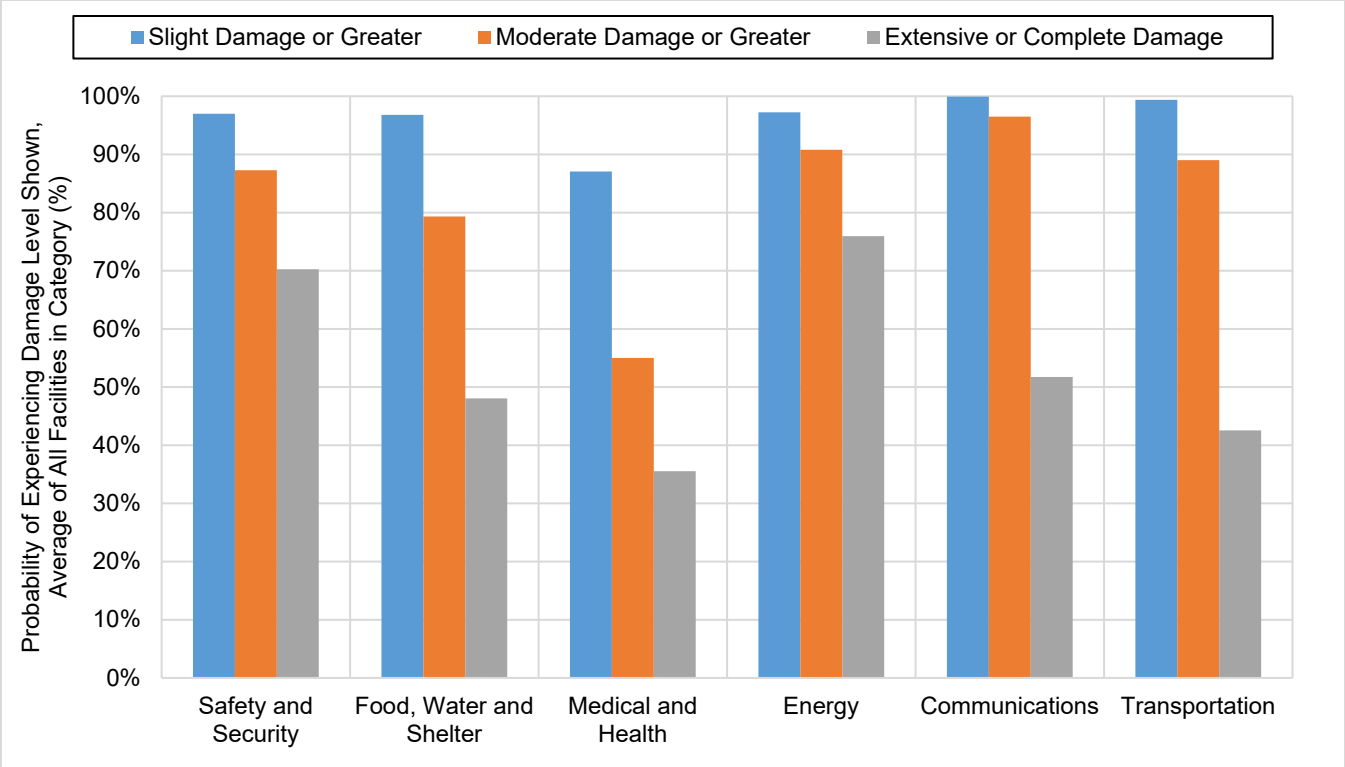


Figure 8-12. Critical Facility Damage Potential, Puente Hills Fault Scenario

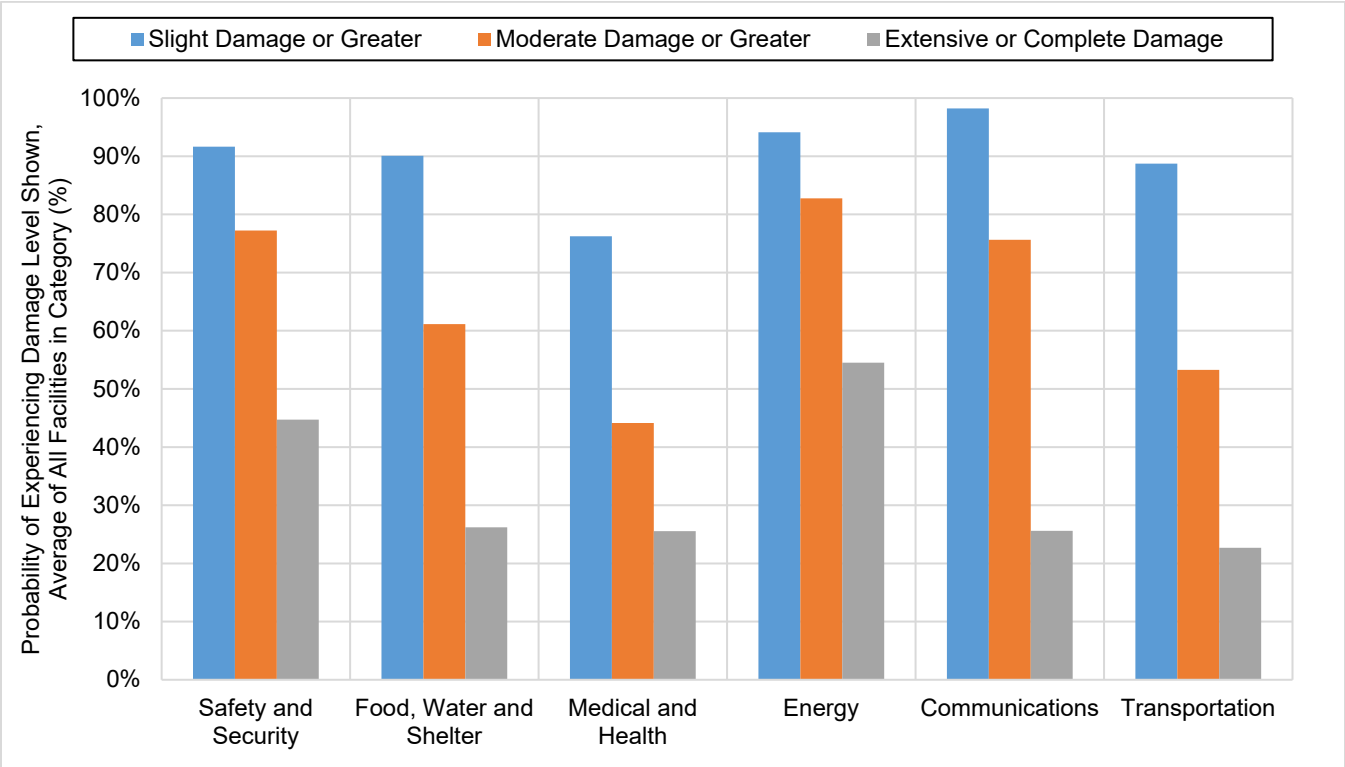


Figure 8-13. Critical Facility Damage Potential, Whittier Fault Scenario

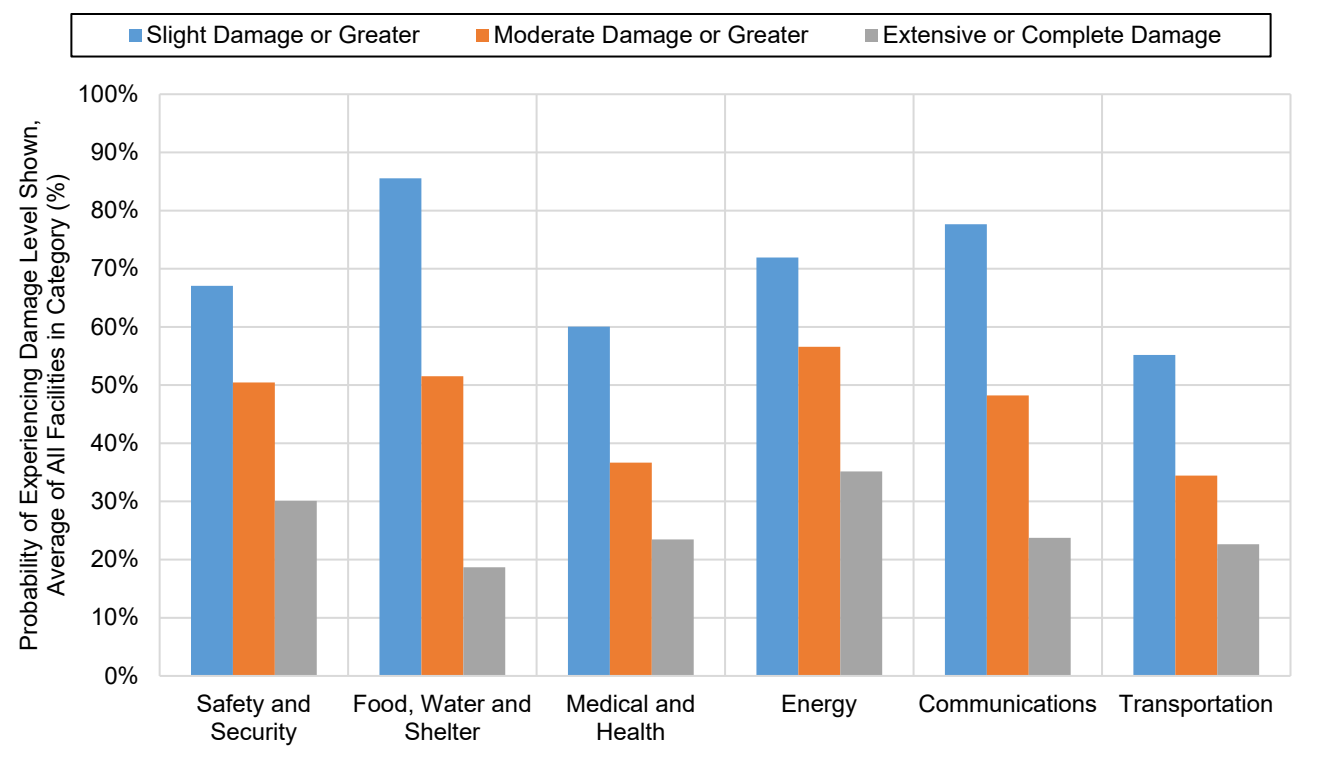


Figure 8-14. Critical Facility Damage Potential, 100-Year Probabilistic Earthquake

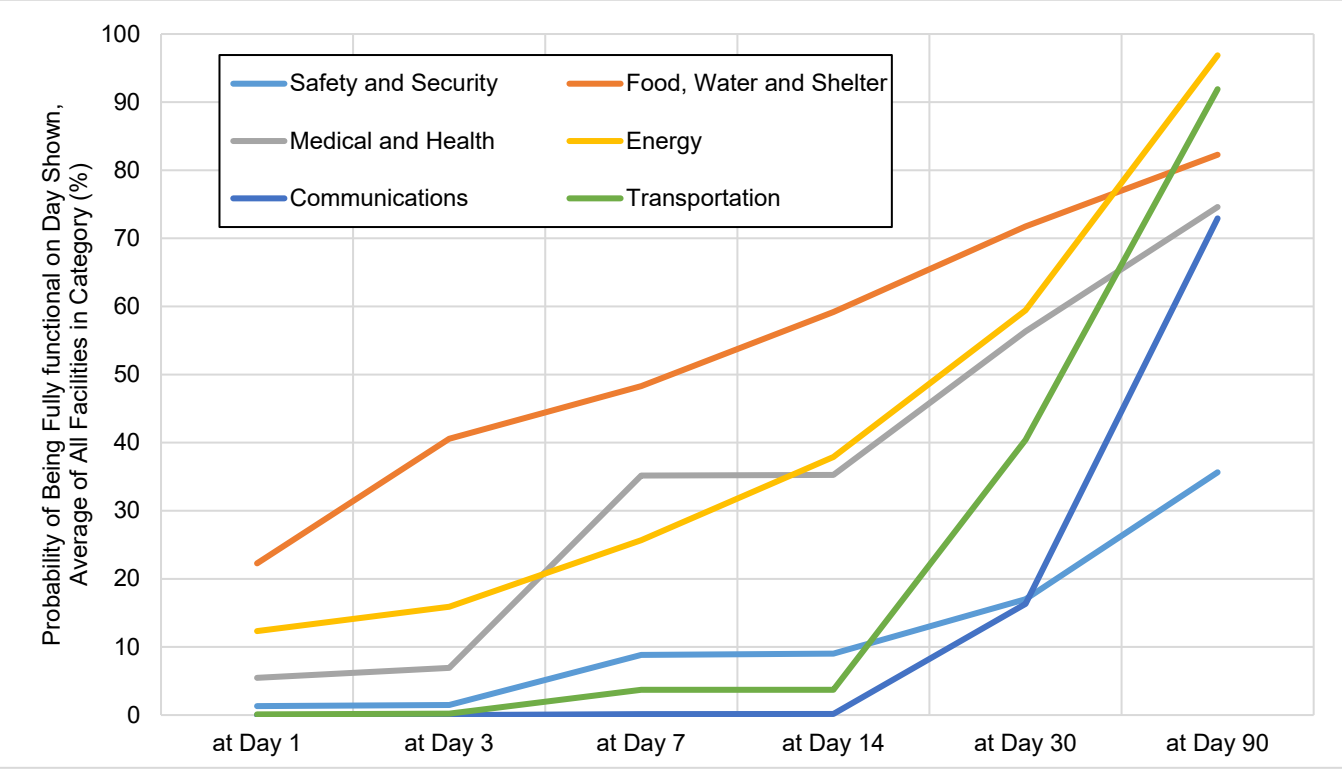


Figure 8-15. Critical Facility Functionality, Compton Fault Scenario

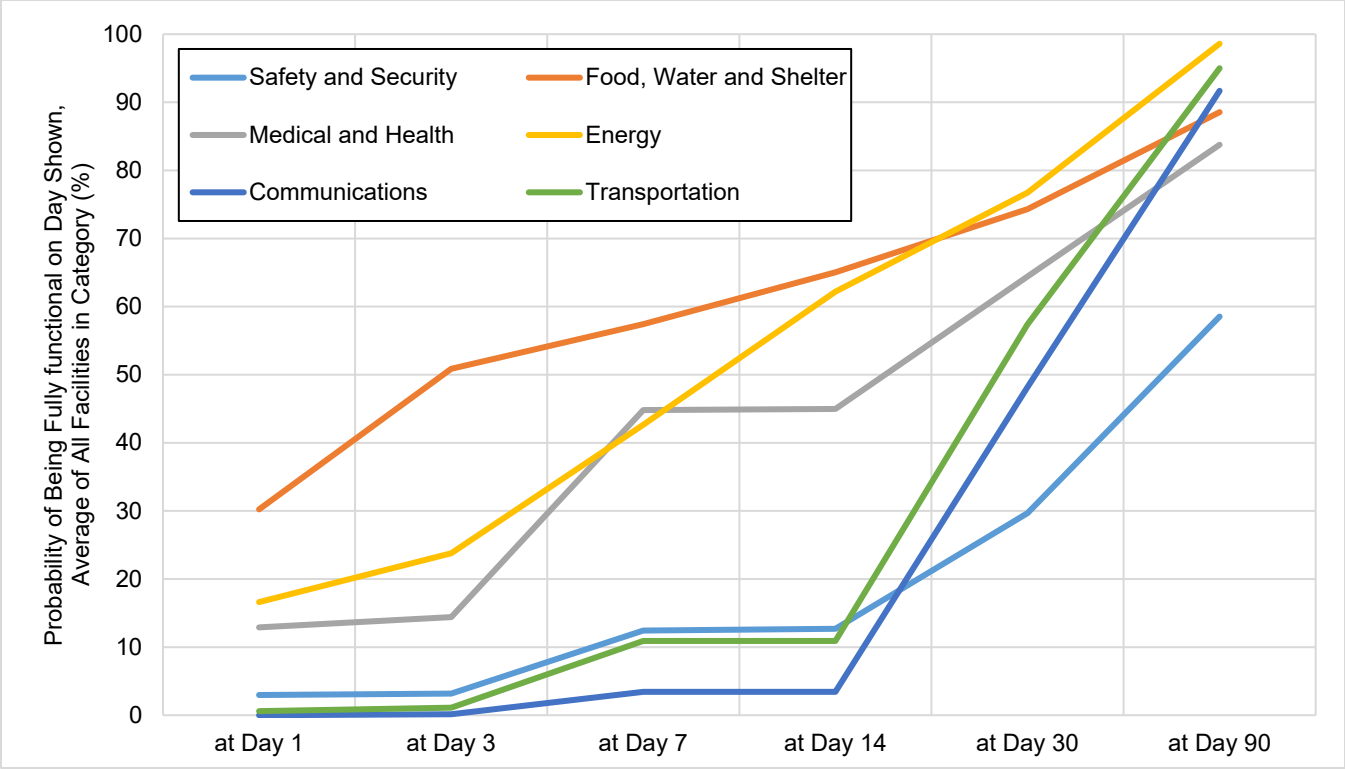


Figure 8-16. Critical Facility Functionality, Puente Hills Fault Scenario

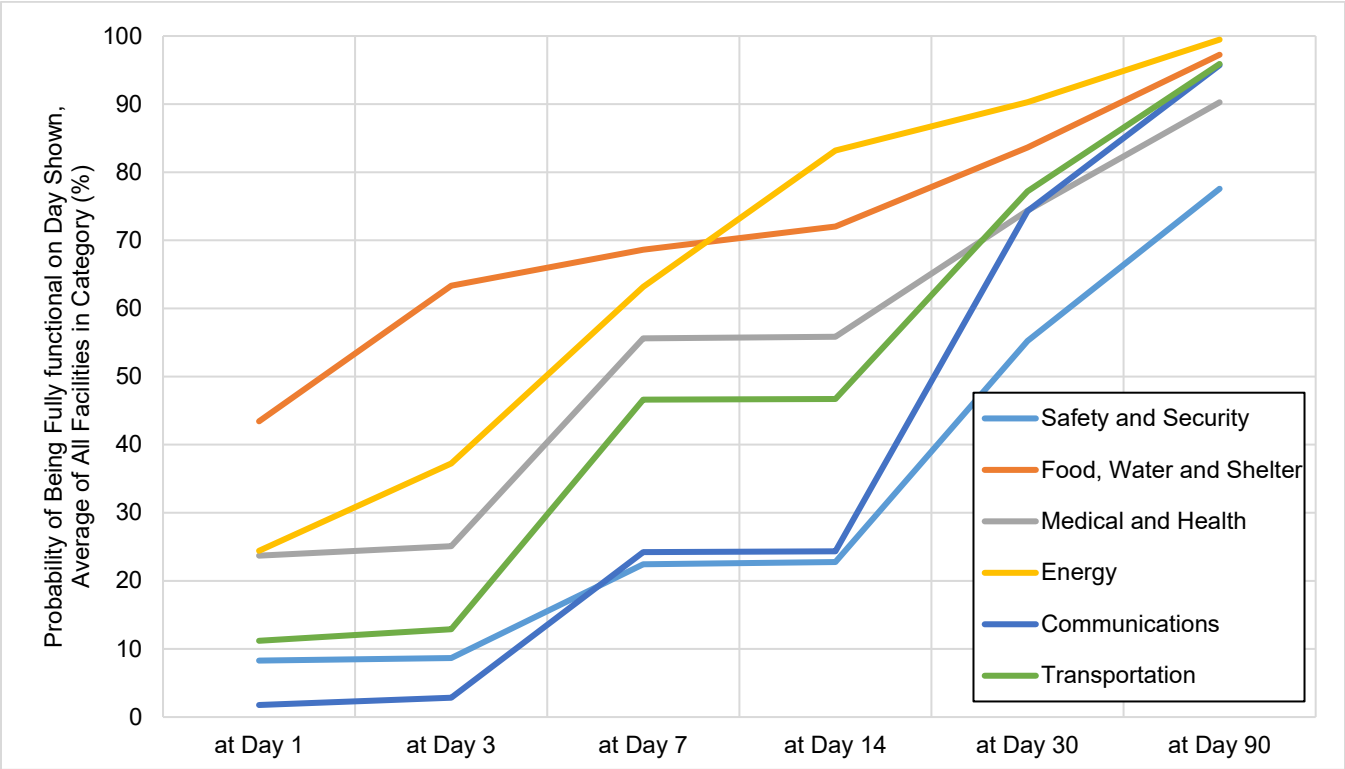


Figure 8-17. Critical Facility Functionality, Whittier Fault Scenario

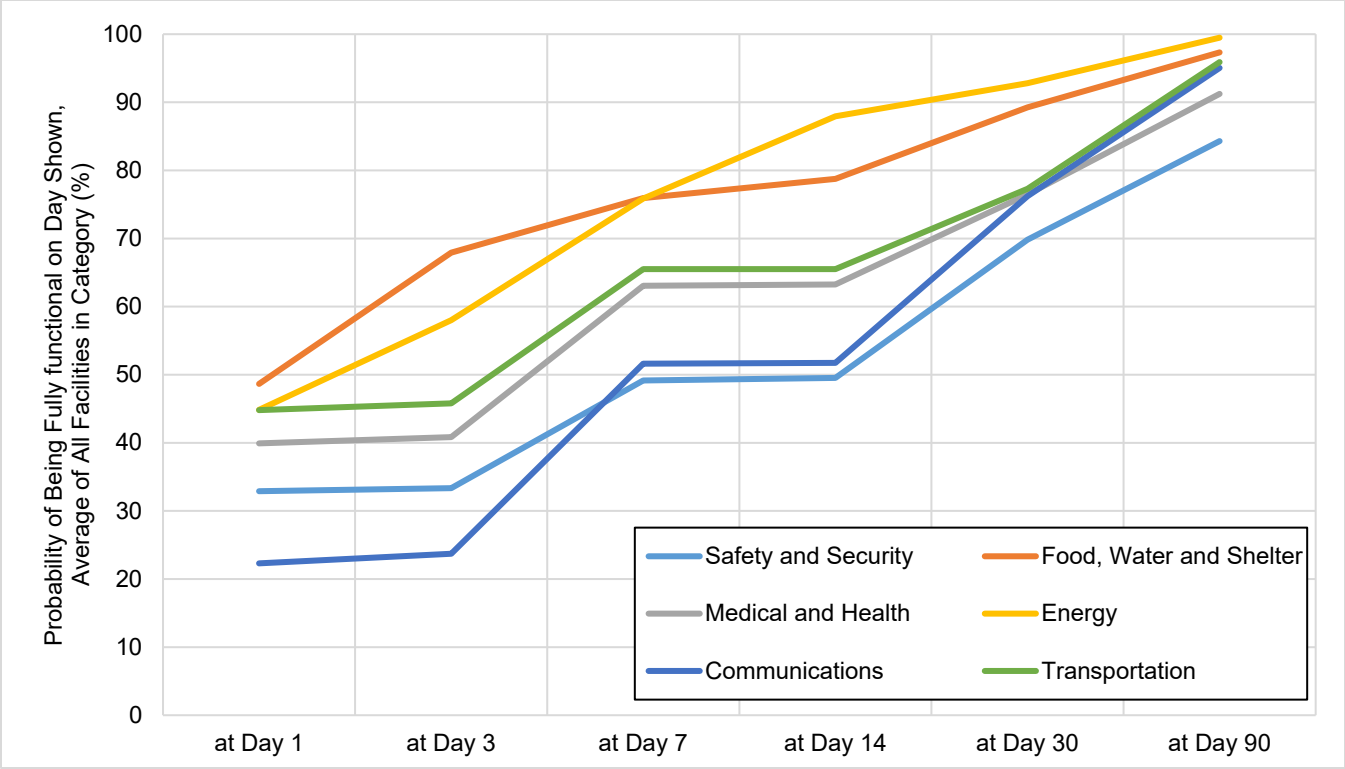


Figure 8-18. Critical Facility Functionality, 100-Year Probabilistic Earthquake

8.5 FUTURE TRENDS IN DEVELOPMENT

Since all of the planning area is located within earthquake hazard zones, all future development will, to some extent, be exposed to the earthquake hazard. The City of Norwalk will strictly enforce all seismic building codes and design standards to prevent loss of life and property from earthquakes. Public education, cooperation with the development community, and individual preparedness are essential.

The City's General Plan has policies directing land use and dealing with issues of geologic and seismic safety. This plan provides the capability to protect future development from the impacts of earthquakes. Deficiencies identified by development reviews can be identified as mitigation actions to increase the capability to deal with future trends in development.

8.6 SCENARIO

With the abundance of fault exposure in southern California, the potential scenarios for earthquake activity are many. Any earthquake above a magnitude of 5.0 or greater on faults near the planning area would have significant impacts throughout the city. With the added factor of the liquefaction potential throughout the entire city, structural failure of buildings, damage to utilities such as water pipes and wells, and sources of power are inevitable. Potential warning systems could give approximately 40 seconds notice that a major earthquake is about to occur but would not provide enough warning other than to duck, cover and hold on for personal safety.

8.7 ISSUES

Important issues associated with an earthquake include the following:

- Almost 83 percent of the planning area's building stock was built prior to 1975, when seismic provisions became uniformly applied through building code applications.
- More information is needed on the exposure and performance of soft-story construction within the planning area.
- Based on the modeling performed for this plan, some critical facilities in the planning area are expected to have complete or extensive damage from scenario events. These facilities are prime targets for structural retrofits.
- Emergency management personnel for critical facilities should create or enhance continuity of operations plans to use the information on risk and vulnerability contained in this plan.
- Geotechnical standards should be established that consider the probable impacts from earthquakes in the design and construction of new or enhanced facilities.
- The Whittier Narrows Dam would gravely affect the planning area if it were to fail as a result of an earthquake. Warning and evacuation plans and procedures should be reviewed and updated to reflect the dam's risk potential associated with earthquake activity in the region.
- A worst-case scenario would be the occurrence of a large seismic event during a flood or high-water event. Levee failures would happen at multiple locations, increasing the impacts of the individual events.

9. FLOODING

9.1 GENERAL BACKGROUND

Flooding is any overflowing of water onto land that is normally dry, due to rain, ocean waves, or the failure of a dam or levee. Floods are the most common of all weather-related natural disasters. They kill more people in the United States each year than tornadoes, hurricanes or lightning (NOAA, 2020). Areas near rivers or streams are at risk from floods during heavy rain or periods of upstream snowmelt. In urban areas, where buildings, highways, driveways, and parking lots reduce the ground's ability to absorb rainfall, the resulting increase in runoff can overwhelm constructed storm drain systems, resulting in flooding on nearby roads and buildings.

9.1.1 Floodplains

A floodplain is the area adjacent to a river, creek or lake that becomes inundated if flooding occurs. Floodplains may be broad, as when a river crosses an extensive flat landscape, or narrow, as when a river is confined in a canyon. These areas form a complex physical and biological system that not only supports a variety of natural resources but also provides natural flood and erosion control.

Ecosystems and Beneficial Functions

Floodplains can support ecosystems that are rich in plant and animal species. Wetting of the floodplain soil releases an immediate surge of nutrients: those left over from the last flood, and those that result from the rapid decomposition of organic matter that has accumulated since then. Microscopic organisms thrive and larger species enter a rapid breeding cycle. The production of nutrients peaks and falls away quickly, but the surge of new growth endures for some time. This makes floodplains valuable for agriculture. Species growing in floodplains are markedly different from those that grow outside floodplains. For instance, riparian trees (trees that grow in floodplains) tend to be very tolerant of root disturbance and very quick growing compared to non-riparian trees.

When floodwaters recede after a flood event, they leave behind layers of rock and mud. These gradually build up to create a new floor of the floodplain. Floodplains generally contain accumulations of sand, gravel, loam, silt, and/or clay, often extending below the bed of the stream. These sediments provide a natural filtering system, with water percolating back into the ground and replenishing groundwater. These are often important aquifers, the water drawn from them being filtered compared to the water in the stream. Fertile, flat reclaimed floodplain lands are commonly used for agriculture, commerce and residential development.

Effects of Human Activities

Human activities tend to concentrate in floodplains for a number of reasons: water is readily available; land is fertile and suitable for farming; transportation by water is easily accessible; and land is flatter and easier to

develop. But human activity in floodplains frequently interferes with the natural function of floodplains. When a river is separated from its floodplain with levees and other flood control facilities, natural, built-in benefits can be lost, altered, or significantly reduced. Structures can affect the distribution and timing of drainage, thereby increasing flood problems. Human development can create local flooding problems by altering or confining drainage channels. This increases flood potential in two ways: it reduces the stream's capacity to contain flows, and it increases flow rates or velocities downstream during all stages of a flood event. Human activities can interface effectively with a floodplain as long as steps are taken to mitigate the activities' adverse impacts on floodplain functions.

9.1.2 FEMA Regulatory Flood Zones and Flood Maps

The frequency and severity of flooding for river systems are based on "discharge probability." The discharge probability is the probability that a certain river discharge (flow) level will be equaled or exceeded in a given year. Flood studies use historical records to determine the probability of occurrence for different discharge levels. These measurements reflect statistical averages only; it is possible for multiple floods with a low probability of occurrence (such as a 1-percent-annual-chance flood) to occur in a short time period. A singe flood event can have flows at different points on a river or stream that correspond to different probabilities of occurrence.

The extent of flooding associated with a 1-percent annual probability of occurrence (the base flood or 100-year flood) is used as a regulatory boundary by many agencies. Also referred to as the special flood hazard area (SFHA), this boundary is a convenient tool for assessing vulnerability and risk in flood-prone communities. Many communities have maps that show the extent and likely depth of flooding for the base flood. Corresponding water-surface elevations describe the elevation of water that will result from a given discharge level, which is one of the most important factors used in estimating flood damage. SFHAs are areas where floodplain management regulations outlined in the National Flood Insurance Program (NFIP) must be enforced, and where mandatory purchase of flood insurance applies. A structure within an SFHA has a 26-percent chance of undergoing flood damage during the term of a 30-year mortgage.

FEMA defines flood hazard areas as areas expected to be inundated by a flood of a given magnitude. These areas are determined via statistical analyses of river flows, storm tides, and rainfall; information from consultation with the community; floodplain topographic surveys; and hydrologic and hydraulic analyses. Flood hazard areas are delineated on DFIRMs (Digital Flood Insurance Rate Maps), which provide the following information:

- Locations of specific properties in relation to special flood hazard areas
- Base flood elevations (1-percent-annual-chance) at specific sites
- Magnitudes of flood in specific areas
- Undeveloped coastal barriers where flood insurance is not available
- Regulatory floodways and floodplain boundaries (1-percent and 0.2-percent-annual-chance floodplains)

DFIRMs depict the following SFHAs and other areas:

- **Zone A (Also known as Unnumbered A-zones)**—SFHAs where no base flood elevations or depths are shown because detailed hydraulic analyses have not been performed.
- **Zones A1-30 and AE—**SFHAs that are subject to inundation by the base flood, determined using detailed hydraulic analysis. Base flood elevations are shown within these zones.

- **Zone AH—**SFHAs that are subject to shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
- **Zone AO—**SFHAs subject to inundation by types of shallow flooding where average depths are between 1 and 3 feet. These are normally areas prone to shallow sheet flow flooding on sloping terrain.
- **Zone AR—**Areas with a temporarily increased flood risk due to the building or restoration of flood control system (such as a levee or a dam). Mandatory flood insurance purchase requirements apply, but rates do not exceed the rates for unnumbered A zones if the structure is built or restored in compliance with Zone AR floodplain management regulations.
- **Zone A99—**Areas with a 1 percent annual chance of flooding that will be protected by a federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones.
- **Zone B and X (shaded)—**Zones where the land elevation has been determined to be above the base flood elevation, but below the 500-year flood elevation. These zones are not SFHAs.
- **Zones C and X (unshaded)—**Zones where the land elevation has been determined to be above both the base flood elevation and the 500-year flood elevation. These zones are not SFHAs.

The FEMA designated floodway is the channel of a water course and portion of the adjacent floodplain that is needed to convey the base flood without increasing flood levels by more than a specified amount (typically, 1 foot). A floodway may be designated within the SFHA where the deepest, highest velocity flow is expected, and any infrastructure will be at risk. Floodways should be kept free of obstructions and development to allow floodwaters to move downstream unobstructed. Any development in a floodway is subject to severe damage and high risks for occupants and emergency responders.

Flood damage may occur outside of SFHAs. FEMA typically does not designate SFHAs for areas subject to flooding from local drainage problems, particularly in urban areas; drainage basins of less than 1 square mile in area; or hillside areas subject to runoff, erosion, and mudflow. FEMA does not map flooding along the length of all streams or in areas that are undeveloped.

9.1.3 Flood Control System

As the City of Norwalk began to grow rapidly in the 1940s, rainwater that was once absorbed by miles of agricultural land began to run off newly paved and developed areas, leading to an increased amount of water flowing into local rivers and creeks. The City of Norwalk today has an extensive drainage system to protect its residents and property from flood damage.

The primary agencies responsible for flood control in the City are the City of Norwalk, the Los Angeles County Flood Control District, and the U.S. Army Corps of Engineers. Each agency exercises jurisdiction over its own flood control facilities, which include open flood control channels, levee segments, flood control basins, storm drains, debris basins, detention basins and spreading grounds.

Typically, City and County storm drains are designed according to criteria identified in a design criteria manual to carry flow from design storms. The combination of storm drain pipe and street conveyance of stormwater typically strives to provide capacity for up to a 25-year storm.

Los Angeles County Drainage Area Project

In 1915, the State Legislature created the Los Angeles County Flood Control District to control floods and conserve water. Early bond issues financed construction of 14 dams in the San Gabriel Mountain, flood channel modifications, and construction of debris basins to trap sediment. In 1936, federal legislation made the Corps of Engineers a participant in Los Angeles County's flood protection program. The Corps' Los Angeles River, San Gabriel River and Ballona Creek projects included the construction of five flood storage reservoirs or basins, 24 debris basins, 95 miles of main channels, 191 miles of tributary channels and two jetties.

These two agencies are responsible for all the major flood control facilities that protect the City of Norwalk. This regional flood control system is described in the Los Angeles County Drainage Area (LACDA) study. It includes the Los Angeles River, San Gabriel River, Rio Hondo Channel and Ballona Creek. Flood control facilities in the LACDA system fall into the following general categories:

- Debris basins, found at the mouth of canyons, trap debris carried by floodwaters, leaving relatively clean water to flow unimpeded in downstream channels.
- Flood control reservoirs control and reduce stream flow so that downstream main channel capacities are not exceeded. The Corps of Engineers operates five major reservoirs:
  - Hansen Dam—25,446 acre-feet
  - Lopez Dam—441 acre-feet
  - Santa Fe Dam—30,887 acre-feet
  - Sepulveda Dam—17,425 acre-feet
  - Whittier Narrows Dam—34,947 acre-feet

  Locally operated facilities include 15 flood control and water supply reservoirs in the upper watershed areas of the LACDA basin. Combined, these local reservoirs have a maximum combined capacity of 109,146 acre-feet.

Improved channels speed the passage of flood flows through local communities and into the main stem river system. Improved tributary channels include Arroyo Seco and Compton Creek. Main channel improvements pass the controlled or partially controlled flows to the ocean. The Los Angeles River is improved along most of the reach below Sepulveda Dam; its sides and bottom are generally lined with concrete or grouted rock. Sepulveda and Hansen Dams regulate flows to the main channel of the Los Angeles River. In total, the LACDA system has over 100 miles of main stem channel, over 370 miles of tributary channels, 129 debris basins, 15 flood control and water conservation dams, and five flood control dams.

Levees

The Los Angeles County Levee 16 and the San Gabriel River/Coyote Creek 2 (SGR/CC2) levees are parts of the LACDA and consist of four levee segments (see Figure 9-1):

- Los Angeles County Levee 16 Segment
- Norwalk Channel Segment
- Coyote Creek SGR/CC2 Segment
- San Gabriel River SGR/CC2 Segment

Source: U.S. Army Corps of Engineers

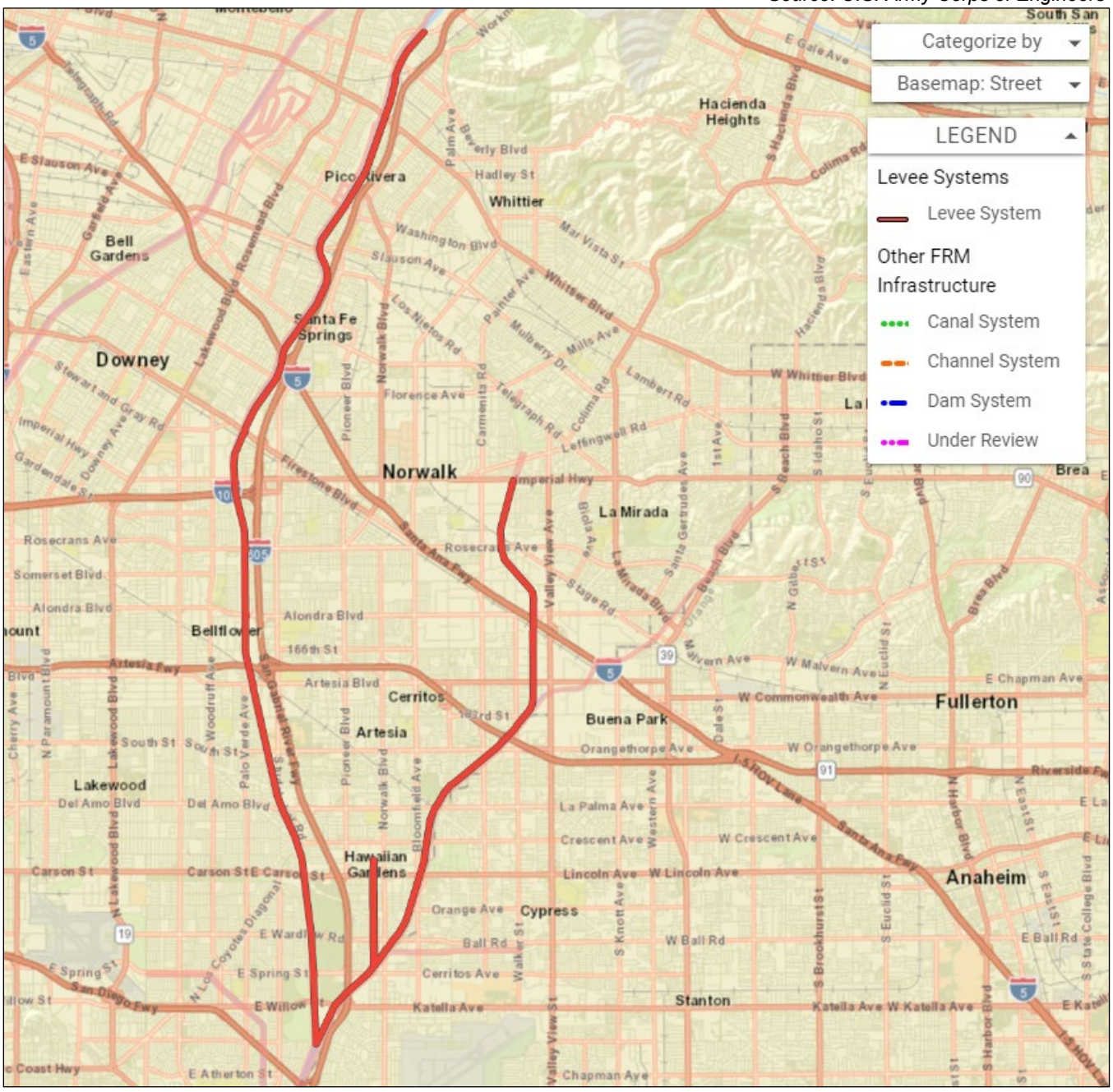


Figure 9-1. Regional Levee Locations

The Los Angeles County Department of Public Works in the local sponsor of the entire SGR/CC2 Levee System. The furthest upstream limit of the system is near San Gabriel River Parkway in the City of Pico Rivera and the downstream limit is at the confluence of the San Gabriel River with Coyote Creek near Willow Street in the City of Long Beach. The SGR/CC2 Levee System consists of an earthen levee embankment and a trapezoidal channel with either riprap, grouted stone, reinforced concrete, or shotcrete on the riverward slope. The area along the levees contains residential, commercial, industrial, and civic improvements.

The San Gabriel River SGR/CC2 Levee Segment is 84,718 feet (16.05 miles) in length. It is located in the cities of Pico Rivera, Santa Fe Springs, Downey, Norwalk, Cerritos, Bellflower, Lakewood, Los Alamitos, Long Beach, and in unincorporated areas of Los Angeles County.

Table 9-1 lists all levees shown for the planning area on the FEMA FIRM and the Corps of Engineers National Levee Database.

Table 9-1. Levees in the City of Norwalk

Levee Name	Levee Location	Responsible Organization/ Owner	Corps of Engineers Levee ID	FIRM Panels	Levee Status
Los Angeles County Levee 16	N/A	California	1904058118	N/A	Non-Accredited
San Gabriel River/Coyote Creek 2	Left Bank (San Gabriel) Right Bank (Coyote Creek)	Los Angeles County	3805010035	06059C0116J, 06037C2000F, 06059C0108J, 06059C0106J, 06037C1980F, 06037C1837F, 06037C1835F, 06037C1843F, 06037C1668F, 06037C1841F, 06037C1990F, 06059C0104J, 06037C1839F, 06037C1663F, 06037C1830F, 06059C0112J, 06037C1829F, 06037C1840F, 06037C1664F	Provisionally Accredited Levee (PAL) Sys

A periodic inspection of the San Gabriel River SGR/CC2 Levee System in November 2016 noted major deficiencies and remedial actions required for the system. The major deficiencies found included non-compliant vegetation growth, encroachments, erosion/bank caving, depressions and rutting through the access road and landward slope, animal control due to a number of burrows, riprap revetment displacement, revetments of the grouted riverward slope, missing floodwall joint material, vegetation and obstructions of the outlet/inlet, encroachments to interior drainage, damaged fencing, missing or unpermitted flap gates, broken trash rack, and settling and tilting of concrete structures. The Los Angeles District Levee Safety Officer rated the system "minimally acceptable" because the deficiencies would not prevent it from performing as intended during the next significant runoff event. Los Angeles County Department of Public Works must correct the minimally acceptable rated items within two years so that they do not deteriorate further and become unacceptable.

City Drainage System

The City of Norwalk complements the LACDA drainage system with a comprehensive network of underground pipes and open channels to prevent local flooding. These local drains collect runoff and carry it rapidly to the main stem river channels. Most of the storm drain system receives no treatment or filtering and is completely separate from Los Angeles' sewer system. Runoff drains from streets to gutters and enters the system through catch basins.

9.1.4 Secondary Hazards

The most problematic secondary hazard for flooding is bank erosion. In many cases the threat and effects of erosion are worse than actual flooding. This is especially true on the upper courses of rivers where there are steep gradients. Floodwaters in these reaches may pass quickly and without much damage, but scour the banks, edging properties closer to the floodplain or causing them to fall in. Flooding is also responsible for hazards such as landslides when high flows over-saturate soils on steep slopes, causing them to fail. Hazardous materials spills are also a secondary hazard of flooding if storage tanks rupture and spill into streams, rivers, or drainage sewers.

9.2 HAZARD PROFILE

9.2.1 Federal Flood Programs Participation

National Flood Insurance Program

The City of Norwalk participates in the National Flood Insurance Program (NFIP), has adopted regulations that meet the program's requirements, and is currently in good standing with program requirements. Within the city, 20 flood insurance policies provide $5 million in coverage at a combined annual premium of $8,133. FEMA statistics show 3 claims have been paid on these policies, for a total of $13,337, an average of $4,446 per claim.

The City entered the NFIP on February 19, 1979; its first Flood Insurance Rate Map (FIRM) was issued September 26, 2008. Structures permitted or built in the City before then are called "pre-FIRM" structures, and structures built afterwards are called "post-FIRM." Post-FIRM structures are eligible for reduced flood insurance rates. Such structures are less vulnerable to flooding since they were constructed after regulations and codes were adopted to decrease vulnerability. Pre-FIRM structures are more vulnerable to flooding because they do not meet code or are located in hazardous areas. A detailed flood insurance study for the areas subject to flooding was originally completed in 2008. There are no depths or base flood elevations determined within Norwalk, so the current effective date for the FIRM is listed as M (No Elevation Determined – All Zone A, C and X).

The Community Rating System

The City of Norwalk does not participate in the Community Rating System (CRS). If the City did participate, residents could receive discounts on their flood insurance.

Repetitive Loss

A repetitive loss property is defined by FEMA as an NFIP-insured property that has experienced any of the following since 1978, regardless of any changes in ownership:

- Four or more paid losses in excess of $1,000
- Two paid losses in excess of $1,000 within any rolling 10-year period
- Three or more paid losses that equal or exceed the current value of the insured property

The government has instituted programs encouraging communities to identify and mitigate the causes of repetitive losses. Studies have found that many of these properties are outside any mapped 1 percent annual chance (100-year) floodplain. The key identifiers for repetitive loss properties are the existence of flood insurance policies and claims paid by the policies.

According to FEMA Region IX, the City of Norwalk currently has no identified repetitive loss properties.

9.2.2 Flood Types and Areas in City of Norwalk

In southern California, most flooding is the result of heavy precipitation over several days. Short streams and steep watersheds emptying onto lowlands in heavily populated areas may produce large volumes of water in short periods, and damage can be severe. There are no identified SFHAs within the City of Norwalk. The following sections describe the primary flood types and flood hazard areas in the city.

Shaded X Zones

Norwalk has an abundance of shaded X zones (between the limits of the base flood and the 0.2 percent annual chance flood boundaries). While there is risk associated with this area, it is not subject to regulation pursuant to the requirements of the NFIP.

Areas With Reduced Flood Risk Due to Levees

FEMA can accredit levee systems that meet the certification requirements specified under 44 CFR, Section 65.10. These are areas that are considered to have reduced flood risk due the presence of an accredited levee. FEMA's National Flood Hazard Layer (https://www.fema.gov/flood-maps/national-flood-hazard-layer) shows these areas as Zone X. Federal flood insurance is available through the NFIP's lower-cost Preferred Risk Policy. While not federally required by lenders, it is strongly recommended, as there is still a risk. Heavy rains can cause flooding behind a levee, or overtopping could occur from a storm event larger than what the levee was built for.

Non-SFHA Shallow Flooding Areas

Although the City is somewhat flat, shallow flooding has occurred. Such flooding may be caused by clogged or undersized drains, catch basins or water courses, or poor surface drainage patterns on streets or property.

Flash Flooding

Flash flooding is characterized by a quick rise and fall of water level. Flash floods generally result from intense storms dropping large amounts of rain within a short period of time onto watersheds that cannot absorb or slow the flow. Natural terrain and vegetation help to reduce the potential for flash floods, but Norwalk is primarily urban developed land, aside from parks and recreational areas.

System-Failure-Related Flood Hazard Areas

Power-Failure-Induced Flooding Areas

Power-failure-induced flooding would result from a loss of power at the City's 10 stormwater pump stations and three booster pump stations that drain low-lying areas. The Utility Programs Division oversees Stormwater Management. Most of the pumping plants have permanent backup power generators installed. For pumping plants that do not have permanent backup generators, portable generators located at the nearest District yards can be brought into service rapidly.

Levee Failures

Levees are a basic means of providing flood protection along waterways. Levees confine floodwaters to a main river channel, and their failure can lead to inundation of surrounding areas. Levees can fail due to structural failures, foundation failures of underlying soils, or overtopping by flood flows. Contributing factors include poor construction materials, seepage through or under the levee, burrowing rodents, and improper repairs. Seismic activity can impact levees as well, especially those constructed on the soft soils that are typical in floodplains. Lack of adequate and regular maintenance to correct these problems may contribute to failure of a levee. Most failures result from several of these factors. Levees in the planning area are described in Section 9.1.3.

9.2.3 Principal Flooding Sources

The City of Norwalk lies within the Colorado Lagoon-Frontal Alamitos Bay Watershed, the Lower Los Angeles River Watershed and the Lower San Gabriel River Watershed.

The Lower San Gabriel River Watershed covers the cities of Norwalk, Artesia, Bellflower, Cerritos, Diamond Bar, Downey, Hawaiian Gardens, La Mirada, Lakewood, Long Beach, Norwalk, Pico, Rivera, Santa Fe Springs, and Whittier, all within the Los Angeles County Flood Control District. The San Gabriel River receives drainage from 689 square miles of eastern Los Angeles County in the San Gabriel Mountains. The watershed consists of extensive areas of vegetation along the banks of the river and woodland habitats in its upper reaches. Much of the watershed of the West Fork and East Fork of the river is set aside as wilderness area; other areas in the upper watershed see heavy recreational use. The upper watershed contains a series of flood control dams. Further downstream, toward the middle of the watershed, are large spreading grounds used for groundwater recharge.

The watershed is hydraulically connected to the Los Angeles River through the Whittier Narrows Reservoir (normally only during high storm flows). The lower part of the river flows through a concrete-lined channel in a heavily urbanized portion of the county before becoming a soft bottom channel once again near the ocean in the City of Long Beach.

Land use in the watershed is diverse and ranges from open space in the upper watershed to urban land uses in the middle and lower parts of the watershed as seen in Figure 9-2. Large power poles line the river along the channelized portion; nurseries, stable areas, and storage facilities are in these areas (State Water Resources Control Board, 2021).

9.2.4 Past Events

The County of Los Angeles and the communities within the county have experienced 15 flooding events since 1969 for which federal disaster declarations were issued, as summarized in Table 9-2. Many flood events do not trigger federal disaster declaration protocol but have significant impacts on their communities. The sections below describe significant flood events in the County of Los Angeles.

January 2, 2018, Wildfires, Flooding, Mud/Debris Flows

A series of storms caused flooding, mud flows and debris flow after the 2017 wildfires had severely burned areas within the counties of Los Angeles, San Diego, Santa Barbara, and Ventura counties.

January 18 – 23, 2017, Winter Storms

A series of storms affected Southern California, including one that dropped nearly 2.5 inches of rain in 3 hours. It caused roads to be flooded, homes to be threatened by mudslides, and traffic to become clogged on many freeways and surface streets. According to the Los Angeles Department of Water and Power, at least 10,000 customers were without power.

January 18 – 22, 2010, Winter Storms

A series of storms brought heavy rain, gusty winds and flash flooding to Southern California. Rainfall totals ranged from 4 to 8 inches over coastal areas. Water was chest high in places, which stranded many vehicles and flooded numerous businesses.

Source: State Water Resources Control Board, 2021

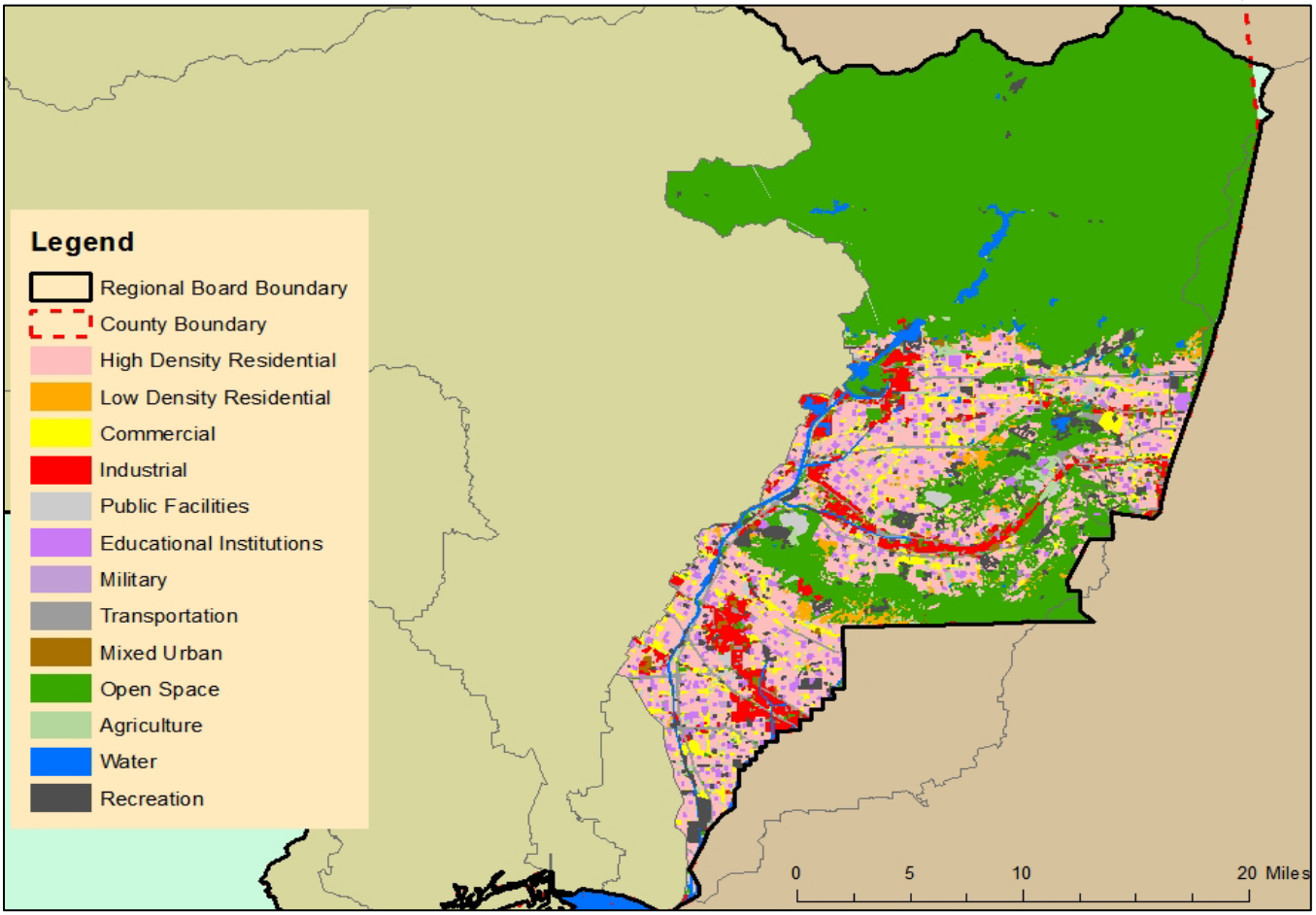


Figure 9-2. Land Use in the San Gabriel River Watershed

Table 9-2. History of Flood Incidents

Date	Declaration #	Type of event
12/04/2017 – 1/31/ 2018	DR-4353	Wildfires, flooding, mudflows, debris flow
1/18 – 1/23/2017	DR-4305	Severe winter storms, flooding, and mudslides
1/17 – 2/6/2010	DR-1884	Severe winter storms, flooding, and debris and mud flows
2/16 – 23/2005	DR-1585	Severe storms, flooding, landslides, and mud and debris flows
12/27/2004 – 1/11/2005	DR-1577	Severe storms, flooding, debris flows, and mudslides
2/2 – 4/30/1998	DR-1203	Severe winter storms, and flooding
2/13 – 4/19/1995	DR-1046	Severe winter storms, flooding landslides, mud flow
1/3 – 2/10/1995	DR-1044	Severe winter storms, flooding, landslides, mud flows
1/5 – 3/20/1993	DR-979	Severe winter storm, mud and landslides, and flooding
2/10-18/1992	DR-935	Rain/snow/wind storms, flooding, mudslides
1/17-22/1988	DR-812	Severe storms, high tides and flooding
1/21 – 3/30/1983	DR-677	Coastal storms, floods, slides and tornadoes
1/8/1980	DR-615	Severe storms, mudslides and flooding
2/15/1978	DR-547	Coastal storms, mudslides and flooding
1/26/1969	DR-253	Severe storms and flooding

Source: FEMA, 2021a

2004 – 2005 Flooding Events

National Weather Service records show a total of 37.25 inches of rain in Los Angeles County in the downtown area during the winter of 2004/2005—the second highest recorded seasonal rainfall (the highest was 38.18 inches in 1883-1884). FEMA records indicate over 70 flood insurance claims were filed by owners of structures. The storms of January 7 – 11, 2005 and February 17 – 23, 2005 prompted state and federal disaster declarations, with flooding throughout southern California. Widespread mud and debris flows, rockslides, and small stream and urban flooding caused considerable damage to roads and homes. According to local newspaper accounts, nine people died, including two deaths caused by mud and rockslides.

9.2.5 Location

The December 21, 2018, Los Angeles County Digital Flood Insurance Rate Map (DFIRM) is FEMA's official delineation of SFHAs in the vicinity of the City of Norwalk. There are no identified SFHAs for the city on this mapping. FEMA has delineated "areas with reduced flood risk due to levees" (X-zones) for the City as part of the National Flood Hazard Layer (see Figure 9-3).

These are considered to be "awareness" zones that depict the "residual risk" associated with the levee systems. Residual risk is the risk that remains after controls are accounted for. The protection level for any flood control facility is based on its design level of protection. A facility with 100-year design effectiveness loses that effectiveness for events with greater than a 100-year probability. This is residual risk.

The mapped areas with reduced flood risk due to levees are the basis for the flood exposure and vulnerability analyses in this hazard mitigation plan. This hazard area represents the best data available at the time of this analysis but is not representative of all identified sources of flood risk in Norwalk. Extent and location mapping are not currently available for all flood hazard areas identified.

9.2.6 Frequency

Records of past flooding specific to the City of Norwalk were not available to support this assessment. However, significant flood events occurred in Los Angeles County in 1914, 1916, 1927, 1934, 1938, 1941, 1943, 1952, 1956, 1966, 1969, 1978, 1980, 1983, 1993, 1995, 1998, 2005, 2010, and 2017. Each of these events was likely to have impacted the City of Norwalk to some degree. Large floods occur every 5 to 6 years in Los Angeles County.

Flood frequency is often evaluated by examining peak discharges. There is no discharge data for flooding sources in the planning area, but upstream discharges could impact the City. According to FEMA's December 21, 2018, Flood Insurance Study, the San Gabriel river peak flow with a 1-percent annual chance at the Whittier Narrows Flood Control Basin at Siphon Road is 90,000 cubic feet per second. The USGS reported a maximum observed daily flow of 21,200 cubic feet per second at the Rio Hondo Bl/Whittier Narrows Dam gauge on October 1, 1966.

9.2.7 Severity

Flooding in Norwalk has the potential for significant damage, especially as development in the floodplain has increased dramatically. The principal factors affecting flood damage are flood depth and velocity. The deeper and faster flood flows become, the more damage they can cause. Shallow flooding with high velocities can cause as much damage as deep flooding with slow velocity. This is especially true when a channel migrates over a broad floodplain, redirecting high-velocity flows and transporting debris and sediment. Table 9-3 summarizes impacts and estimated costs of recent federally declared flood disasters in Los Angeles County.

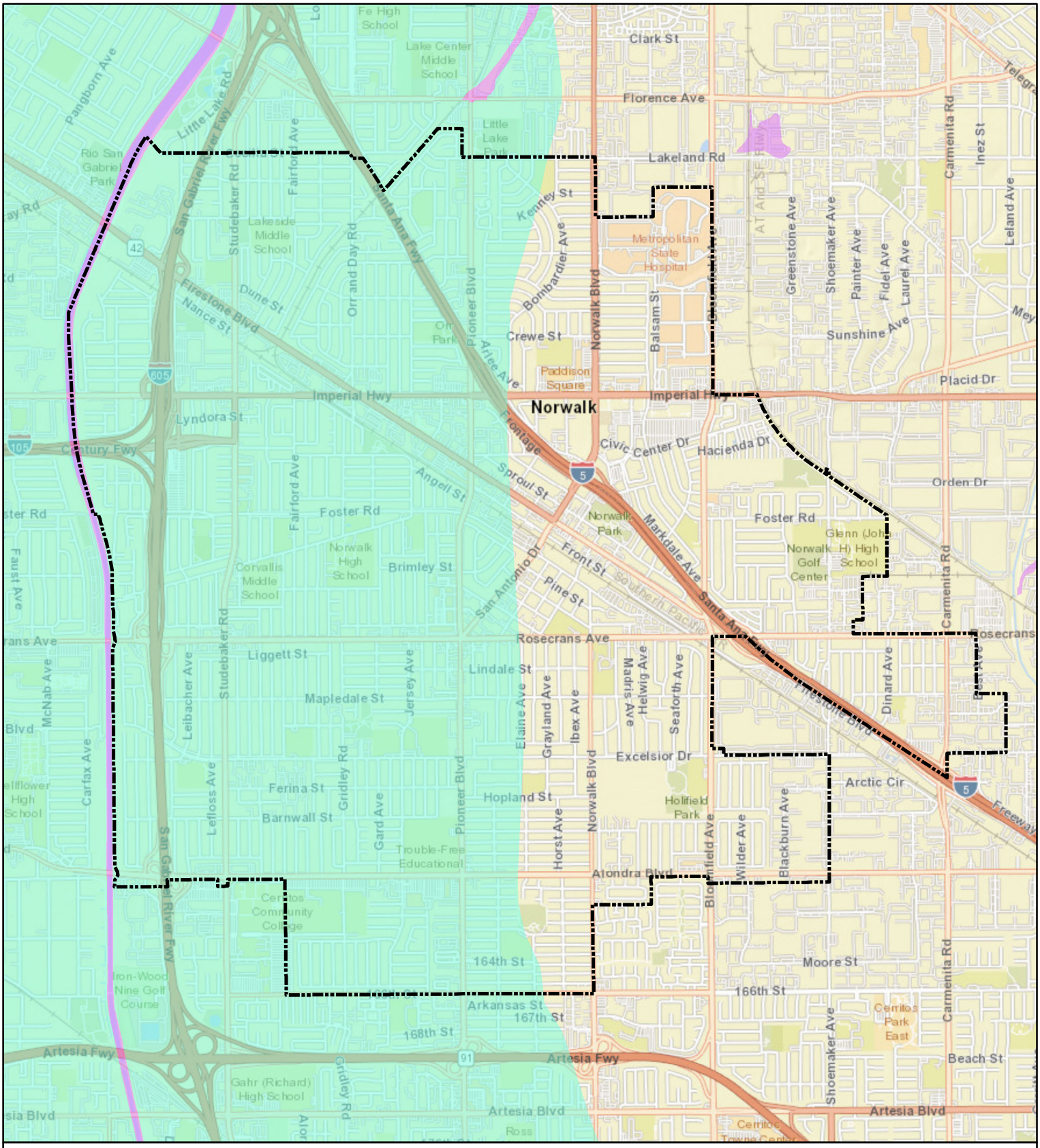


Figure 9-3. Areas of Reduced Flood Risk Due to Levees

Reduced Risk Due To Levee

1% Annual Chance Flood (100-year)

City Boundary

N

0 0.4 0.8 Miles

Data Sources: Esri, City of Norwalk, FEMA

Table 9-3. Estimated Losses from Recent Disaster-Declared Floods Impacting Los Angeles County

Incident Period	Financial Assistance Received[a]	Damage
December 4, 2017-January 31, 2018	$5.1 million Individual Assistance	• 1,004 residences destroyed • 55 residences suffered major damage • 51 residences suffered minor damage • 206 additional residences were affected
January 18-January 23, 2017	$113 million Public Assistance	• Damage to roads and bridges • 10,000 residents without power
January 17-February 6, 2010	$50.6 million Public Assistance	• Businesses flooded • Vehicles stranded • Large amount of debris removal needed
December 27, 2005-January 11, 2006	$218.9 million Individual and Public Assistance	• Roads and structures damaged by mud, rockslides, flooding • 70 residential insurance claims filed • 9 storm-related deaths

a. Dollar amounts in the year of occurrence and for all areas affected

9.2.8 Warning Time

Due to the sequential pattern of meteorological conditions needed to cause serious flooding, it is unusual for a flood to occur without warning. Warning times for floods can be between 24 and 48 hours. Flash flooding can be less predictable, but potential hazard areas can be warned in advanced of potential flash flooding danger.

Each watershed has unique qualities that affect its response to rainfall. A hydrograph, which is a graph showing stream flow in relation to time, is a useful tool for examining a stream's response to rainfall. Once rainfall starts falling over a watershed, runoff begins, and the stream begins to rise. Water depth in the stream channel (stage of flow) will continue to rise in response to runoff even after rainfall ends. Eventually, the runoff will reach a peak and the stage of flow will crest. It is at this point that the stream stage will remain the most stable, exhibiting little change over time until it begins to fall and eventually subside to a level below flooding stage.

The potential warning time a community has to respond to a flooding threat is a function of the time between the first rainfall and the first occurrence of flooding. The time it takes to recognize a flooding threat reduces the potential warning time to the time that a community has to take actions to protect lives and property. Another element that characterizes a community's flood threat is the length of time floodwaters remain above flood stage.

The Los Angeles County flood threat system consists of a network of precipitation gages stream gages at strategic locations in the county that constantly monitor and report stream levels (see Figure 9-4). This information is provided to the National Weather Service (NWS) and National Oceanic and Atmospheric Administration. In addition to this program, data and flood warning information is provided by the NWS.

Wireless Emergency Alerts from NWS are notices about potentially hazardous weather that are sent out to all compatible cell phones in affected areas. All of this information is analyzed to evaluate the flood threat and possible evacuation needs. Figure 9-4 shows stream gage locations for Los Angeles County, as provided in the 2017-2018 Hydrologic Report.

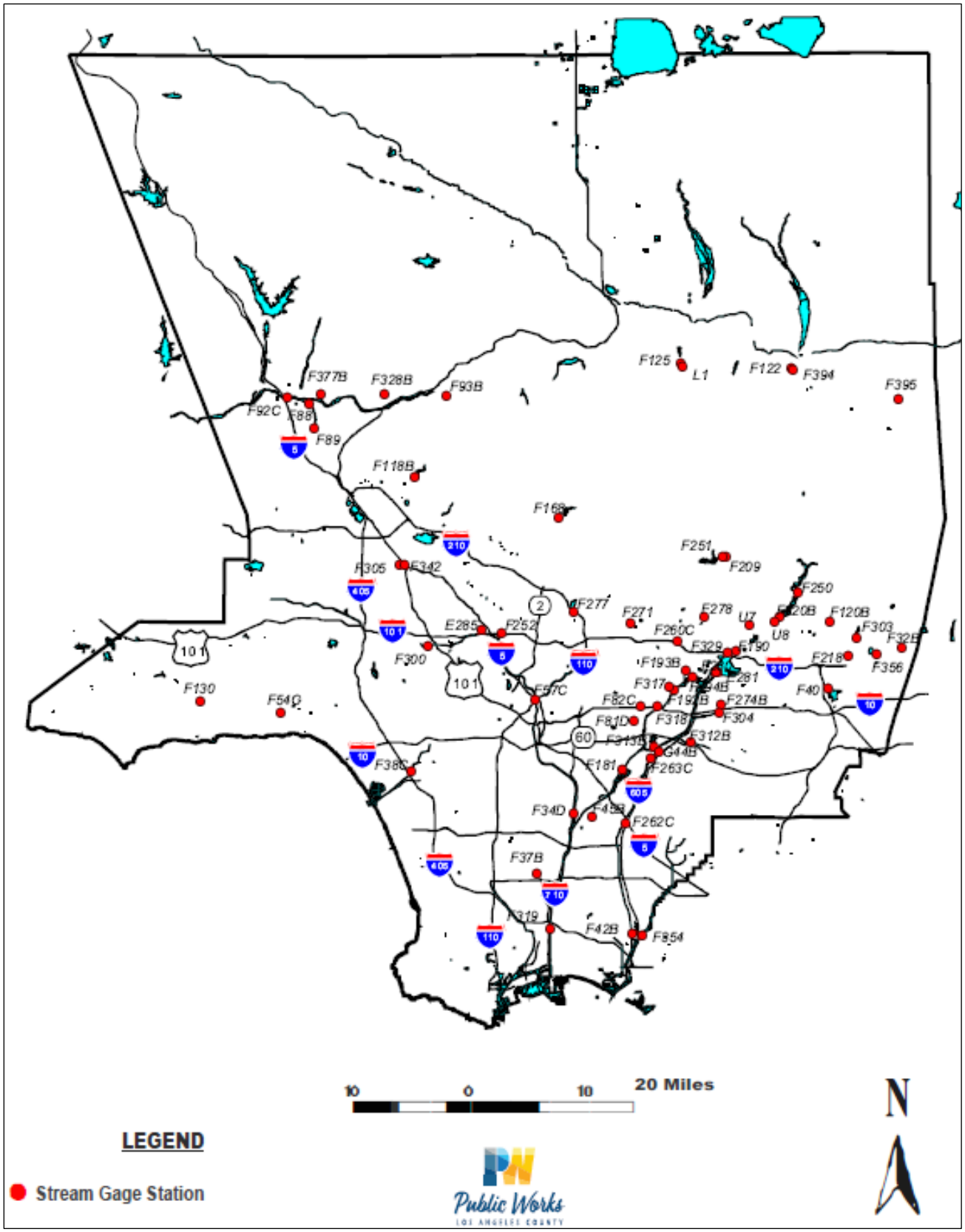


Figure 9-4. Stream Gage Locations in Los Angeles County

The NWS issues watches, and warnings as follows when forecasts indicate rivers may approach bank-full levels:

- Minor Flooding—Minimal or no property damage, but possibly some public threat or inconvenience.
- Moderate Flooding—Some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary.
- Major Flooding—Extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.

When a watch is issued, the public should prepare for the possibility of a flood. When a warning is issued, the public is advised to stay tuned to a local radio station for further information and be prepared to take quick action if needed. A warning means a flood is imminent, generally within 12 hours, or is occurring. Local media broadcast NWS warnings.

9.3 EXPOSURE

The "areas of reduced flood risk due to levees" mapping is the best available data of flood risk for the City of Norwalk to support this flood hazard risk assessment. This data was used to perform the exposure analysis. Results are summarized in the following sections

9.3.1 Population and Property

Table 9-4 summarizes the estimated population living in the evaluated flood hazard area and the estimated property exposure. The distribution of exposed structures by use category is shown in Figure 9-5.

Table 9-4. Exposed Population and Property in Evaluated Flood Hazard Area

Population	
Population Exposed	66,268
% of Total Planning Area Population	62.78
Property	
Inundated area (acres)	5,532
Number of Buildings Exposed	14,902
Value of Exposed Structures	$5,023,751,800
Value of Exposed Contents	$3,398,478,237
Total Exposed Property Value	**$8,422,230,037**
Total Exposed Value as % of Planning Area Total	55

9.3.2 Critical Facilities

Critical facilities exposed to the flood hazard represent 66 percent (72 facilities) of the 109 total critical facilities in the planning area. The breakdown of exposure by facility type is shown in Figure 9-6.

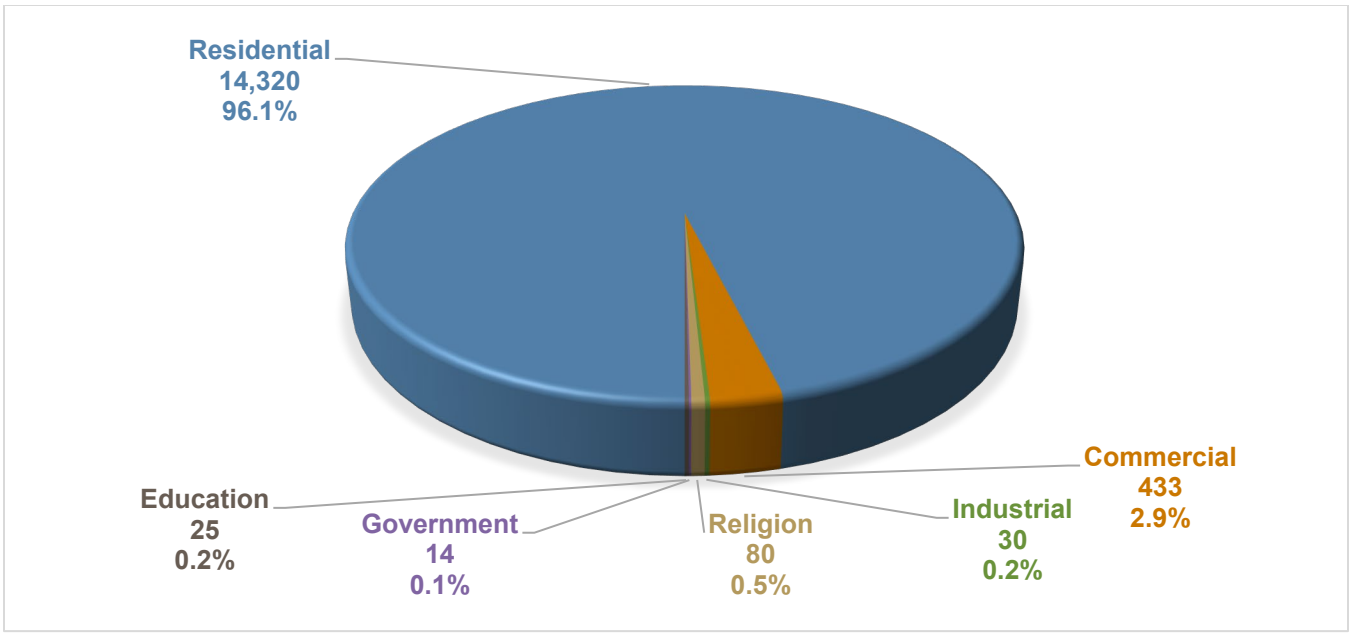


Figure 9-5. Distribution of Exposed Structures in the Flood Hazard Area by Occupancy Class

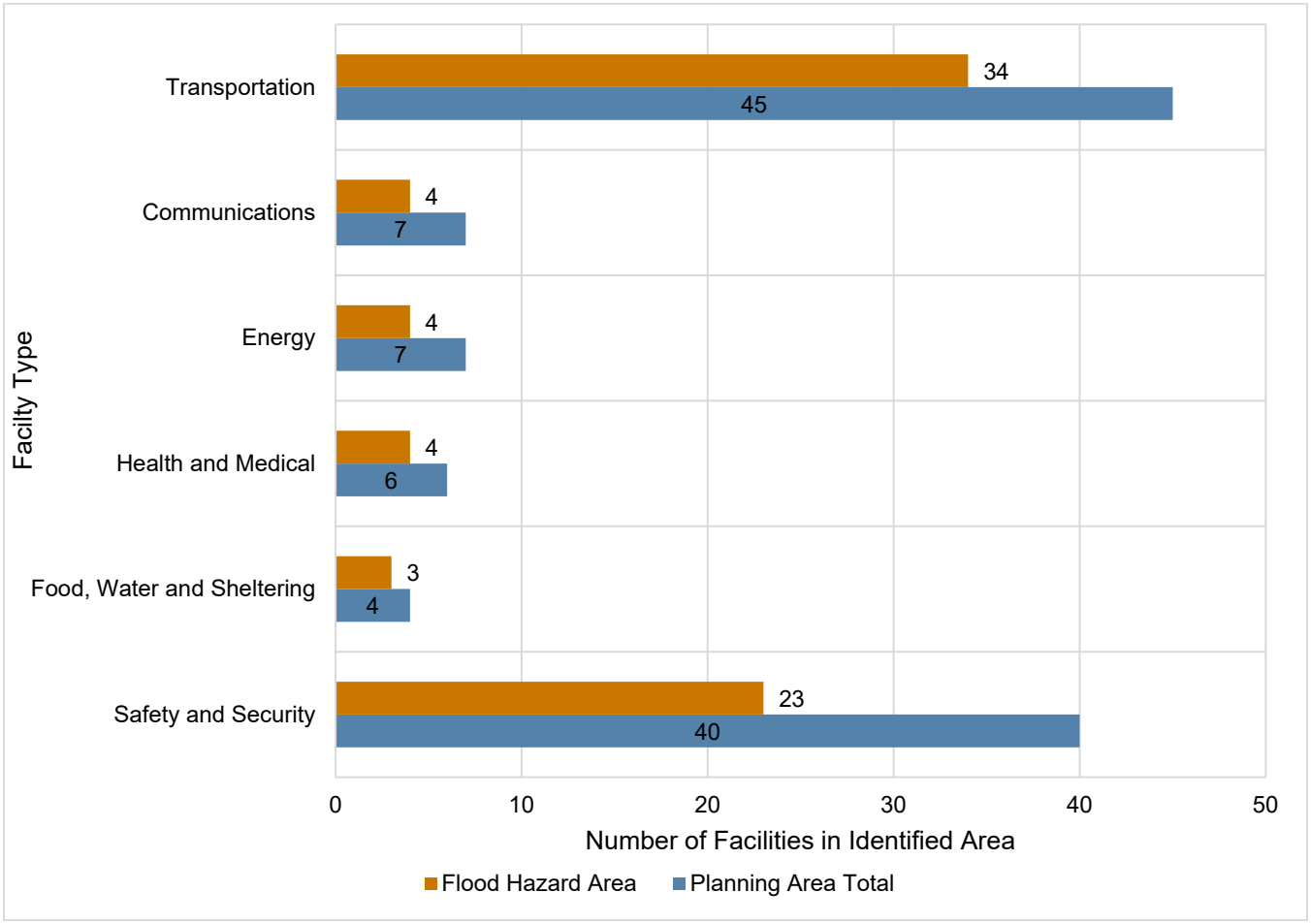


Figure 9-6. Critical Facilities in Mapped Flood Hazard Areas and Citywide

The following main arterial roads in the planning area pass through the assessed flood hazard area and are exposed to flooding:

- North—South Arterials
  - Interstate 605
  - Studebaker Rd.
  - Pioneer Blvd
  - San Antonio Dr.
- East—West Arterials
  - Rosecrans Ave.
  - Alondra Blvd.
  - Excelsior Dr.
  - Belcher St.

Some or parts of these roads may be above the flood level; still, in severe flood events these roads may be blocked or damaged, preventing access to some areas.

9.3.3 Environment

Parks and open spaces are considered to be wise uses within designated flood hazards areas. The following parks and open spaces are within the assessed flood hazard area:

- Gerdes Park
- Glazier Park
- Hermosillo Park
- Lakeside Park
- New River Park
- Robert White Park
- Sara Mendez Park
- Vista Verde Park

9.4 VULNERABILITY

9.4.1 Population

Estimated impacts of flooding on people in the flood zone were not modeled using damage functions, because the flood probability in the mapped hazard area is very low. However, social vulnerability in the flood hazard area was assessed. Socially vulnerable populations include the elderly and young, who may be unable to get themselves out of the flood zone, as well as low-income populations who may lack resources to be informed about a flood or to evacuate quickly.

Socially vulnerable populations exposed to the flood hazard were estimated based on data for the Census-defined blocks that lie at least partially within the mapped flood hazard area. Because many of those Census blocks extend outside the flood zone, the estimates are greater than the actual exposed populations, but they provide reasonable relative data for use in mitigation planning. Table 9-5 summarizes the results.

Table 9-5. Estimated Flood Vulnerability of Persons and Households

	Number[a]	% of Total in Hazard Area
Exposed Population by Age		
Over 65 Years	7,063	10.2%
Under 16	19,010	27.4%
Exposed Number of Households by Income		
Households with Income Below $60,000 (very low income[b])	8,961	49.5%
Totals Used for Calculating Percentages[a]		
Population	69,478	
Households	18,118	

a. Note that the methodology used for this analysis overestimates exposed population and households. Results presented in this table should be used to evaluate relative exposure between groups rather than absolute numbers of exposed persons or households.
b. See Section 3.7.1 for a discussion of "very low income" as used in this risk assessment.

Disasters in general also disproportionately affect individuals with disabilities, seniors, children, those with limited English proficiency, and those with limited transportation options. These people will need assistance such as alerting and warning in their native language, evacuation assistance, or sheltering that meets the individual needs of each person. Estimates for key populations of these groups in the overall Norwalk planning area are as follows:

- 67 percent of the population live in a home where a language other than English is spoken
- 6.5 percent of the population have a disability
- 10.6 percent of the population do not have health insurance

9.4.2 Property

Loss estimations for the assessed flood hazard area are not based on modeling utilizing damage functions, because the flood probability in the mapped hazard area is very low. Instead, loss estimates were developed representing 1 percent, 10 percent, 30 percent, and 50 percent of the replacement value of exposed structures. This allows emergency managers to select a range of economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 9-6 shows potential losses in the areas with the highest degree of flood susceptibility.

Table 9-6. Loss Estimation for the Assessed Flood Hazard Area

	Exposed Value	Loss Value	Loss as % of Total Planning Area Replacement Value
Loss = 1% of Exposed Value	$8.4 Billion	$84,222,300	0.55%
Loss = 10% of Exposed Value		$842,223,004	5.50%
Loss = 30% of Exposed Value		$2,526,669,011	16.50%
Loss = 50% of Exposed Value		$4,211,115,019	27.50%

9.4.3 Critical Facilities

Specific vulnerabilities of critical facilities to flooding have been identified as follows:

- Roads that are blocked or damaged can isolate residents and prevent access throughout the planning area, including for emergency service providers needing to get to vulnerable populations or to make repairs.
- Bridges washed out or blocked by floods or debris also can cause isolation.
- Underground utilities can be damaged.
- Levees can fail or be overtopped, inundating the land that they protect.
- Floodwaters can back up drainage systems, causing localized urban flooding.
- Culverts can be blocked by debris from flood events, also causing localized urban flooding.
- Floodwaters can get into drinking water supplies, causing contamination.
- Sewer systems can be backed up, causing wastewater to spill into homes, neighborhoods, or streams.

9.4.4 Environment

Flooding is a natural event, and floodplains provide many natural and beneficial functions. Nonetheless, flooding can impact the environment in negative ways.

- Fish can wash into roads or over dikes into flooded fields, with no possibility of escape.
- Pollution from roads, such as oil, and hazardous materials can wash into rivers and streams. During floods, these can settle onto normally dry soils, polluting them for agricultural uses.
- Human development such as bridge abutments and levees can increase stream bank erosion, causing rivers and streams to migrate into non-natural courses.
- Flooding may disrupt normal drainage systems in cities and can overwhelm sewer systems, causing raw sewage to spill into the flooded area.
- Severe flooding can destroy buildings that may contain toxic materials (paints, pesticides, gasoline, etc.) releasing these materials into the local environment.

Loss estimation platforms such as Hazus are not currently equipped to measure environmental impacts of flood hazards. The best gauge of vulnerability of the environment would be a review of damage from past flood events. Loss data that segregates damage to the environment was not available at the time of this plan. Capturing this data from future events could be beneficial in measuring the vulnerability of the environment for future updates.

9.5 FUTURE TRENDS

According to the California Department of Finance, the population of the greater Los Angeles County region is expected to increase over the next 45 years. The City of Norwalk has limited potential for expansion through annexation, as it is surrounded by other incorporated cities. It is anticipated that future growth in the City will be managed through redevelopment, which creates an opportunity to correct past land use decisions, especially with regards to development within floodplains.

While regulated floodplains for the City have not been clearly identified, the City will be well-equipped to manage growth in floodplains with its flood damage prevention ordinance, its building code, and the Safety

Element of its General Plan. Proper application of these tools requires accurate hazard mapping. Flood mapping should be taken into account as future land use decisions are made for areas impacted by flooding.

9.6 SCENARIO

The major flooding causes in the City of Norwalk are short-duration, high-intensity storms. Water courses in the City can flood in response to a succession of intense winter rainstorms, usually between early November and late March. A series of such weather events can cause severe flooding in the City due to the large percentage of impervious area and the age and capacity of the drainage system.

A worst-case scenario is a series of storms that flood numerous drainage basins in a short time, such as those projected by USGS in the CA ARkStorm Scenario (USGS, 2013). This could overwhelm response and floodplain management capabilities within the city. Major roads could be blocked, preventing critical access for many residents and critical functions. High in-channel flows could cause water courses to scour, possibly washing out roads and creating more isolation problems. In the case of multi-basin flooding, floodplain management resources would not be able to make repairs quickly enough to restore critical facilities and infrastructure. Additionally, as the grounds become saturated, groundwater flooding issues typical for the City would be significantly enhanced.

9.7 ISSUES

The planning team has identified the following flood-related issues relevant to the planning area:

- Ongoing flood hazard mitigation will require funding from multiple sources
- A coordinated hazard mitigation effort between jurisdictions affected by flood hazards across Los Angeles County will benefit future mitigation for the flooding hazard
- Floodplain residents need to continue to be educated about flood preparedness and the resources available during and after floods
- A lack of concern regarding flood risk by property owners can translate to the lack of political will to make changes
- The residual risk from flood control structures such as levees and channels should be communicated to the public
- The potential impact of climate change on flood conditions needs to be better understood
- The capability for flood threat recognition and warning needs to be enhanced
- Flood warning capability should be tied to flood phases
- There needs to be enhanced modeling to better understand the true flood risk
- Floodplain restoration/reconnection opportunities should be identified as a means to reduce flood risk
- Post-flood disaster response and recovery actions need to be solidified
- Staff capacity is required to maintain the City's existing level of floodplain management
- Floodplain management actions require interagency coordination
- Open spaces (infiltration) have decreased substantially, with no plans to reverse this trend. More impervious surface leads to more runoff

10. CLIMATE CHANGE CONSIDERATIONS

10.1 GENERAL BACKGROUND

10.1.1 Climate Change and the Role of Greenhouse Gases

Climate, consisting of patterns of temperature, precipitation, humidity, wind and seasons, plays a fundamental role in shaping natural ecosystems and the human economies and cultures that depend on them. "Climate change" refers to changes over a long period of time.

The well-established worldwide warming trend of recent decades and its related impacts are caused by increasing concentrations in the earth's atmosphere of greenhouse gases from human activities. Greenhouse gases are gases that trap heat in the atmosphere, resulting in a warming effect. The major greenhouse gases are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (NO_2), and fluorine-containing gases grouped as "high global warming potential" (HGWP) gases.

Emissions of these gases come from a variety of sources, such as fossil fuel combustion for energy and transportation, wastewater treatment, agricultural production, livestock, landfills, and changes in land use. Figure 10-1 shows the emissions by type of gas and by economic sector in California for 2018. CO_2 accounts for 83 percent of greenhouse gas emissions in the state, and transportation is its largest source, accounting for over a third of the total emissions in 2018.

Source: Office of Environmental Health Hazard Assessment, 2018

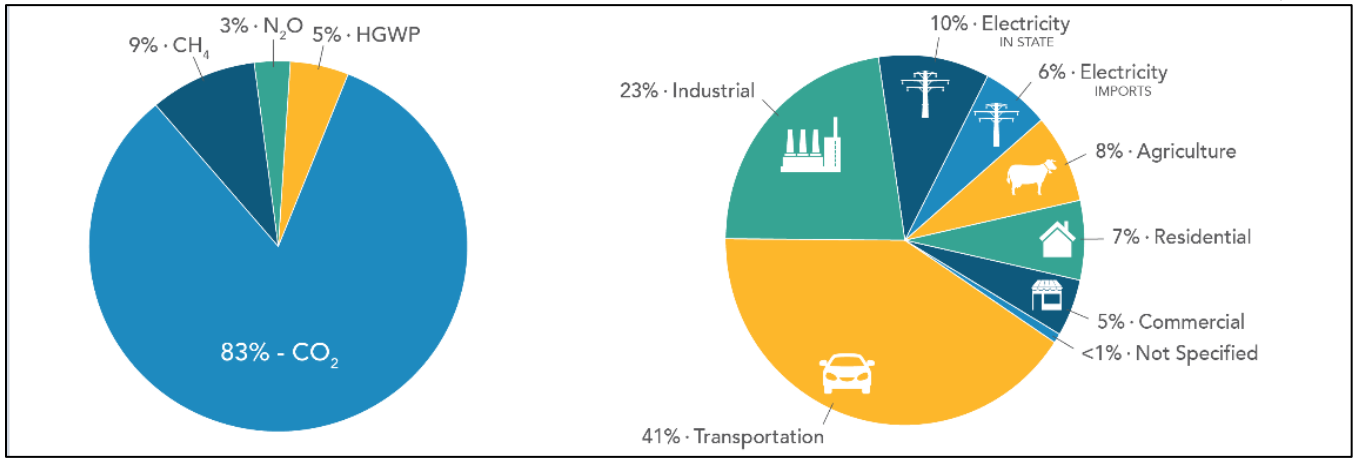


Figure 10-1. California's 2018 Greenhouse Gas Emission Inventory by Gas (left) and Sector (right)

According to the National Aeronautics and Space Administration (NASA), carbon dioxide concentrations in the atmosphere measured about 280 parts per million (ppm) before the industrial era began in the late 1700s and have risen dramatically since then, surpassing 400 ppm in 2013 for the first time in recorded history (see Figure 10-2).

Source: NASA, 2021

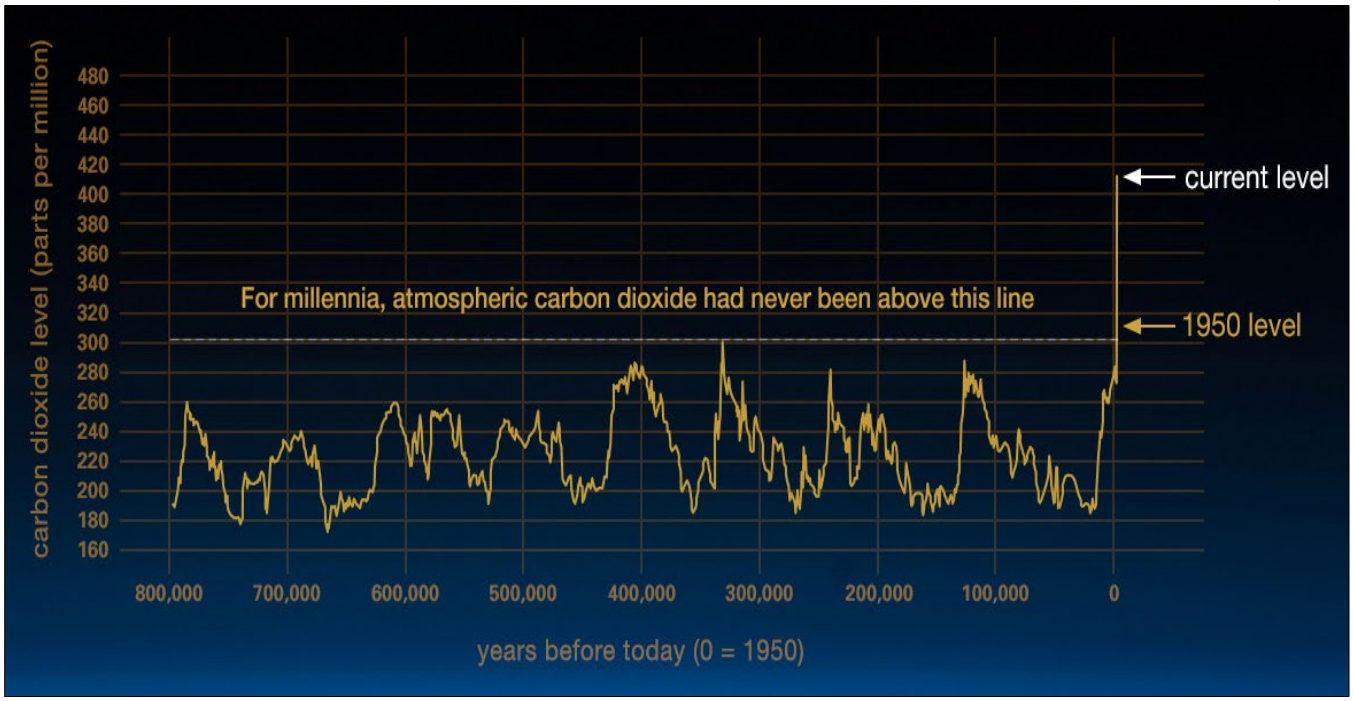


Figure 10-2. Global Carbon Dioxide Concentrations Over Time

10.1.2 How Climate Change Affects Hazard Mitigation

Climate change will affect the people, property, economy and ecosystems of the planning area in a variety of ways. Consequences of climate change include increased flood vulnerability, and increased heat-related illnesses. The most important effect for the development of this plan is that climate change will have a measurable impact on the occurrence and severity of natural hazards.

An essential aspect of hazard mitigation is predicting the likelihood of hazard events in a planning area. Typically, predictions are based on statistical projections from records of past events. This approach assumes that the likelihood of hazard events remains essentially unchanged over time. Thus, averages based on the past frequencies of, for example, floods are used to estimate future frequencies: if a river has flooded an average of once every 5 years for the past 100 years, then it can be expected to continue to flood an average of once every 5 years.

For hazards that are affected by climate conditions, the assumption that future behavior will be equivalent to past behavior is not valid if climate conditions are changing. As flooding is generally associated with precipitation frequency and quantity, for example, the frequency of flooding will not remain constant if broad precipitation patterns change over time. Specifically, as hydrology changes, storms currently considered to be the 100-year flood might strike more often, leaving many communities at greater risk. For this reason, an understanding of

climate change is pertinent to efforts to mitigate natural hazards. Information about how climate patterns are changing provides insight on the reliability of future hazard projections used in mitigation analysis.

10.1.3 Current Indicators of Climate Change

Global Indicators

The major scientific agencies of the United States—including NASA and the National Oceanic and Atmospheric Administration (NOAA)—have presented evidence that climate change is occurring. NASA summarizes key evidence as follows (NASA, 2021b):

- **Global Temperature Rise**—The planet's average surface temperature has risen about 1.62 ºF since the late 19th century, a change driven largely by increased carbon dioxide and other human-made emissions into the atmosphere. Most of the warming occurred in the past 35 years, with the five warmest years on record taking place since 2010.
- **Warming Oceans**—The oceans have absorbed much of this increased heat, with the top 2,300 feet of ocean showing warming of more than 0.4 ºF since 1969.
- **Shrinking Ice Sheets**—The Greenland and Antarctic ice sheets have decreased in mass. Greenland lost an average of 286 billion tons of ice per year between 1993 and 2016, and Antarctica lost about 127 billion tons of ice per year during the same time period. The rate of Antarctica ice mass loss has tripled in the last decade.
- **Glacial Retreat**—Glaciers are retreating almost everywhere around the world—including in the Alps, Himalayas, Andes, Rockies, Alaska and Africa.
- **Decreased Snow Cover**—Satellite observations reveal that the amount of spring snow cover in the Northern Hemisphere has decreased over the past five decades and that the snow is melting earlier
- **Sea Level Rise**—Global sea level rose about 8 inches in the last century. The rate in the last two decades is nearly double that of the last century and is accelerating slightly every year.
- **Declining Arctic Sea Ice**—Both the extent and thickness of Arctic sea ice has declined rapidly over the last several decades
- **Extreme Events**—The number of record high temperature events in the United States has been increasing since 1950, while the number of record low temperature events has been decreasing. The U.S. has also witnessed increasing numbers of intense rainfall events.
- **Ocean Acidification**—Since the beginning of the Industrial Revolution, the acidity of surface ocean waters has increased by about 30 percent. The amount of carbon dioxide absorbed by the upper layer of the oceans is increasing by about 2 billion tons per year.

California Indicators

The California Office of Environmental Health Hazard Assessment conducts research and develops reports to describe how California's climate is changing and how these changes are affecting the state. The 2018 report presents 36 indicators—scientifically based measurements that track trends in various aspects of climate change—in four categories (OEHHA, 2018):

- Human-influenced drivers of climate change, such as greenhouse gas emissions
- Changes in the state's climate

- Impacts of climate change on physical systems, such as oceans and snowpack
- Impacts of climate change on biological systems – humans, vegetation and wildlife

Based on trends for these indicators, the report concludes that climate change is continuing to occur in California and is having significant, measurable impacts on the state and its people, as summarized in the sections below

Human-Influenced Drivers of Climate Change

California has pioneered efforts to curb greenhouse gases despite an increase in the state's population and economic output. Since 1990, there has been a downward trend of California's greenhouse gas emissions due to declining emissions per capita and per dollar of gross domestic product. However, the state's reduced emissions have not been sufficient to address rising global effects in the air and oceans:

- **Atmospheric Concentrations—**CO_2 concentrations in the atmosphere continue to increase. The first and longest continuous measurements of global atmospheric CO_2 concentrations have been taken at Mauna Loa, Hawai'i. California coastal sites are consistent with those at Mauna Loa. In 60 years, CO_2 concentrations have increased from 315 parts per million (ppm) to over 414 ppm (2020). It is expected that the levels will remain above 400 ppm for many generations because CO_2 persists in the atmosphere for centuries.
- **Ocean Acidification—**Ocean acidification is increasing due to the increase in atmospheric concentrations of CO_2. Each year, the ocean absorbs approximately 30 percent of the CO_2 released into the atmosphere. Since 1988, CO_2 levels in seawater off Hawai'i have been monitored and are increasing at a steady rate. Monitoring of CO_2 off the California coast at Point Conception began in 2010, and while this time period is not long enough to discern a trend, the values are similar to those measured at Hawai'i at similar times.

Changes in the State's Climate

Climate is often referred to as "average weather" in describing the temperature, precipitation and wind in a given time period. Consistent with global observations, each of the last three decades in California has been warmer than any preceding decade. Throughout the state, annual average air temperatures have increased since 1895. Beginning in the 1980s the temperatures rose at a faster rate. From 2014 to 2017, temperatures were particularly warm. Eleven of the 20 warmest years in California have occurred since 2000. Nighttime temperatures, or minimum temperatures, have increased at a rate of 2.3 °F per century, while day time maximum temperatures have increased by 1.3 °F per century (OEHHA, 2019a). In the past 30 years, extreme heat days and nights have increased at a faster rate, and heat waves (five or more consecutive days) have also increased. Heat waves that continue through the night have increased since the mid-1970s.

The Palmer Drought Severity Index, a universal indicator of drought, shows that California has become drier throughout the years. The extreme drought in California, when index values fell below -3, occurred for eight years between 2007 and 2016. The most extreme drought since instrumental records began in 1895 occurred from 2012 to 2016. During these years, there was record warmth and dry weather, including a year of record low snowpack.

Other indicators of changes in climate show that:

- Energy used to cool buildings during warm weather has increased, while energy used to heat buildings during cold weather has decreased.
- Seven of the last 10 years had precipitation below the statewide average of 22.9 inches. 2012 through 2015 were the driest consecutive four years in California history.

- The precipitation that falls as rain, rather than snow, over the watersheds that provide most of California's water supply has been increasing.

Impacts of Climate Change on Physical Systems

The physical systems in California on which the state depends—the ocean, lakes, rivers and snowpack— have been altered due to warming temperatures and changing precipitation patterns. Winter snowpack and spring snowmelt runoff from the Sierra Nevada and southern Cascade Mountains provide approximately one-third of the state's annual water supply.

The amount of water stored in the state's snowpack varies from year to year, ranging from a high in 1952 of about 240 percent of the long-term average to a record low of 5 percent in 2015. When winter temperatures are warmer, less snowpack accumulates because more precipitation falls as rain instead of snow.

Some of the largest glaciers in the Sierra Nevada have lost an average of about 70 percent of their area from the beginning of the 20th century to 2014. Reductions ranged from about 50 to 85 percent of each glacier's area in 1903 (OEHHA, 2019b). Winter air temperature determines whether precipitation falls as rain or snow, affecting glacier mass gain, while summer air temperature affects glacier loss. Glacier shrinkage worldwide is an important contributor to global sea level rise.

Mean sea level has increased by about 7 inches at San Francisco since 1900, and by about 6 inches at La Jolla since 1924. Sea level rise threatens existing or planned infrastructure, development, and ecosystems along California's coast.

Other indicators of the impacts of climate change on physical systems show that:

- Average water temperatures in Lake Tahoe have increased by nearly 1 °F since 1970, at an average rate of 0.02 °F per year
- Coastal ocean temperatures at three sites in California have warmed over the past century
- Oxygen concentrations at three water depths offshore of San Diego indicate overall decreases as well as low-oxygen events

Impacts of Climate Change on Biological Systems

Humans

In natural ecosystems, humans are more adaptable to climate change than plants and animals. Regardless, the public's health is threatened by climate change in many ways. Extreme events may contribute to injuries and fatalities, and poor air quality can cause respiratory stress. Indicators of the impacts of climate change on human health show that:

- Vector-borne pathogen transmission and disease patterns in California can be affected by warming temperatures and changes in precipitation. West Nile Virus currently poses the greatest mosquito-borne disease threat.
- Heat-related deaths and illnesses typically increase during heat waves. In 2006 they were much higher than any other year because of the prolonged heat wave.

Vegetation

Vegetation can be stressed by warming temperatures, declining snowpack, and earlier spring snowmelt runoff. Climatic water deficit shows the demand plants have for water relative to the availability of water in the soil, and is associated with a warming climate.

Since 1950, wildfires have burned more areas each year, as temperatures have been warmer in spring and summer, and spring snowmelt has occurred earlier. During the latest drought, very low precipitation, low snowpack and unusually warm temperatures created conditions for extreme, high severity wildfires that spread rapidly. More than 11 million acres burned between 2007 and 2018, an average of 922,000 each year (CAL FIRE, 2020). Five of the six largest wildfires in California history started in 2020.

Studies have shown that the structure and composition of the state's forests and woodlands are changing. There are fewer large trees compared to the 1930s. There are fewer pine trees statewide and, in certain parts of the state, oaks cover larger areas. The decline in large trees and increased abundance of oaks are associated with statewide increases in climatic water deficit.

Since the 2012-2016 drought, tree deaths have increased dramatically. Trees were more vulnerable to insects and pathogen attacks from the higher temperatures and decreased water availability. Approximately 129 million trees died between 2012 and December 2017 (USDA, 2017). According to the USDA report, *2019 Aerial Survey Results: California*, an estimated 22,000 trees are dead in Los Angeles County.

Vegetation distribution has shifted across the north slope of Deep Canyon in the Santa Rosa Mountains in the Peninsular Ranges system, located east of the Los Angeles Basin. Dominant plant species have moved. Certain birds and mammals are found at different elevations. In parts of the Central Valley, prunes and one walnut variety are maturing more quickly with warming temperatures. This leads to earlier harvests and smaller fruits and nuts, potentially causing a significant loss of revenue for growers and suppliers.

Wildlife

Changes in the timing of key life cycle events for plants and animals and their habitat may be altered due to changes in temperature, precipitation, food sources, competition for prey, and other physical or biological features. These factors, along with the inherent sensitivity of the species, interact in ways that can affect species responses differently.

In three study regions of the Sierra Nevada Mountains, certain birds and mammals are found at different elevations today compared to a century ago. Range shifts have been observed in almost 75 percent of the small mammal species and over 80 percent of the bird species surveyed. High-elevation mammals tended to move upslope; birds and low-elevation mammals moved downslope as frequently as upslope. Species did not show uniform shifts in elevation. This could be from a sensitivity to temperature, precipitation or other physical factors, or a change in food sources, vegetation and interactions with competitors.

Unusually warm sea surface temperatures may cause marine species to respond to changing ocean conditions. A nudibranch sea slug expanded its range 130 miles—from the Monterey Peninsula to Bodega Bay—in response to warming ocean conditions.

Other indicators of the impacts of climate change on wildlife show that:

- Over the past 45 years, butterfly species in the Central Valley have been appearing earlier in the spring. Their earlier emergence is linked with hotter and drier regional winter conditions.
- Ocean conditions strongly influence marine organisms in the California Current, as seen with copepod populations. At the base of the food chain, the abundance and types of copepod species have been correlated with the abundance of many fish species.
- Extreme mortality events among juvenile salmon is causing the fluctuation of the number of adult Chinook salmon returning from the ocean to the Sacramento River for the past two decades. Salmon are at risk from the impacts of climate change on these habitats as they are residents of both marine and freshwater environments.
- During years when sea surface temperatures are unusually warm in their breeding area, there have been fewer California sea lion pup births, higher pup mortality, and poor pup conditions at San Miguel Island off Santa Barbara. Sea lions are vulnerable to fluctuations in the abundance and distribution of their primary prey, which are directly influenced by ocean conditions.

10.1.4 Responses to Climate Change

Communities and governments worldwide are working to address, evaluate and prepare for climate changes that are likely to impact communities in coming decades. Generally, climate change discussions encompass two separate but inter-related considerations: mitigation and adaptation. The term "mitigation" can be confusing, because its meaning changes across disciplines:

- Mitigation in emergency management—as generally addressed in this hazard mitigation plan—is typically defined as the effort to reduce loss of life and property by lessening the impact of disasters.
- Mitigation in climate change discussions is defined as a human intervention to reduce impacts on the climate system. It includes strategies to reduce greenhouse gas sources and emissions and enhance greenhouse gas sinks.

In this chapter, mitigation is used as defined by the climate change community. In the other chapters of this plan, mitigation is primarily used in an emergency management context.

Adaptation refers to adjustments in natural or human systems in response to the actual or anticipated effects of climate change and associated impacts. These adjustments may moderate harm or exploit beneficial opportunities. Mitigation and adaptation are related, as the world's ability to reduce greenhouse gas emissions will affect the degree of adaptation that will be necessary. Some initiatives and actions can both reduce greenhouse gas emissions and support adaptation to likely future conditions.

Societies across the world are facing the need to adapt to climate change. Farmers are altering crops and agricultural methods to deal with changing rainfall and rising temperature; architects and engineers are redesigning buildings; planners are looking at managing water supplies to deal with droughts or flooding.

Adaptive capacity goes beyond human systems. Some ecosystems can adapt to change and buffer surrounding areas from the impacts of change. Forests can bind soils and hold large volumes of water, releasing it through the year; floodplains can absorb water during peak flows; coastal ecosystems can attenuate waves and reduce erosion. Other ecosystem services—such as food provision, timber, materials, medicines, and recreation—can provide buffers in the face of changing conditions. Ecosystem-based adaptation is the use of biodiversity and ecosystem services as part of an overall strategy to help people adapt to the adverse effects of climate change. This includes the sustainable management, conservation and restoration of specific ecosystems that provide key services.

10.2 POTENTIAL IMPACT ON HAZARDS OF CONCERN

The following sections provide information on how each hazard of concern identified for this planning process may be impacted by climate change and how these impacts may alter current exposure and vulnerability to these hazards for the people, property, critical facilities and environment in the planning area.

10.2.1 Dam Failure

Climate Change Impacts on the Hazard

On average, changes in California's annual precipitation levels are not expected to be dramatic; however, small changes may have significant impacts for water resource systems, including dams. Dams are designed partly based on assumptions about a river's flow behavior, expressed as hydrographs. Changes in weather patterns can have significant effects on the hydrograph used for the design of a dam. If the hygrograph changes, it is conceivable that the dam can lose some or all of its designed margin of safety, also known as freeboard.

If the freeboard of a dam is reduced, dam operators may be forced to release increased volumes earlier in a storm cycle in order to maintain the required margins of safety. Such early releases of increased volumes can increase flood potential downstream. The California Division of Safety of Dams has indicated that climate change may result in the need for increased safety precautions to address higher winter runoff, frequent fluctuations of water levels, and increased potential for sedimentation and debris accumulation from changing erosion patterns and increases in wildfires. Climate change also may impact the ability of dam operators to estimate extreme flood events.

Exposure and Vulnerability

The following summarizes changes in exposure and vulnerability to the dam failure hazard resulting from climate change:

- **Population**—Population exposure and vulnerability to the dam failure hazard are unlikely to change as a result of climate change.
- **Property**—Property exposure and vulnerability to the dam failure hazard are unlikely to change as a result of climate change.
- **Critical facilities**—The exposure and vulnerability of critical facilities are unlikely to change as result of climate change. Dam owners and operators are sensitive to the risk and may need to alter maintenance and operations to account for changes in the hydrograph and increased sedimentation. Critical facility owners and operators in levee failure inundation areas should always be aware of residual risk from flood events that may overtop the levee system.
- **Environment**—The exposure and vulnerability of the environment to dam and levee failure are unlikely to change as a result of climate change. Ecosystem services may be used to mitigate some factors that could increase the risk of design failures, such as increasing the natural water storage capacity in watersheds above dams.
- **Economy**—Changes in the dam failure hazard related to climate change are unlikely to affect the local economy. Economic impacts may result from changes to the levee failure hazard if accreditation is lost.

10.2.2 Drought

Climate Change Impacts on the Hazard

The long-term effects of climate change on regional water resources are unknown, but global water resources are already experiencing the following stresses without climate change:

- Growing populations
- Increased competition for available water
- Poor water quality
- Environmental claims
- Uncertain reserved water rights
- Groundwater overdraft
- Aging urban water infrastructure

With a warmer climate, droughts could become more frequent, more severe, and longer-lasting. The *Fourth National Climate Assessment Report for the United States* indicates that "rising air and water temperatures and changes in precipitation are intensifying droughts… Changes in the relative amounts and timing of snow and rainfall are leading to mismatches between water availability and needs in some regions… Groundwater depletion is exacerbating drought risk." (USGCRP, 2018).

Because changes in precipitation patterns are still uncertain, the potential impacts and likelihood of drought are uncertain. DWR has noted impacts of climate change on statewide water resources by charting changes in snowpack, sea level, and river flow. As temperatures rise and more precipitation comes in the form of rain instead of snow, these changes will likely continue or grow even more significant. DWR estimates that parts of the state will experience a 48- to 65-percent loss in snowpack by the end of the century compared to historical averages (DWR, 2021). Increasing temperatures may also increase net evaporation from reservoirs. The planning area's water supply is derived from groundwater. Increased incidence of drought may cause a drawdown in groundwater resources without allowing for the opportunity for aquifer recharge.

Exposure and Vulnerability

The following summarizes changes in exposure and vulnerability to the drought hazard resulting from climate change:

- **Population**—Population exposure and vulnerability to drought are unlikely to increase as a result of climate change. While greater numbers of people may need to engage in behavior change, such as water saving efforts, significant life or health impacts are unlikely.
- **Property**—Property exposure and vulnerability may increase as a result of increased drought resulting from climate change, although this would most likely occur in non-structural property such as crops and landscaping. It is unlikely that structure exposure and vulnerability would increase as a direct result of drought, although secondary impacts of drought, such as wildfire, may increase and threaten structures.
- **Critical facilities**—Critical facility exposure and vulnerability are unlikely to increase as a result of increased drought resulting from climate change; however, critical facility operators may be sensitive to changes and need to alter standard management practices and actively manage resources, particularly in water-related service sectors

- **Environment**—The vulnerability of the environment may increase as a result of increased drought resulting from climate change. Prolonged or more frequent drought resulting from climate change may stress ecosystems in the region, which include many special-status species.
- **Economy**—Increased incidence of drought could increase the potential for impacts on the local economy. Drought may affect businesses in the landscape installation and maintenance industry.

10.2.3 Extreme Heat

Climate Change Impacts on the Hazard

Climate change presents a challenge for risk management associated with extreme heat. The science for linking the severity of specific severe weather events to climate change is still evolving; however, some trends provide an indication of how climate change may be impacting these events. The increase in average surface temperatures can lead to more intense heat waves that can be exacerbated in the City of Norwalk. Evidence suggests that heat waves are already increasing, especially in western states. Extreme heat days in the planning area are likely to increase.

Exposure and Vulnerability

The following summarizes changes in exposure and vulnerability to the severe weather hazard resulting from climate change:

- **Population and Property**—Population and property exposure and vulnerability would be unlikely to increase as a direct result of climate change impacts on the extreme heat hazard.
- **Critical facilities**—Critical facility exposure and vulnerability would be unlikely to increase as a result of climate change impacts on the extreme heat hazard.
- **Environment**—Exposure and vulnerability of the environment would be unlikely to increase; however, more frequent heat events and more intense rainfall may place additional stress on already stressed systems.
- **Economy**—Climate change impacts on the extreme heat hazard may impact the local economy through more frequent disruption to services, such as power outages during heat waves.

10.2.4 Earthquake

Climate Change Impacts on the Hazard

The impacts of global climate change on earthquake probability are unknown. There is an unproven theory that melting glaciers could induce tectonic activity. The concept is that, as ice melts and water runs off, tremendous amounts of weight are shifted on the earth's crust. As newly freed crust returns to its original, pre-glacier shape, it could cause seismic plates to slip and stimulate volcanic activity. This theory coincides with research into prehistoric earthquakes and volcanic activity. NASA and USGS scientists found that retreating glaciers in southern Alaska may be opening the way for future earthquakes (NASA, 2004).

Secondary impacts of earthquakes could be magnified by climate change. Soils saturated by repetitive storms or heavy precipitation could experience liquefaction during seismic activity due to the increased saturation. Dams storing increased volumes of water due to changes in the hydrograph could fail during seismic events.

Exposure and Vulnerability

Because impacts of climate change on the earthquake hazard are not well understood, increases in exposure and vulnerability of the local resources are not able to be determined.

10.2.5 Flood

Climate Change Impacts on the Hazard

Use of historical hydrologic data has long been the standard of practice for designing and operating water supply and flood protection projects. For example, historical data are used for flood forecasting models and to forecast snowmelt runoff for water supply. This method of forecasting assumes that the climate of the future will be similar to that of the period of historical record. However, scientists project greater storm intensity with climate change, resulting in more direct runoff and flooding. High frequency flood events (e.g. 10-year floods) in particular will likely increase with a changing climate. What is currently considered a 1-percent-annual-chance (100-year flood) also may strike more often, leaving many communities at greater risk. Going forward, model calibration must happen more frequently, new forecast-based tools must be developed, and a standard of practice that explicitly considers climate change must be adopted.

Climate change is already impacting water resources, and resource managers have observed the following:

- Historical hydrologic patterns can no longer be solely relied on to forecast the water future.
- Precipitation and runoff patterns are changing, increasing the uncertainty for water supply and quality, flood management and ecosystem functions.
- Extreme climatic events will become more frequent, necessitating improvement in flood protection, drought preparedness and emergency response.

The amount of snow is critical for water supply and environmental needs, but so is the timing of snowmelt runoff into rivers and streams. Rising snowlines caused by climate change will allow more mountain areas, such as the Sierra Nevada watersheds, to contribute to peak storm runoff. Changes in watershed vegetation and soil moisture conditions will likewise change runoff and recharge patterns. As stream flows and velocities change, erosion patterns will also change, altering channel shapes and depths, possibly increasing sedimentation behind dams, and affecting habitat and water quality.

Exposure and Vulnerability

The following summarizes changes in exposure and vulnerability to the flood hazard resulting from climate change:

- **Population and Property**—Population and property exposure and vulnerability may increase as a result of climate change impacts on the flood hazard. Runoff patterns may change, resulting in flooding in areas where it has not previously occurred.
- **Critical facilities**—Critical facility exposure and vulnerability may increase as a result of climate change impacts on the flood hazard. Runoff patterns may change, resulting in risk to facilities that have not historically been at risk from flooding. Changes in the management and design of flood protection critical facilities may be needed as additional stress is placed on these systems. Planners will need to factor a new level of safety into the design, operation, and regulation of flood protection facilities such as dams, bypass channels and levees, as well as the design of local sewers and storm drains.

- **Environment**—The exposure and vulnerability of the environment may increase as a result of climate change impacts on the flood hazard. Changes in the timing and frequency of flood events may have broader ecosystem impacts that alter the ability of already stressed species to survive.
- **Economy**—If flooding becomes more frequent, there may be impacts on the local economy. More resources may need to be directed to response and recovery efforts, and businesses may need to close more frequently due to loss of service or access during flood events.

10.3 ISSUES

The major issues for climate change are the following:

- Planning for climate-change-related impacts can be difficult due to inherent uncertainties in projection methodologies.
- Average temperatures are expected to continue to increase in the planning area, which may lead to a host of primary and secondary impacts, such as an increased incidence of heat waves.
- Expected changes in precipitation patterns are still poorly understood and could have significant impacts on localized flooding in the planning area.
- Heavy rain events may result in flooding after stormwater management systems are overwhelmed.

11. HAZARDS OF INTEREST

11.1 PUBLIC HEALTH INCIDENTS: PANDEMICS, EPIDEMICS

11.1.1 General Background

Widespread public health emergencies, referred to as pandemics, occur when a disease emerges to which the population has little immunity. In addition to the ongoing COVID-19 pandemic, the 20th century saw three such pandemics, the most notable of which was the 1918 Spanish influenza pandemic that was responsible for 20-40 million deaths throughout the world. Public health experts are always concerned about the risk of another pandemic where a disease spreads between and among species. Depending on the nature of such a disease, between 25 to 35% of the population could become ill. This level of disease activity would disrupt all aspects of society and severely affect the economy.

The Los Angeles County Department of Public Health (LAC DPH) is responsible for public health in Los Angeles County and the City of Norwalk. Norwalk will coordinate with LAC DPH during a public health emergency, whether in the city, or throughout the county or state. The LAC DPH will serve as the lead agency for a pandemic response and would work closely with each city to ensure that:

- Planning efforts are consistent throughout the county
- Official information is provided to cities in a timely manner
- Pharmaceutical distribution is conducted across the county

Outbreaks of infectious diseases following floods, tornados, earthquakes, and other disasters are not uncommon in the developing world but are rare in developed countries. Most post-disaster disease is produced by poor sanitation, a lack of safe drinking water and contaminated food.

COVID-19

As this planning process was underway, the City of Norwalk, the state of California, and the remainder of the world were beginning to deal with the impacts from the COVID-19 global pandemic. The impacts from this event will be long term and change the way society as a whole views, prepares for and responds to pandemics.

Data on the impacts from COVID-19 and the development of policies to respond were in their infancy as of this writing and were not fully vetted enough to inform this plan. It is anticipated that future updates to this plan will have well informed, expanded dialogue on this subject matter.

The LAC DPH has provided extensive information and resources to help individuals, communities, and counties during the COVID-19 pandemic. The COVID-19 Public Health website recommends these steps to help stop the spread of COVID-19 (LAC DPH, 2021a):

- Physical Distancing—Staying home, avoiding crowds, and staying at least 6 feet away from others whenever possible.
- Handwashing—Rub and scrub hands with soap and water for at least 20 seconds before rising and drying with a paper towel. If soap and water are not available, rub hands together with an alcohol-based sanitizer for 20 seconds. Sanitizer should be at least 60 percent alcohol.
- Cloth Face Coverings—A cloth face covering is a material that covers the nose and mouth. It can be secured to the head with ties or straps or simply wrapped around the lower face.
- Cleaning—Clean and disinfect frequently touched objects and surfaces often.
- COVID-19 Vaccine—The Public Health website also provides updated information about vaccination sites and scheduling an appointment.

Additional infectious and communicable diseases are described below within their classifications:

Vector-Borne Diseases

A vector-borne disease results from an infection transmitted to humans and other animals by blood-feeding anthropods, such as mosquitoes, ticks, and fleas. The sections below describe some of the more common vector-borne diseases in the western United States.

West Nile Virus

West Nile virus (WNV) is a disease caused by the bites of infected mosquitoes. The virus survives in nature in several types of birds and is transmitted by the bites of mosquitoes that feed on infected birds. WNV spreads during warm weather months when mosquitoes are most active. While not all mosquitoes carry this virus, the type of mosquito that spreads this virus is found throughout Los Angeles County.

According to the Centers for Disease Control and Prevention (CDC), approximately 80 percent of people who are infected with West Nile virus will show no symptoms. Up to 20 percent have symptoms such as fever, headache, and body aches, nausea, vomiting, and sometimes swollen lymph glands or a skin rash on the chest, stomach and back. Symptoms can last for as short as a few days, though even healthy people have become sick for several weeks. About 1 percent of people infected with WNV will develop severe illness, with symptoms that can include high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness and paralysis. These symptoms may last several weeks, and neurological effects may become permanent. There is no specific treatment for WNV infection. In more severe cases, neuroinvasive infection may occur requiring hospital care.

Other statistics for WNV include:

- The number of infections identified in 2019 was well below the previous 5-year average.
- There were three deaths from WNV (neuroinvasive infections) in Los Angeles County in 2019.

Dengue Fever

Dengue is a mosquito-borne disease caused by any of four closely related dengue viruses (DENV-1, DENV-2, DENV-3 and DENV-4). People get dengue from the bite of an infected mosquito. The mosquito becomes infected when it bites a person who has dengue virus in their blood. It takes a week or more for the dengue virus to

replicate in the mosquito; then the mosquito can transmit the virus to another person when it bites. Dengue is transmitted by yellow fever mosquito and the Asian tiger mosquito. Dengue virus cannot be transmitted from person to person.

The main symptoms of dengue are high fever, severe headache, severe pain behind the eyes, joint pain, muscle and bone pain, rash, bruising, and sometimes mild bleeding from the nose or mouth. Severe dengue patients proceed to experience more bleeding, severe pain in the abdomen, respiratory distress, and fluid accumulation in the lungs as the capillaries begin to leak. If not treated, severe dengue can result in death. There is no specific treatment for dengue infection. Severe dengue may require hospitalization and intensive medical care.

Zika Virus

Zika is a mosquito-borne disease. The most common symptoms of Zika are fever, rash, joint pain, and conjunctivitis (red eyes). The illness is usually mild, with symptoms lasting for several days to a week after being bitten by an infected mosquito. People usually do not get sick enough to go to the hospital, and they rarely die of Zika. For this reason, many people might not realize they have been infected. However, Zika virus infection during pregnancy can cause a serious birth defect called microcephaly, as well as other severe fetal brain defects. Once a person has been infected, he or she is likely to be protected from future infections.

Zika virus is transmitted by yellow fever mosquito and the Asian tiger mosquito. An *Aedes* mosquito can only transmit Zika virus after it bites a person who has this virus in their blood. Zika virus is not spread through casual contact but can be spread by infected men to their sexual partners. There is a growing association between Zika and microcephaly (abnormally small head and brain) in newborns, as well as Zika and Guillain-Barré Syndrome, a disease affecting the nervous system. Studies are ongoing to further evaluate these associations.

Tularemia

Tularemia, named after Tulare County in California, where it was first described in 1911, is a tick-borne disease of animals and humans caused by a bacterium. Tularemia is similar to plague but is typically spread differently. While plague is usually spread to humans by fleas, humans usually become infected with Tularemia by tick and deer fly bites, skin contact with infected animals, ingestion of contaminated water or meat, or inhalation of contaminated dusts or aerosols. Rabbits, hares, and rodents are especially susceptible and often die in large numbers during outbreaks. Although Tularemia can be life-threatening, most infections can be treated successfully with antibiotics. Steps to prevent Tularemia include use of insect repellent, wearing gloves when handling sick or dead animals, and not mowing over dead animals. In the United States, naturally occurring infections have been reported from all states except Hawai‘i.

Lyme Disease

Lyme disease, named after the city in Connecticut, where it was first identified in 1975, is a tick-borne disease caused by a bacterium that normally lives in mice, squirrels and other small animals. It is transmitted among these animals and to humans through the bites of certain species of ticks. In the northeastern and north-central United States, the black-legged tick (or deer tick) transmits Lyme disease. In the Pacific Coast region of the United States, the disease is spread by the western black-legged tick. Other major tick species found in the United States have not been shown to transmit the disease.

Typical symptoms include fever, headache, fatigue, and a skin rash. If left untreated, infection can spread to joints, the heart, and the nervous system. Lyme disease is diagnosed based on symptoms, physical findings (e.g., rash), and the possibility of exposure to infected ticks. Laboratory testing is helpful in later stages of the disease. Most cases of Lyme disease can be treated successfully with a few weeks of antibiotics. Steps to prevent Lyme disease include using insect repellent, removing ticks promptly, landscaping, and integrated pest management. The ticks that transmit Lyme disease can occasionally transmit other tick-borne diseases as well.

Rocky Mountain Spotted Fever

Rocky Mountain spotted fever is a potentially fatal tick-borne disease caused by a bacterium. It is transmitted to humans by the bite of an infected American dog tick, Rocky Mountain wood tick, or brown dog tick.

Typical symptoms include fever, headache, abdominal pain, vomiting, and muscle pain. A rash may also develop after a few days, but never develops in some patients. Rocky Mountain spotted fever can be a severe or fatal if not treated in the first few days of symptoms. It can be treated successfully with a few weeks of antibiotics. Steps to prevent the disease include using insect repellent, removing ticks promptly, landscaping, and integrated pest management. The ticks that transmit Rocky Mountain spotted fever can occasionally transmit other tick-borne diseases as well

Malaria

Malaria is a potentially fatal mosquito-borne disease caused by a parasite that commonly infects the *Anopheles* mosquito, which feeds on humans. People who contract malaria are typically very sick with high fevers, chills, and flu-like illness. Although malaria can be fatal, illness and death can usually be prevented.

On average 1,500 cases of malaria are diagnosed in the United States each year, the majority of cases being in travelers and immigrants returning from countries where malaria transmission occurs (sub-Saharan Africa and South Asia). In many temperate areas, such as Western Europe and the United States, economic development and public health measures have succeeded in eliminating malaria. However, most of these areas have *Anopheles* mosquitoes that can transmit malaria, and reintroduction of the disease is a constant risk.

Individuals in the noted areas need to reduce their likelihood of being bitten by mosquitoes by checking for the fit and any holes in screens on windows and doors and using mosquito repellent to keep mosquitoes from biting.

Saint Louis Encephalitis

In October 2018, the first human case of Saint Louis encephalitis was identified in Los Angeles County since 1997. Saint Louis encephalitis virus is similar to West Nile virus and can affect the nervous system and result in infections of the brain, paralysis and cause death. The majority of people infected with Saint Louis encephalitis virus have no or mild symptoms. People over 50 years of age or individuals with lowered immune systems are at greater risk of experiencing severe symptoms when infected. Symptoms of severe disease include fever, headache, stiff neck, confusion and decreased alertness. All county residents are at risk for Saint Louis encephalitis, and there is no vaccine to prevent Saint Louis encephalitis, only supportive treatment is available.

Zoonotic Diseases

A zoonotic disease is a disease that normally exists in animals but can infect humans – it can be transmitted from animals to people. There are multitudes of zoonotic diseases including Anthrax, Brucellosis, Hantavirus Pulmonary Syndrome, Listeriosis, Plague, Ebola, Rabies, Salmonellosis, Trichinosis, and Q-Fever.

Viral Hemorrhagic Fevers

Viral hemorrhagic fevers (VHF) are a group of zoonotic diseases caused by several distinct families of viruses that cause multisystem syndrome (multiple systems in the body are affected). Characteristically, the overall vascular system is damaged and the body's ability to regulate itself is impaired. These symptoms are often accompanied by hemorrhage (bleeding). Each virus is associated with one or more particular host species and are usually active only where the host species live. Therefore, the risk of getting VHFs caused by these viruses is restricted to these areas of the globe.

Anthrax

Anthrax is a disease caused by *Bacillus anthracis*, a bacterium that forms spores (a spore is a cell that is dormant but may come to life with the right conditions). There are three forms of anthrax:

- **Cutaneous**—The first symptom is a small sore that develops into a blister. The blister then develops into a skin ulcer with a black area in the center. The sore, blister and ulcer do not hurt.
- **Gastrointestinal**—The first symptoms are nausea, loss of appetite, bloody diarrhea, and fever, followed by bad stomach pain.
- **Inhalation**—The first symptoms of inhalation anthrax are like cold or flu symptoms and can include a sore throat, mild fever and muscle aches. Later symptoms include cough, chest discomfort, shortness of breath, tiredness and muscle aches.

Anthrax is a naturally occurring illness and isolated cases occur all over the world yearly. Humans can become infected with anthrax by handling products from infected animals or by breathing in anthrax spores from infected animal products (such as wool). People can become infected with gastrointestinal anthrax by eating undercooked meat from infected animals. Anthrax can be treated successfully with antibiotics.

Anthrax can be used as a weapon, as happened in the United States in 2001, when anthrax was spread through the postal system by sending letters with powder containing anthrax spores. This caused 22 cases of anthrax infection and brought anthrax back into the public eye.

Ebola

The 2014 Ebola virus outbreak was unprecedented in geographical reach and impact on health care systems across the globe. Ebola is more common in Central African countries, such as the Democratic Republic of Congo and Sudan, where it was first discovered in 1976. The 2014 outbreak was the largest and deadliest Ebola virus outbreak ever recorded, spreading to the West African countries of Guinea, Liberia, Sierra Leone, Nigeria, Mali, and Senegal for the first time. It was also the first time Ebola made it to the United States and Europe, prompting world-wide preparedness and response efforts. The outbreak was closely monitored, and traveler screenings were developed for those returning from West Africa.

In August 2014 two U.S. healthcare workers returned to the United States for treatment for Ebola. One of the patients diagnosed with Ebola in Dallas, Texas, died due to Ebola in October 2014. The nurse who provided care for the patient later tested positive for Ebola. This caused a nation-wide response across the country from hospitals, emergency medical teams, fire departments and public health agencies to enhance protocols for isolation precautions, emergency policies, personal protective equipment and conduct training and multi-agency emergency exercises in case the spread of Ebola became a pandemic.

Prior to 2014, only 2,200 cases of Ebola had been recorded. Of these, 68 percent were fatal. Twenty percent of new Ebola infections were linked to burial traditions in which family and community members wash and touch dead bodies before burial. In Guinea, 60 percent of Ebola infections were linked to traditional burial practices.

Hantavirus

Hantavirus is a rodent-borne disease. It was discovered in 1993 in the southwestern U.S. and was determined that the unrecognized disease had been present at least as early as 1959. Hantavirus has now been identified in over half of the U.S. Two Los Angeles County residents died in 2006 after getting sick from Hantavirus. In 2013, seven cases of Hantavirus occurred in Yosemite National Park, and has been detected in the Sierra Nevada region.

The hantavirus spreads when individuals touch or eat something contaminated with infected rodent urine, droppings, or saliva. It is also transmitted through aerosolization, which occurs when dried materials contaminated by infected rodent droppings or saliva are disturbed and brought up into the air and inhaled. Infected persons develop with one to five weeks after exposure. Early symptoms include fever, headache, and muscle aches, especially in the thighs, hips, back, and shoulders. Other symptoms include dizziness, chills, nausea, vomiting, diarrhea, and abdominal pain. After two to seven days of these symptoms, patients develop breathing difficulties that range from cough and shortness of breath to severe respiratory failure. Approximately 40 percent of hantavirus patients die from the disease.

Plague

Plague is a potentially fatal infectious disease of animals and humans caused by the *Yersinia pestis* bacterium. Today, antibiotics are effective against plague, if an infected person is treated promptly. If not, the disease is likely to cause illness or death. There are three forms of plague:

- **Bubonic plague—**This form is usually the result of an infected flea bite. Patients develop sudden onset of fever, headache, chills, and weakness and one or more swollen, tender and painful lymph nodes (called buboes). The bacteria multiply in the lymph node closest to where the bacteria entered the human body. If the patient is not treated with appropriate antibiotics, the bacteria can spread to other parts of the body.
- **Septicemic plague—**This form results from bites of infected fleas or from handling an infected animal. Patients develop fever, chills, extreme weakness, abdominal pain, shock, and possibly bleeding into the skin and other organs. Skin and other tissues may turn black and die, especially on fingers, toes, and the nose. Septicemic plague can occur as the first symptoms of plague or may develop from untreated bubonic plague.
- **Pneumonic plague—**Pneumonic plague may develop from inhaling infectious droplets or from untreated bubonic or septicemic plague that spreads to the lungs. Patients develop fever, headache, weakness, and a rapidly developing pneumonia with shortness of breath, chest pain, cough, and sometimes bloody or watery mucous. The pneumonia may cause respiratory failure and shock. Pneumonic plague is the most

serious form of the disease and is the only form of plague that can be spread from person to person, by infectious droplets.

In North America, plague is found in certain animals and their fleas in the Great Plains to the Pacific Coast, and from southwestern Canada to Mexico. The last urban plague epidemic in the United States occurred in Los Angeles in 1924-25. The CDC reports in recent decades, an average of 7 human plague cases are reported each year, within a range of 1-17 cases per year.

Severe Acute Respiratory Syndrome

Severe Acute Respiratory Syndrome (SARS) is a is a viral respiratory disease of zoonotic origin caused by the SARS coronavirus (SARS-CoV). SARS was first reported in Asia in February 2003. Within several months, the illness spread to more than two dozen countries in Asia, Europe, South America, and North America prior to containment of the global outbreak. The World Health Organization (WHO) reports worldwide 8,098 people became sick and 774 died with SARS during the 2003 outbreak. In the United States, only eight people had laboratory evidence of SARS-CoV infection. Each person had traveled to parts of the world where SARS was present. SARS did not spread more widely in the United States.

SARS symptoms include a high fever, headache, and an overall feeling of discomfort and body aches. Some people also have mild respiratory symptoms at the outset. About 10 to 20 percent of patients have diarrhea and may develop a dry cough. Most patients develop pneumonia. The virus that causes SARS is thought to be transmitted most readily by respiratory droplets produced when an infected person coughs or sneezes. It also can spread by touching an object contaminated with infectious droplets and passing the droplets to the mouth, nose, or eyes. SARS virus might spread more broadly through the air or by other ways that are not now known.

As of May 2005, the CDC reported there was no remaining sustained SARS transmission anywhere in the world. The CDC has developed recommendations and guidelines to assist public health and healthcare officials in planning for the reappearance of SARS if that occurs. Lessons learned from the SARS outbreak helped healthcare facilities and communities successfully plan and respond to the 2009 H1N1 pandemic.

Foodborne Diseases

Foodborne disease infections come from bacterial and parasitic pathogens in the nations' food sources. In 2015, the CDC's "FoodNet" identified 20,098 laboratory-confirmed infections, as well as 4,598 hospitalizations and 77 deaths related to these infections. Recent cases of foodborne disease include:

- In April 2017, a contained outbreak of the botulism was confirmed in California, linked to a cheese sauce.
- In May 2018, Hickory Harvest Foods announced a recall of organic nut mix, potentially infected by listeria monocytogenes.
- In 2018, a strain of *Escherichia coli* bacteria caused the reported illness of 210 people across 36 states in the US, carried on romaine lettuce from Arizona.
- On November 20, 2018, the CDC and FDA investigated a second outbreak of E. coli O157:H7 infections linked to romaine lettuce.
- Three outbreaks of E. coli O157:H7 in the fall of 2019 were attributed to contaminated romaine lettuce.
- As of December 18, 2020, a total of 40 people infected with the outbreak strain of E. coli O157:H7 were reported from 19 states, including California.

Table 11-1 is a chart from the Food and Drug Administration that provides the foodborne disease-causing organisms that frequently cause illness in the United States.

Table 11-1. Common Foodborne Disease Organisms in the United States

Organism	Common Name of Illness	Signs & Symptoms	Duration	Food Sources
Bacillus cereus	*B. cereus* food poisoning	Abdominal cramps, watery diarrhea, nausea	24-48 hours	Meats, stews, gravies, vanilla sauce
Campylobacter jejuni	Campylobacteriosis	Diarrhea, cramps, fever, and vomiting; diarrhea may be bloody	2-10 days	Raw and undercooked poultry, unpasteurized milk, contaminated water
Clostridium botulinum	Botulism	Vomiting, diarrhea, blurred vision, double vision, difficulty in swallowing, muscle weakness. Can result in respiratory failure and death	Variable	Improperly canned foods, especially home-canned vegetables, fermented fish, baked potatoes in aluminum foil
Clostridium perfringens	Perfringens food poisoning	Intense abdominal cramps, watery diarrhea	Usually 24 hours	Meats, poultry, gravy, dried or precooked foods, time and/or temperature-abused foods
Cryptosporidium	Intestinal cryptosporidiosis	Diarrhea (usually watery), stomach cramps, upset stomach, slight fever	May relapse from weeks to months	Uncooked food or food contaminated by an ill food handler after cooking, contaminated drinking water
Cyclospora cayetanensis	Cyclosporiasis	Diarrhea (usually watery), loss of appetite, substantial loss of weight, stomach cramps, nausea, vomiting, fatigue	Can remit and relapse over weeks to months	Various types of fresh produce (imported berries, lettuce, basil)
***E. coli (Escherichia coli)* producing toxin**	*E. coli* infection (common cause of "travelers' diarrhea")	Watery diarrhea, abdominal cramps, some vomiting	3-7 or more days	Water or food contaminated with human feces
***E. coli* O157:H7**	Hemorrhagic colitis or *E. coli* O157:H7 infection	Severe (often bloody) diarrhea, abdominal pain and vomiting. Usually, little or no fever. More common in children 4 years or younger. Can lead to kidney failure.	5-10 days	Undercooked beef, unpasteurized milk and juice, raw fruits and vegetables (e.g. sprouts), and contaminated water
Hepatitis A	Hepatitis	Diarrhea, dark urine, jaundice, and flu-like symptoms, i.e., fever, headache, nausea, and abdominal pain	Variable, 2 weeks-3 months	Raw produce, drinking water, uncooked or cooked foods that are not reheated after contact with an infected food handler; shellfish from contaminated waters
Listeria monocytogenes	Listeriosis	Fever, muscle aches, and nausea or diarrhea. Pregnant women may have mild flu-like illness, and infection can lead to premature delivery or stillbirth. The elderly or immunocompromised patients may develop bacteremia or meningitis.	Variable	Unpasteurized milk, soft cheeses made with unpasteurized milk, ready-to-eat deli meats
Noroviruses	Variously called viral gastroenteritis, winter diarrhea, acute non- bacterial gastroenteritis, food poisoning, and food infection	Nausea, vomiting, abdominal cramping, diarrhea, fever, headache. Diarrhea is more prevalent in adults, vomiting more common in children.	12-60 hours	Raw produce, contaminated drinking water, uncooked foods and cooked foods that are not reheated after contact with an infected food handler; shellfish from contaminated waters

Organism	Common Name of Illness	Signs & Symptoms	Duration	Food Sources
Salmonella	Salmonellosis	Diarrhea, fever, abdominal cramps, vomiting	4-7 days	Eggs, poultry, meat, unpasteurized milk or juice, cheese, contaminated raw fruits and vegetables
Shigella	Shigellosis or Bacillary dysentery	Abdominal cramps, fever, and diarrhea. Stools may contain blood and mucus.	24-48 hours	Raw produce, contaminated drinking water, uncooked foods and cooked foods that are not reheated after contact with an infected food handler
Staphylococcus aureus	Staphylococcal food poisoning	Sudden onset of severe nausea and vomiting. Abdominal cramps. Diarrhea and fever may be present.	24-48 hours	Unrefrigerated or improperly refrigerated meats, potato and egg salads, cream pastries
Vibrio parahaemolyticus	*V. parahaemolyticus* infection	Watery (occasionally bloody) diarrhea, abdominal cramps, nausea, vomiting, fever	2-5 days	Undercooked or raw seafood, such as shellfish
Vibrio vulnificus	*V. vulnificus* infection	Vomiting, diarrhea, abdominal pain, bloodborne infection. Fever, bleeding within the skin, ulcers. Can be fatal to those with liver disease or weak immune systems.	2-8 days	Undercooked or raw seafood, such as shellfish (especially oysters)

Waterborne Diseases

Waterborne diseases are caused by drinking dirty or contaminated water. In a report released on October 7, 2017, a total of 42 drinking water–associated outbreaks were reported to CDC for the 2013 – 2014 period, resulting in at least 1,006 cases of illness, 124 hospitalizations, and 13 deaths. Legionella was responsible for 57% of outbreaks and 13% of illnesses, and chemicals/toxins and parasites together accounted for 29% of outbreaks and 79% of illnesses. Eight outbreaks caused by parasites resulted in 289 (29%) cases, among which 279 (97%) were caused by Cryptosporidium and 10 (3%) were caused by Giardia duodenalis. Chemicals or toxins were implicated in four outbreaks involving 499 cases, with 13 hospitalizations, including the first outbreaks associated with algal toxins. Regardless of legislation and requirements for water sanitation and management, waterborne disease and outbreaks continue to occur in the United States. Waterborne diseases include:

Cholera

Cholera is an acute, diarrheal illness caused by infection of the intestine with the toxigenic bacterium *Vibrio cholerae* serogroup O1 or O139. An estimated 2.9 million cases and 95,000 deaths occur each year around the world. The infection is often mild or without symptoms but can sometimes be severe. Approximately 10 percent of infected persons will have severe disease characterized by profuse watery diarrhea, vomiting, and leg cramps. In these people, rapid loss of body fluids leads to dehydration and shock. Without treatment, death can occur within hours.

Hepatitis A

Hepatitis A is a vaccine-preventable, communicable disease of the liver caused by the hepatitis A virus. It is usually transmitted person-to-person through the fecal-oral route or consumption of contaminated food or water.

Dysentery

Dysentery is bloody diarrhea, i.e. any episode in which the loose or watery stools contain visible red blood. There are two main types of dysentery:

- Bacillary dysentery or shigellosis – caused by shigella bacteria
- Amoebic dysentery or amoebiasis – caused by an amoeba (single-celled parasite) called Entamoeba histolytica, which is mainly found in tropical areas; this type of dysentery is usually picked up abroad

Dysentery is most often caused by *Shigella* species (bacillary dysentery) or *Entamoeba histolytica* (amoebic dysentery). Other symptoms of dysentery can include painful stomach cramps, nausea or vomiting, and a fever of 100.4 ºF or above. Dysentery is highly infectious and can be passed on if precautions aren't taken, such as properly and regularly washing your hands.

Influenza

Influenza (flu) is a contagious respiratory illness caused by influenza viruses. Symptoms can include fever, headache, extreme tiredness, dry cough, sore throat, and muscle aches. Depending on the season, age, and prior health conditions flu can be serious and/or life-threatening. Flu season in Los Angeles County is typically the first week of October through the end of March but can circulate throughout the year.

The 2020-2021 season (beginning October 1, 2020) in Los Angeles County had significantly lower influenza activity than previous influenza seasons. This was attributed to more people receiving the flu vaccine, many schools and businesses holding virtual classes and meetings instead of in-person, and fewer people traveling. Figure 11-1 shows the percentage of respiratory specimens testing positive for influenza at LAC Sentinel Surveillance Laboratories by season, from 2016-17 through 2020-21.

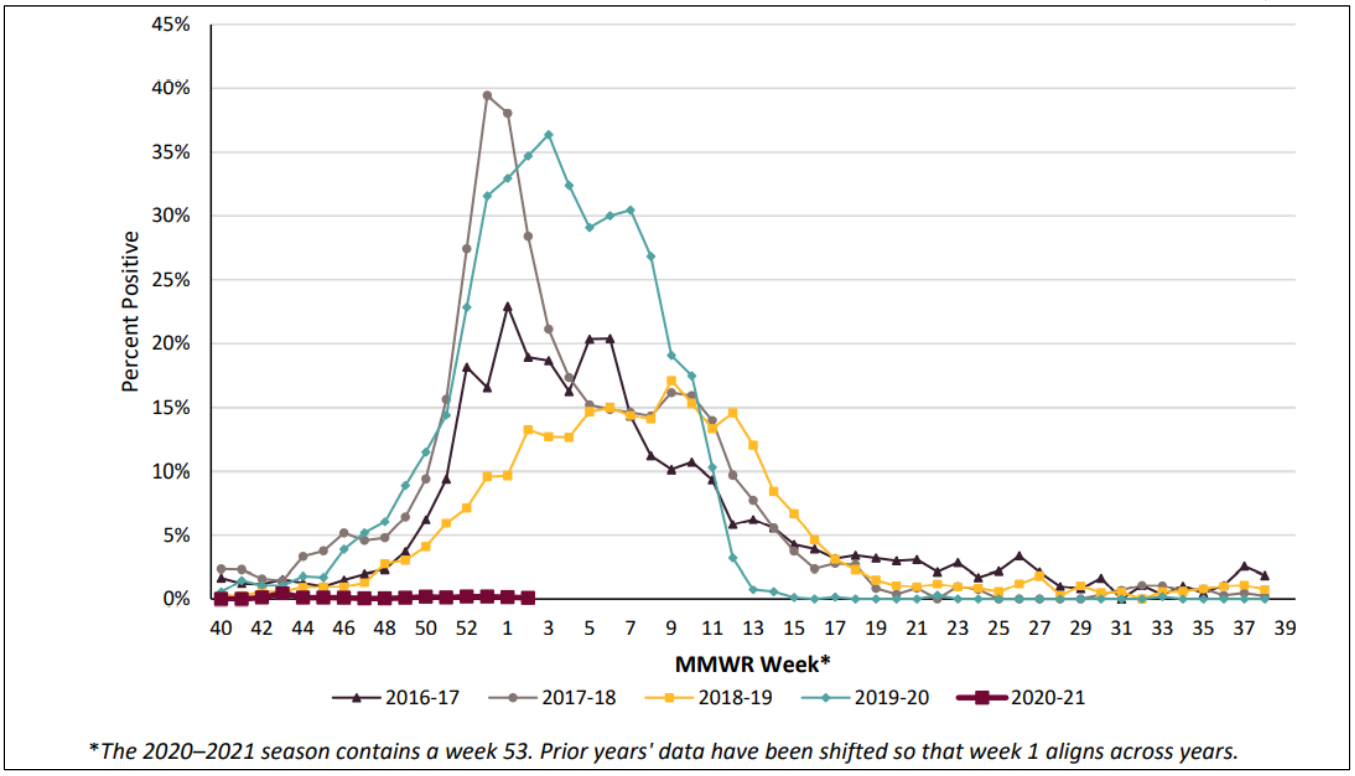
Avian Influenza

Avian influenza refers to the disease caused by infection with avian (bird) influenza (flu) Type A viruses. These viruses occur naturally among wild aquatic birds worldwide and have previously infected domestic poultry and other bird and animal species. Normally, avian flu viruses do not infect humans, but human infections with avian flu viruses have occurred.

H5N1

Human cases of the H5N1 virus infection were identified in Hong Kong in 1997, but the virus did not spread far. In 2004, in Thailand, there was evidence of probable human-to-human spread of H5N1 virus associated with prolonged very close unprotected contact between an ill child with H5N1 virus infection and her mother and her aunt. Further transmission did not occur. In 2005, in Indonesia, limited, non-sustained person-to-person transmission of H5N1 virus could not be excluded among two clusters of patients who had no known contact with poultry or other animals. The cumulative number of confirmed human cases for avian influenza A(H5N1) reported to the WHO from 2003 to 2018 is 860 cases and 454 deaths. In 2018 there were no H5N1 cases reported.

Source: LAC DPH, 2021b



MMWR = Morbidity and Mortality Weekly Report

Figure 11-1. Percent of Positive Influenza Tests 2016-17 through 2020-21

H1N1

In 2009, the A (H1N1) virus (swine flu), a new variant of the influenza virus, was confirmed in patients in Mexico. The mutation contained a combination of genetic material from avian and pig viruses as well as human influenza virus. In May 2009 there were 286 laboratory-confirmed cases of A (H1N1) in the United States—30 in California and 3 in Los Angeles County. Based on the human-to-human spread of the virus in at least two countries in one region of the WHO, the agency raised its pandemic alert level to Phase 5 (out of 6).

H7N9

Human infections with avian influenza A (H7N9) virus were first reported in China in March 2013. Annual epidemics of human infections with Asian H7N9 viruses in China have occurred and are driven mostly by exposure to infected poultry at live poultry markets. A small percentage of reported cases have been associated with possible limited, non-sustained human-to-human transmission, mostly occurring between family members. Since October 1, 2017, there have been only 3 reported human infections. During the fifth epidemic, from October 1, 2016 through September 30, 2017, the WHO reported 766 human infections with Asian H7N9 virus, making it the largest H7N9 epidemic to date. As of December 7, 2017, the total cumulative number of human infections with Asian lineage H7N9 reported by WHO since 2013 is 1565. During epidemics one through five, about 39 percent of people confirmed with Asian H7N9 virus infection died.

11.1.2 Hazard Profile

The severity of public health hazards is dependent upon the hazard and the population exposed to it. As the population increases, so does the risk of exposure to hazards. The key to reducing the disease hazard is isolation so that the exposed population does not continue to spread the hazard to the uninfected population. For disease and weather-related public health hazards, promoting education and personal preparedness will help to mitigate and reduce the severity of the hazard.

Past Events

The following recent public health alerts and advisories were issued by the Los Angeles County Health Alert Network:

- January 21, 2021—CDPH Recommendations: Providers pause administration of Moderna's COVID-19 vaccine Lot 041L20A
- December 4, 2020—COVID-19 vaccine update
- October 29, 2020—Wound Botulism cases associated with Heroin
- October 7, 2020—CDC Health Advisory: HIV clusters and outbreaks across the US among people who inject drugs
- August 20, 2020—CDPH Health Advisory: Resurgence of *Candida auris* in healthcare facilities
- July 17, 2020—LAC DPH Health Advisory: Resurgence of *Candida auris* in Los Angeles County
- July 6, 2020—CDC Health Advisory: Serious adverse health events associated with methanol-based hand sanitizers
- July 4, 2020—LAC DPH Health Advisory: Increasing COVID-19 cases
- June 23, 2020—CDC Health Advisory: The CDC is notifying healthcare providers about a significant increase in penicillin- and ciprofloxacin-resistant meningococci in the United States
- May 14, 2020—CDC Health Advisory: Multisystem Inflammatory Syndrome in children (MIS-C) associated with COVID-19
- May 12, 2020—LAC DPH Health Alert: Pediatric Multi-System Inflammatory Syndrome potentially associated with COVID-19

This list summarizes historical disease outbreak events in the United States:

- In Los Angeles County, as of January 28, 2021, there have been 16,107 COVID-19 deaths and 1.1 million cases of COVID-19
- In the United States during the 2009 H1N1 influenza pandemic, there were 12,271 deaths, 59,979,608 confirmed cases of the disease and 270,435 people hospitalized due to the illness. In California, there were 4,134 people hospitalized due to the illness and 596 deaths
- There were two confirmed cases of SARS in California during the worldwide outbreak in 2002-2003, neither of them in the planning area

11.1.3 Issues

Important issues associated with the public health hazards include the following:

- Prevention through vaccination and personal emergency and disaster preparation will help to reduce the impacts of public health hazards.
- Response personnel need to be integrated in a unified command with Los Angeles Sheriff's Department and Los Angeles County Fire Department when needed in response to public health hazards.
- City employees must be advised and trained on public health issues and planning.
- Up-to-date and functional all-hazard contingency planning should be carried out.
- A system needs to be in place for informing the public with a unified message about the public health hazard.
- Health agencies and facilities require surge capacity management and adaptation to the rising number and needs of the region.

11.2 TERRORISM

11.2.1 General Background

The Federal Bureau of Investigation (FBI) defines terrorism as "the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives." Some acts of terrorism rise to the level of a disaster, and some are more localized to a business or city. Norwalk is home to businesses and government agencies, transportation infrastructure, historic sites, and cultural facilities that are vulnerable to a terrorist attack. Due to the hardening of previous terrorism targets, a recent trend is for terrorists to pursue soft targets. Soft targets are open public areas, e.g., shopping malls, concert or sports venues, hotels, restaurants, bars, nightclubs, movie theaters, transportation centers, and places where numerous people or tourists gather that remain relatively unprotected. A variety of political, social, religious, cultural, and economic factors underlie terrorist activities. Terrorists typically target civilians with a goal of instilling fear to advance their agenda. The media interest generated by terrorist attacks makes this a high visibility threat.

11.2.2 Hazard Profile

Past Incidents

Norwalk has not had any acts of terrorism in the city. The following is a compilation of previous terrorism events in the County of Los Angeles:

- **March 31, 2020—**A man attempted to ram a train into the USNS Mercy, going over 250 yards before stopping and causing damage to the pavement. No one was injured in the incident. He thought the COVID-19 pandemic was an attempt at a government takeover.
- **November 1, 2013—**A man entered the checkpoint at the LAX Airport and fired his rifle, killing one Transportation Security Administration officer and injuring six others. The motivation behind the attack was an anti-government agenda.
- **February 3-12, 2013**—A former LAPD officer went on a killing spree targeting police officers and their families throughout Southern California. The former officer was eventually killed in a shootout and fire.
- **September 16, 2010**—A Hawaiian Airlines flight was delayed for nearly two hours after someone phoned in a bomb threat. The Los Angeles Police Department bomb squad and canine team searched the

plane, which was due to leave LAX for Honolulu with 225 people onboard. The Boeing 767 was carefully inspected, and passengers and luggage were rescreened.

- **September 7, 2010**—Law enforcement authorities investigated a written threat found on a Thai Airways aircraft that landed at LAX. After landing shortly, Flight 794 was taken to a remote area of the airport, where crew members and passengers were interviewed. Bomb technicians searched the plane and authorities screened the luggage. The flight originated in Bangkok, Thailand.
- **June 19, 2010**—A man falsely claiming to be carrying an explosive at LAX prompted the closure of the Tom Bradley Terminal before police shot him with a stun gun and took him into custody. The incident began when the suspect grabbed a passenger's luggage outside of the terminal, ran inside and claimed the package contained a bomb. The terminal was evacuated for 20 minutes as officers pursued the man inside the facility. The package he was carrying did not contain explosives.
- **September 16, 2005**—Fire officials responded to a fire at the high-rise condominium home of the director of Los Angeles Animal Services, after residents observed smoke coming from a recyclables/janitorial closet. First responders recovered an improvised incendiary device consisting of a 4-inch-long tube labeled "TOXIC" and using a cigarette as a fuse. The device, which had been placed next to a stack of newspapers in the recyclables/janitorial closet, had malfunctioned and only scorched the concrete floor of the closet. The Animal Liberation Front claimed responsibility for this incident.
- **July 7, 2005**—Fire officials responded to a vehicle fire in the driveway of a private residence in Los Angeles, California. In extinguishing the fire, authorities recovered a partially melted plastic gasoline container from behind the vehicle's left front wheel. The car belonged to a representative for the Animal Care Technicians Union, which represents employees for the Los Angeles Animal Services (LAAS). LAAS and its affiliates have been targeted by local animal rights extremists, and the LAAS union representative had been placed on a "targets" list of individuals profiled by extremists.
- **2005 Disruption of Plot to Attack Military and Jewish Targets**—Officers with the Torrance Police Department arrested suspects during a commercial armed robbery in progress at a Los Angeles area gas station. Their arrest, and subsequent local and FBI investigation, revealed that the suspects were conducting the armed robberies to raise money for an alleged terrorist plot targeting U.S. military facilities, Israeli government facilities, and Jewish synagogues in the greater Los Angeles area.
- **August 22, 2003**—Vandalism and Destruction of Property—Individuals associated with the Earth Liberation Front (ELF) carried out acts of vandalism in Los Angeles, damaging roughly 125 vehicles and one commercial building. Much of the damage was caused by spray-painted graffiti, although in two cases, individuals set fire to vehicles. Some of the graffiti associated the vehicles with "terrorism."
- **July 2002**—Attack by Lone Gunman at LAX—An Egyptian citizen opened fire with a handgun at LAX while standing in line at the ticket counter of El Al, killing two persons and wounding four others before an airline security officer shot and killed him. The FBI assumed the primary responsibility for the investigation due to the possible terrorist connection, and in March 2003, the attack was determined a terrorist crime, with the gunman acting alone and not part of an identified group.
- **December 31, 1999**—Attempted Terrorist Attack on LAX—An Algerian national and suspected member of the Armed Islamic Group (GIA) was stopped as he came across the U.S.-Canadian border into Washington State on December 14, 1999. He had a trunk filled with explosives and timing devices and a plan to detonate a suitcase bomb at LAX. The Algerian said he picked LAX because, "it was sensitive politically and economically." He was arrested at Port Angeles, Washington.

11.2.3 Issues

The major issues for terrorism include the following:

- Continue regular and redundant emergency response training for field level responders (public works) and public information staff in order to respond quickly in the event of a terrorism related disaster.
- Conduct terrorism awareness training for all local government employees to recognize threats or suspicious activity in order to prevent an incident from occurring.
- Further develop City response capabilities based on the terrorism threat.
- Enhance existing infrastructure and buildings to prevent or mitigate terrorism incidents.
- Participate in regional training exercises in support of local, state and national preparedness.
- Develop continuity of operations plans for the City and work with the private sector to create business continuity plans to be followed in the event of a terrorism emergency.
- Review and revise existing automatic aid and mutual aid agreements with other public works agencies to ensure mutual aid is available.
- Implement a public emergency information line for 24-hour contact during an emergency.
- Coordinate with all school districts in the City to ensure their emergency preparedness plans include preparation for terrorism incidents.
- Build a comprehensive emergency management capability within the City.
- Prepare and present terrorism risk and preparedness information to the public through meetings, town hall gatherings, and preparedness fairs.

11.3 CYBERSECURITY THREATS

11.3.1 General Background

Cyberterrorism and cyberattacks are terms for cybersecurity threats that are often used interchangeably, though they are not the same. All cyberterrorism is a form of cyberattack, but not all cyberattacks are cyberterrorism.

Public and private computer systems can experience a variety of cyberattacks, from blanket malware infection to targeted attacks on system capabilities. Cyberattacks specifically seek to breach information technology security measures designed to protect an individual or organization. The initial attack is followed by more severe attacks to cause harm, steal data or for financial gain. Organizations are prone to different types of attacks that can be automated or targeted.

Any facility that relies on computers, computer systems and programs for their operations could be a target. Generally, attacks last minutes to days, but large-scale events and their impacts can last much longer. As information technology continues to grow in capability and interconnectivity, cyber threats become increasingly frequent and destructive. Cyber threats differ by motive, attack type and perpetrator profile. Motives range from the pursuit of financial gain to political or social aims. Cyber threats are difficult to identify and comprehend. Types of threats include using viruses to erase entire systems, breaking into systems and altering files, using someone's personal computer to attack others, or stealing confidential information. The spectrum of cyber risks is limitless, with threats having a wide range of effects on the individual, community, organizational, and national threat.

Ransomware

The FBI defines ransomware as a type of malicious software, or malware, that prevents you from accessing your computer files, systems, or networks and demands you pay a ransom for their return. Businesses should have a business continuity plan in case of a ransomware attack.

Cyberterrorism

The FBI is the lead federal agency for investigating cyberterrorism. In order for a cyberattack to be considered terrorism, the attack must by premeditated and politically motivated against information, computer systems, computer programs, or data. "Cyberterrorism may be carried out by state and non-state actors which have the capability to steal, alter, or destroy the nations sensitive data and, in the worst of cases, to manipulate from afar the process control systems that are meant to ensure the proper functioning of portions of the nations' critical infrastructure" (FBI, *The Cyber Threat and the FBI's Cyber Program*). Critical infrastructure and the nation are becoming more vulnerable to cyberattacks as their dependency on computer networks and systems grows.

The following list is of cyber-attacks in Los Angeles County:

- **April 30, 2018**—In Pasadena, City employee email accounts were compromised through a phishing scheme. Hackers used access to accounts to send out fraudulent emails to city contacts. The City immediately disabled accounts and changed passwords of all city employees, and advised residents and associates to take caution when opening emails from city.
- **November 22, 2017—**500 Los Angeles Superior Court employees received fraudulent emails leading to fake websites asking for account credentials. Less than a dozen employees fell for the phishing scam. A 31-year old Texas resident was found to responsible for the hacking.
- **June 27th, 2017**—The Los Angeles County Board of Supervisors website homepage displayed pro-ISIS propaganda. The website was one of four U.S. websites hacked the same way.
- **December 2016**—A virus locked the Los Angeles Community College District's computer network as well as its email and voicemail systems. After consulting with cyber-security experts and law enforcement, the District paid a $28,000 cyber-ransom in bitcoin. The district had a cyber-security insurance policy to cover such attacks.
- **December 18, 2016**—In Los Angeles County the possible exposure of 750,000+ personal data resulted from a phishing email which deceived 108 county officials into entering email and passwords. A Nigerian hacker was responsible for the attack. There has been no evidence that confidential information was breached.
- **May 2016**—Cyber-attack on Los Angeles County employees targeted 1,000 county employees with a phishing email. A Nigerian national was charged with the crime.
- **December 2014—**A cyberattack by a (suspected) Korean group against Sony Pictures published embarrassing private emails and threatened to attack theaters if they showed a satire depicting Korean leader Kim Jong Un.
- **September 2014**—A months-long cyber-attack on the University of California, Los Angeles hospital system compromised personal information for up to 4.5 million people.

11.3.2 Issues

The major issues for cybersecurity threats include:

- Encourage local businesses to adopt information technology and telecommunications recovery plans to prepare for and prevent cyberterrorism and cyberattacks.
- Develop continuity of operations plans for the City and work with the private sector to create business continuity plans in the event of a ransomware attack.

12. RISK RANKING

FEMA requires all hazard mitigation plans to include mitigation actions based on local risk, vulnerability and community priorities. For this plan, risk was calculated by multiplying probability by impact on people, property and the economy. The risk estimates were generated using methodologies promoted by FEMA. The Steering Committee reviewed, discussed and approved the methodology and results.

Numerical ratings of probability and impact were based on the hazard profiles and exposure and vulnerability evaluations presented in Chapters 6 through 9. Using that data, the City ranked the risk of all the natural hazards of concern described in this plan. When available, estimates of risk were generated with data from Hazus or GIS. For hazards of concern with less specific data available, qualitative assessments were used. As appropriate, results were adjusted based on local knowledge and other information not captured in the quantitative assessments. The hazards of interest described in Chapter 11 were not ranked for the following reasons:

- A key component of risk for the planning effort is probability of occurrence. The hazards of interest lack historical precedent for establishing recurrence intervals.
- Federal hazard mitigation planning regulations do not require the assessment of non-natural hazards (44 CFR, 201.6). It is FEMA's position that this is a local decision.

Risk ranking results are used to help establish mitigation priorities and inform the development of a mitigation action plan. The action plan includes mitigation actions, at a minimum, to address each hazard with a "high" or "medium" risk ranking. Actions that address hazards with a low or no hazard ranking are optional.

12.1 PROBABILITY OF OCCURRENCE

The probability of occurrence of a hazard is indicated by a factor based on likelihood of annual occurrence:

- High—Hazard event is likely to occur within 25 years (Probability Factor = 3)
- Medium—Hazard event is likely to occur within 100 years (Probability Factor =2)
- Low—Hazard event is not likely to occur within 100 years (Probability Factor =1)
- No exposure—There is no probability of occurrence (Probability Factor = 0)

The assessment of hazard frequency is generally based on past natural hazard events in the area. Table 12-1 summarizes the probability assessment for each natural hazard of concern for this plan.

Table 12-1. Probability of Hazards

Hazard Event	Probability (high, medium, low)	Probability Factor
Dam Failure	Medium	2
Drought/Extreme Heat	High	3
Earthquake	High	3
Flooding	Low	1[a]

a. The probability for flooding is based on the extent and location mapping for "Areas of Reduced Risk Due to Levees" mapping prepared by FEMA. This is considered to be a low probability, high consequence event under this ranking scheme.

12.2 IMPACT

Hazard impacts were assessed in three categories: impacts on people, impacts on property and impacts on the local economy. Numerical impact factors were assigned as follows:

- **People**—Values were assigned based on the percentage of the total ***population exposed*** to the hazard event. The degree of impact on individuals will vary and is not measurable, so the calculation assumes for simplicity and consistency that all people exposed to a hazard because they live in a hazard zone will be equally impacted when a hazard event occurs. Impact factors were assigned as follows:
  - High—50 percent or more of the population is exposed to a hazard (Impact Factor = 3)
  - Medium—25 percent to 49 percent of the population is exposed to a hazard (Impact Factor = 2)
  - Low—25 percent or less of the population is exposed to the hazard (Impact Factor = 1)
  - No impact—None of the population is exposed to a hazard (Impact Factor = 0)

  These quantitative values may be subjectively modified based on known experience.
- **Property**—Values were assigned based on the percentage of the total ***property value exposed*** to the hazard event:
  - High—30 percent or more of the total assessed property value is exposed to a hazard (Impact Factor = 3)
  - Medium—15 percent to 29 percent of the total assessed property value is exposed to a hazard (Impact Factor = 2)
  - Low—14 percent or less of the total assessed property value is exposed to the hazard (Impact Factor = 1)
  - No impact—None of the total assessed property value is exposed to a hazard (Impact Factor = 0)
- **Economy**—Values were assigned based on the percentage of the total ***property value vulnerable*** to the hazard event. Values represent estimates of the loss from a major event of each hazard in comparison to the total replacement value of the property exposed to the hazard. For some hazards, vulnerability was considered to be the same as exposure due to the lack of loss estimation tools specific to those hazards. Loss estimates separate from the exposure estimates were generated for the earthquake and flood hazards using Hazus.
  - High—Estimated loss from the hazard is 20 percent or more of the total exposed property value (Impact Factor = 3)
  - Medium—Estimated loss from the hazard is 10 percent to 19 percent of the total exposed property value (Impact Factor = 2)
  - Low—Estimated loss from the hazard is 9 percent or less of the total exposed property value (Impact Factor = 1)
  - No impact—No loss is estimated from the hazard (Impact Factor = 0)

The impacts of each hazard category were assigned a weighting factor to reflect the significance of the impact. These weighting factors are consistent with those typically used for measuring the benefits of hazard mitigation actions: impact on people was given a weighting factor of 3; impact on property was given a weighting factor of 2; and impact on the economy was given a weighting factor of 1. Table 12-2, Table 12-3 and Table 12-4 summarize the impacts for each hazard.

Table 12-2. Impact on People from Hazards

Hazard Event	Impact (high, medium, low)	Impact Factor	Multiplied by Weighting Factor (3)
Dam Failure	High	3	3x3=9
Drought/Extreme Heat	Medium	2	3x2=6
Earthquake	High	3	3x3=9
Flooding	High	3	3x3=9

Table 12-3. Impact on Property from Hazards

Hazard Event	Impact (high, medium, low)	Impact Factor	Multiplied by Weighting Factor (2)
Dam Failure	High	3	3x2=6
Drought/Extreme Heat	Low	1	1x2=2
Earthquake	High	3	3x2=6
Flooding	High	3	3x2=6

Table 12-4. Impact on Economy from Hazards

Hazard Event	Impact (high, medium, low)	Impact Factor	Multiplied by Weighting Factor (1)
Dam Failure	High	3	3x1=3
Drought/Extreme Heat	Low	1	1x1=1
Earthquake	High	3	3x1=3
Flooding	Medium	2	2x1=2

12.3 RISK RATING AND RANKING

The risk rating for each hazard was determined by multiplying the probability factor by the sum of the weighted impact factors for people, property and operations, as summarized in Table 12-5. Based on these ratings, a priority of high, medium or low was assigned to each hazard, as shown on Table 12-6.

Table 12-5. Hazard Risk Rating

Hazard Event	Probability Factor	Sum of Weighted Impact Factors	Total (Probability x Impact)
Dam Failure	2	9+6+3=18	2x18=36
Drought/Extreme Heat	3	6+2+1=9	3x9=27
Earthquake	3	9+6+3=18	3x18=54
Flooding	1	9+6+2=17	1x17=17

Table 12-6. Hazard Risk Ranking

Hazard Ranking	Hazard Event	Category
1	Earthquake (54)	High
2	Dam Failure (36)	High
3	Drought/ Extreme Heat (27)	Medium
4	Flooding (17)	Medium

PART 3—MITIGATION STRATEGY

13. MISSION STATEMENT, GOALS AND OBJECTIVES

Hazard mitigation plans must identify goals for reducing long-term vulnerabilities to identified hazards (44 CFR Section 201.6(c)(3)(i)). The Steering Committee established a mission statement, a set of goals and measurable objectives for this plan, based on data from the preliminary risk assessment and the results of the public involvement strategy. The mission statement, goals, objectives, and actions in this plan all support each other. Goals were selected to support the mission statement. Objectives were selected that meet multiple goals. Actions were prioritized based on ability to accomplish multiple objectives.

13.1 MISSION STATEMENT

The mission of the City of Norwalk Hazard Mitigation Plan is to establish and promote a mitigation policy and program to protect City residents and the business community, their property, public facilities, lifelines, and the environment from hazards.

13.2 GOALS

The Steering Committee determined the following goals for the Hazard Mitigation Plan:

1. Protect health and safety by minimizing the potential for loss of life and injury
2. Protect property by minimizing the potential for damage and increasing the resilience of infrastructure and lifelines
3. Protect the economy by minimizing financial impacts and public expenses due to hazards
4. Protect the environment
5. Increase community awareness by developing a public understanding of hazards along with methods to reduce community vulnerability

13.3 OBJECTIVES

The Steering Committee reviewed example objectives and identified the following objectives for this plan, based on approval by more than 50 percent of committee members:

1. Minimize the disruption of local government operations caused by hazards
2. Develop and provide updated information regarding threats, hazards, vulnerabilities, and mitigation strategies to public, private entities
3. Inform the public of exposure risks and hazards, along with ways to increase capacity to prevent, respond to, recover from, and mitigate impacts

4. Establish and maintain partnerships that identify and implement hazard mitigation measures
5. Encourage the incorporation of hazard mitigation best practices into plans, codes, projects, development, and regulatory standards
6. Advance community and environmental sustainability through preparation and participation in state, regional and local projects
7. Enhance emergency response capabilities and improve systems that provide warning and emergency communications
8. Ensure equitable access by and inclusion of the whole community to all hazard mitigation information, practices, planning, and benefits

14. MITIGATION BEST PRACTICES AND ADAPTIVE CAPACITY

14.1 MITIGATION BEST PRACTICES

Catalogs of hazard mitigation best practices were developed that present a broad range of alternatives to be considered for use in the mitigation action plan, in compliance with 44 CFR (Section 201.6(c)(3)(ii)). One catalog was developed for each hazard of concern evaluated in this plan. The catalogs present alternatives that are categorized in two ways:

- By who would have responsibility for implementation:
  - Individuals (personal scale)
  - Businesses (corporate scale)
  - Government (government scale)
- By what the alternative would do:
  - Manipulate the hazard
  - Reduce exposure to the hazard
  - Reduce vulnerability to the hazard
  - Increase the ability to respond to or be prepared for the hazard

The catalogs are lists of what could be considered to reduce risk from natural hazards in the planning area. They include practices that will mitigate current risk from hazards or help reduce new risk resulting from climate change. Hazard mitigation actions recommended in this plan were selected from an analysis of the best practices presented in the catalogs. The catalogs provide a baseline of mitigation alternatives that are backed by a planning process and are consistent with the established goals and objectives. Actions were selected out of the catalogs based on an analysis of the City's ability to implement them. Best practices in the catalog that are not included in the action plan were omitted for one or more of the following reasons:

- The action is not feasible
- The action is already being implemented
- The City does not have the capability to implement the action
- There is an apparently more cost-effective alternative
- The action does not have public or political support

The collections for each hazard are presented in Table 14-1 through Table 14-5.

Table 14-1. Alternatives to Mitigate the Dam Failure Hazard

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ None • **Reduce exposure to the hazard:** ❖ Relocate out of dam failure inundation zone. • **Reduce vulnerability to the hazard:** ❖ Elevate home to appropriate levels. • **Increase the ability to respond to or be prepared for the hazard:** ❖ Learn about risk reduction for the dam failure hazard. ❖ Learn the evacuation routes for a dam failure event. ❖ Educate yourself on early warning systems and the dissemination of warnings.	• **Manipulate the hazard:** ❖ Remove dams. ❖ Remove levees. ❖ Harden dams. • **Reduce exposure to the hazard:** ❖ Relocate critical facilities out of dam failure inundation zone. • **Reduce vulnerability to the hazard:** ❖ Flood-proof facilities within dam failure inundation zone. • **Increase the ability to respond to or be prepared for the hazard:** ❖ Educate employees on the probable impacts of a dam failure. ❖ Develop a continuity of operations plan.	• **Manipulate the hazard:** ❖ Remove dams. ❖ Remove levees. ❖ Harden dams. • **Reduce exposure to the hazard:** ❖ Relocate critical facilities out of dam failure inundation zone. ❖ Consider open space land use in designated dam failure inundation zone. • **Reduce vulnerability to the hazard:** ❖ Adopt higher floodplain standards in mapped dam failure inundation zone. ❖ Retrofit critical facilities within dam failure inundation zone. • **Increase the ability to respond to or be prepared for the hazard:** ❖ Map dam failure inundation zone. ❖ Enhance emergency operations plan to include a dam failure component. ❖ Institute monthly communications checks with dam operators. ❖ Inform the public on risk reduction techniques ❖ Adopt real-estate disclosure requirements for the re-sale of property located within dam failure inundation zone. ❖ Consider the probable impacts of climate in assessing the risk associated with the dam failure hazard. ❖ Establish early warning capability downstream of listed high hazard dams. ❖ Consider the residual risk associated with protection provided by dams in future land use decisions.

Table 14-2. Alternatives to Mitigate the Drought Hazard

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ None • **Reduce exposure to the hazard:** ❖ None • **Reduce vulnerability to the hazard:** ❖ Drought-resistant landscapes ❖ Reduce water system losses ❖ Modify plumbing systems (through water saving kits) • **Increase the ability to respond to or be prepared for the hazard:** ❖ Practice active water conservation	• **Manipulate the hazard:** ❖ None • **Reduce exposure to the hazard:** ❖ None • **Reduce vulnerability to the hazard:** ❖ Drought-resistant landscapes ❖ Reduce private water system losses • **Increase the ability to respond to or be prepared for the hazard:** ❖ Practice active water conservation	• **Manipulate the hazard:** ❖ Groundwater recharge through stormwater management • **Reduce exposure to the hazard:** ❖ None • **Reduce vulnerability to the hazard:** ❖ Identify and create groundwater backup sources ❖ Water use conflict regulations ❖ Reduce water system losses ❖ Distribute water saving kits • **Increase the ability to respond to or be prepared for the hazard:** ❖ Public education on drought resistance ❖ Encourage recycling ❖ Identify alternative water supplies for times of drought; mutual aid agreements with alternative suppliers ❖ Develop drought contingency plan ❖ Develop criteria “triggers” for drought-related actions ❖ Improve accuracy of water supply forecasts ❖ Modify rate structure to influence active water conservation techniques

Table 14-3. Alternatives to Mitigate the Extreme Heat Hazard

Personal-Scale	Corporate-Scale	Government-Scale
Manipulate the hazard: ❖ None **Reduce exposure to the hazard:** ❖ None **Reduce vulnerability to the hazard:** ❖ Insulate house ❖ Provide redundant heat and power ❖ Insulate structure ❖ Plant appropriate trees near home and power lines ("Right tree, right place" National Arbor Day Foundation Program) **Increase the ability to respond to or be prepared for the hazard:** ❖ Trim or remove trees that could affect power lines ❖ Promote 72-hour self-sufficiency ❖ Obtain a NOAA weather radio. ❖ Obtain an emergency generator.	**Manipulate the hazard:** ❖ None **Reduce exposure to the hazard:** ❖ None **Reduce vulnerability to the hazard:** ❖ Relocate critical infrastructure (such as power lines) underground ❖ Reinforce or relocate critical infrastructure such as power lines to meet performance expectations ❖ Install tree wire **Increase the ability to respond to or be prepared for the hazard:** ❖ Trim or remove trees that could affect power lines ❖ Create redundancy ❖ Equip facilities with a NOAA weather radio ❖ Equip vital facilities with emergency power sources.	**Manipulate the hazard:** ❖ None **Reduce exposure to the hazard:** ❖ None **Reduce vulnerability to the hazard:** ❖ Harden infrastructure such as locating utilities underground ❖ Trim trees back from power lines ❖ Consider "cool roofs" and "green roofs" **Increase the ability to respond to or be prepared for the hazard:** ❖ Support programs such as "Tree Watch" that proactively manage problem areas through use of selective removal of hazardous trees, tree replacement, etc. ❖ Establish and enforce building codes that require all roofs to withstand snow loads ❖ Increase communication alternatives ❖ Modify land use and environmental regulations to support vegetation management activities that improve reliability in utility corridors. ❖ Modify landscape and other ordinances to encourage appropriate planting near overhead power, cable, and phone lines ❖ Provide NOAA weather radios to the public

Table 14-4. Alternatives to Mitigate the Earthquake Hazard

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ None • **Reduce exposure to the hazard:** ❖ Locate outside of hazard area (off soft soils) • **Reduce vulnerability to the hazard:** ❖ Retrofit structure (anchor house structure to foundation) ❖ Secure household items that can cause injury or damage (such as water heaters, bookcases, and other appliances) ❖ Build to higher design • **Increase the ability to respond to or be prepared for the hazard:** ❖ Practice "drop, cover, and hold" ❖ Develop household mitigation plan, such as creating a retrofit savings account, communication capability with outside, 72-hour self-sufficiency during an event ❖ Keep cash reserves for reconstruction ❖ Become informed on the hazard and risk reduction alternatives available. ❖ Develop a post-disaster action plan for your household	• **Manipulate the hazard:** ❖ None • **Reduce exposure to the hazard:** ❖ Locate or relocate mission-critical functions outside hazard area where possible • **Reduce vulnerability to the hazard:** ❖ Build redundancy for critical functions and facilities ❖ Retrofit critical buildings and areas housing mission-critical functions • **Increase the ability to respond to or be prepared for the hazard:** ❖ Adopt higher standard for new construction; consider "performance-based design" when building new structures ❖ Keep cash reserves for reconstruction ❖ Inform your employees on the possible impacts of earthquake and how to deal with them at your work facility. ❖ Develop a continuity of operations plan	• **Manipulate the hazard:** ❖ None • **Reduce exposure to the hazard:** ❖ Locate critical facilities or functions outside hazard area where possible • **Reduce vulnerability to the hazard:** ❖ Harden infrastructure ❖ Provide redundancy for critical functions ❖ Adopt higher regulatory standards • **Increase the ability to respond to or be prepared for the hazard:** ❖ Provide better hazard maps ❖ Provide technical information and guidance ❖ Enact tools to help manage development in hazard areas (e.g., tax incentives, information) ❖ Include retrofitting and replacement of critical system elements in capital improvement plan ❖ Develop strategy to take advantage of post-disaster opportunities ❖ Warehouse critical infrastructure components such as pipe, power line, and road repair materials ❖ Develop and adopt a continuity of operations plan ❖ Initiate triggers guiding improvements (such as <50% substantial damage or improvements) ❖ Further enhance seismic risk assessment to target high hazard buildings for mitigation opportunities. Develop a post-disaster action plan that includes grant funding and debris removal components.

Table 14-5. Alternatives to Mitigate the Flood Hazard

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ Clear storm drains and culverts ❖ Use low-impact development techniques • **Reduce exposure to the hazard:** ❖ Locate outside of hazard area ❖ Elevate utilities above base flood elevation ❖ Use low-impact development techniques • **Reduce vulnerability to the hazard:** ❖ Raise structures above base flood elevation ❖ Elevate items within house above base flood elevation ❖ Build new homes above base flood elevation ❖ Flood-proof structures • **Increase the ability to respond to or be prepared for the hazard:** ❖ Buy flood insurance ❖ Develop household plan, such as retrofit savings, communication with outside, 72-hour self-sufficiency during and after an event	• **Manipulate the hazard:** ❖ Clear storm drains and culverts ❖ Use low-impact development techniques • **Reduce exposure to the hazard:** ❖ Locate critical facilities or functions outside hazard area ❖ Use low-impact development techniques • **Reduce vulnerability to the hazard:** ❖ Build redundancy for critical functions or retrofit critical buildings ❖ Provide flood-proofing when new critical infrastructure must be located in floodplains • **Increase the ability to respond to or be prepared for the hazard:** ❖ Keep cash reserves for reconstruction ❖ Support and implement hazard disclosure for sale of property in risk zones. ❖ Solicit cost-sharing through partnerships with others on projects with multiple benefits.	• **Manipulate the hazard:** ❖ Maintain drainage system ❖ Institute low-impact development techniques on property ❖ Dredging, levee construction, and providing regional retention areas ❖ Structural flood control, levees, channelization, or revetments. ❖ Stormwater management regulations and master planning ❖ Acquire vacant land or promote open space uses in developing watersheds to control increases in runoff • **Reduce exposure to the hazard:** ❖ Locate or relocate critical facilities outside of hazard area ❖ Acquire or relocate identified repetitive loss properties ❖ Promote open space uses in identified high hazard areas via techniques such as: planned unit developments, easements, setbacks, greenways, sensitive area tracks. ❖ Adopt land development criteria such as planned unit developments, density transfers, clustering ❖ Institute low impact development techniques on property ❖ Acquire vacant land or promote open space uses in developing watersheds to control increases in runoff • **Reduce vulnerability to the hazard:** ❖ Harden infrastructure, bridge replacement program ❖ Provide redundancy for critical functions and infrastructure ❖ Adopt regulatory standards such as freeboard standards, cumulative substantial improvement or damage, lower substantial damage threshold; compensatory storage, non-conversion deed restrictions. ❖ Stormwater management regulations and master planning. ❖ Adopt “no-adverse impact” floodplain management policies that strive to not increase the flood risk on downstream communities. • **Increase the ability to respond to or be prepared for the hazard:** ❖ Produce better hazard maps ❖ Provide technical information and guidance ❖ Enact tools to help manage development in hazard areas (stronger controls, tax incentives, and information) ❖ Incorporate retrofitting or replacement of critical system elements in capital improvement plan ❖ Develop strategy to take advantage of post-disaster opportunities ❖ Warehouse critical infrastructure components ❖ Develop and adopt a continuity of operations plan ❖ Consider participation in the Community Rating System ❖ Maintain and collect data to define risks and vulnerability ❖ Train emergency responders ❖ Create an elevation inventory of structures in the floodplain ❖ Develop and implement a public information strategy ❖ Charge a hazard mitigation fee ❖ Integrate floodplain management policies into other planning mechanisms within the planning area. ❖ Consider the probable impacts of climate change on the risk associated with the flood hazard ❖ Consider residual risk associated with structural flood control in land use decisions ❖ Enforce National Flood Insurance Program ❖ Adopt a Stormwater Management Master Plan

14.2 ADAPTIVE CAPACITY

Adaptive capacity is defined as "the ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences" (IPCC, 2014). This term is typically used while discussing climate change adaptation; however, it is similar to the alternatives presented in the tables for building local capacity. The following are general alternatives that can be considered to build capacity for adapting to current and future risks:

- Incorporate climate change adaptation into relevant local and regional plans and projects.
- Establish a climate change adaptation and hazard mitigation public outreach and education program.
- Build collaborative relationships between regional entities and neighboring communities to promote complementary adaptation and mitigation strategy development and regional approaches.
- Establish an ongoing monitoring program to track local and regional climate impacts and adaptation strategy effectiveness.
- Increase participation of low-income, immigrant, non-English-speaking, racially and ethnically diverse, and special-needs residents in planning and implementation.
- Ask local employers and business associations to participate in local efforts to address climate change and natural hazard risk reduction.
- Conduct a communitywide assessment and develop a program to address health, socioeconomic, and equity vulnerabilities.
- Focus planning and intervention programs on neighborhoods that currently experience social or environmental injustice or bear a disproportionate burden of potential public health impacts.
- Use performance metrics and data to evaluate and monitor the impacts of climate change and natural hazard risk reduction strategies on public health and social equity.
- Develop coordinated plans for mitigating future flood and related impacts through concurrent adoption of updated general plan safety elements and local hazard mitigation plans.
- Update safety elements to reflect existing hazards and projected climate change impacts on hazards.
- Implement general plan safety elements through zoning and subdivision practices that restrict development in floodplains and other natural hazard areas.
- Identify and protect locations where native species may shift or lose habitat due to climate change impacts (sea level rise, loss of wetlands, warmer temperatures, drought).
- Collaborate with agencies managing public lands to identify, develop, or maintain corridors and linkages between undeveloped areas.
- Promote economic diversity.
- Incorporate consideration of climate change impacts as part of infrastructure planning and operations.
- Conduct a climate impact assessment on community infrastructure.
- Identify gaps in legal and regulatory capabilities and develop ordinances or guidelines to address them.
- Identify and pursue new sources of funding for mitigation and adaptation activities.
- Hire new staff or provide training to current staff to ensure an adequate level of administrative and technical capability to pursue mitigation and adaptation activities.

15. MITIGATION ACTION PLAN

15.1 ACTION PLAN

The Steering Committee reviewed the collections of hazard mitigation alternatives and selected 16 actions to be included in the hazard mitigation action plan. The selection of actions was based on the risk assessment of identified hazards of concern and the defined hazard mitigation goals and objectives. Table 15-1 lists the recommended hazard mitigation actions that make up the action plan. The timeframe indicated in the table is defined as follows:

- Short Term = to be completed in 1 to 5 years
- Long Term = to be completed in greater than 5 years
- Ongoing = currently being funded and implemented under existing programs

Table 15-1. Action Plan

Affects New or Existing Assets	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action NOR-1—Develop and conduct a multi-hazard seasonal public awareness program for the residents of the Norwalk community. *Hazards Mitigated:* Dam Failure, Drought/Extreme Heat, Earthquake, Flood					
Existing	2, 3, 4, 7, 8	Emergency Management Office	Low	General Funds	Ongoing
Action NOR-2—Develop and conduct a seismic vulnerability study of Norwalk's critical facilities and infrastructure. *Hazards Mitigated:* Earthquake					
New & Existing	1, 3, 5, 6	Emergency Management Office	High	General Funds, Grant Funding-FEMA HMA-(BRIC, FMA and HMGP)	Long-term
Action NOR-3—Assess the City's stormwater facilities for their capacity, capability, and functionality during extreme storm events. *Hazards Mitigated:* Dam Failure, Flood					
Existing	1, 2, 5	Emergency Management Office, Public Works	High	General Funds, Grant Funding- FEMA HMA-(BRIC, FMA and HMGP)	Ongoing
Action NOR-4—Acquire emergency generators for critical facilities and infrastructure that lack backup power capability. *Hazards Mitigated:* Dam Failure, Drought/Extreme Heat, Earthquake, Flood					
Existing	1, 5, 6	Emergency Management Office, Public Works	Medium	General Funds, Grant Funding- FEMA HMA-(BRIC, FMA and HMGP)	Short-term
Action NOR-5—Develop and conduct a risk assessment plan for soft story buildings in the City of Norwalk. *Hazards Mitigated:* Earthquake					
Existing	2, 3, 4, 5, 6	Emergency Management Office, Planning and Public Works	High	General Funds, Grant Funding FEMA HMA-(BRIC, FMA and HMGP)	Long-term

Affects New or Existing Assets	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action NOR-6—Develop the City of Norwalk's capacity to integrate geographic information system (GIS) hazard mapping into planning documents.					
Hazards Mitigated: Dam Failure, Drought/Extreme Heat, Earthquake, Flood					
New & Existing	2, 3, 4, 5, 6	Emergency Management Office, Planning Dept.	Medium	General Funds, BRIC (C&CB)	Long-term
Action NOR-7—Provide information to new home and property buyers on earthquake, fire, and multi-hazard safety.					
Hazards Mitigated: Dam Failure, Drought/Extreme Heat, Earthquake, Flood					
Existing	2, 3, 6, 7	Emergency Management Office	Low	General Funds	Ongoing
Action NOR-8—Develop and implement a climate action/adaptation plan for the City of Norwalk.					
Hazards Mitigated: Drought/Extreme Heat, Flood					
New & Existing	1, 2, 3, 4, 5, 6, 8	City Planning Department, Emergency Management	Medium	General Funds, Grant Funding BRIC (C&CB)	Long-term
Action NOR-9—Coordinate with appropriate stakeholders on the strengthening and/or retrofitting of the Whittier Narrows Dam.					
Hazards Mitigated: Dam Failure					
Existing	1, 4, 5	Emergency Management Office, U.S. Army Corps of Engineers	Low	General Funds	Long-term
Action NOR-10—Evaluate long-term capacity and capability of the City's designated cooling centers and shelters.					
Hazards Mitigated: Extreme Heat					
New & Existing	1, 2, 3, 6, 7, 8	Emergency Management Office, Planning	Medium	General Funds, Grant Funding BRIC (C&CB)	Ongoing
Action NOR-11—Investigate and evaluate flood control systems, including but not limited to permeable pavement and catchwater systems, that can address urban flooding and stormwater surges.					
Hazards Mitigated: Dam Failure, Drought, Flood					
New & Existing	1, 2, 5, 6	Emergency Management Office, Planning, Public Works	High	General Funds, Grant Funding BRIC (C&CB)	Long-term
Action NOR-12—Continue to maintain the City's good standing and compliance under the NFIP through implementation of floodplain management programs that, at a minimum, meet the NFIP requirements: • Enforce the flood damage prevention ordinance. • Participate in floodplain identification and mapping updates. • Provide public assistance/information on floodplain requirements and impacts.					
Hazards Mitigated: Dam Failure, Flood					
New & Existing	1, 2, 3, 5, 6, 8	Public Works	Low	General Fund	Ongoing
Action NOR-13—To support implementation of any future updates to the City's local hazard mitigation plan and safety element, use the best available local data on hazard extent and location to inform development and redevelopment within the City.					
Hazards Mitigated: Dam Failure, Drought/Extreme Heat, Earthquake, Flood					
New & Existing	1, 3, 4, 5, 6	Planning	Low	General Fund	Ongoing
Action NOR-14—Revise the emergency operations plan, including functional annexes, to include new information from the hazard mitigation plan to ensure coordination between the plans.					
Hazards Mitigated: Dam Failure, Drought/Extreme Heat, Earthquake, Flood					
New & Existing	1, 6, 7	Emergency Management Office	Low	General Fund, EMPG/HSGP grants	Short Term

Affects New or Existing Assets	Objectives Met	Lead Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action NOR-15— Acquire mobile camera systems with the ability to deploy at critical facilities to monitor mitigation efforts during incidents. System will be able to deploy at strategic sites throughout the city to monitor areas for early warning detection of hazards such as flooding, earthquake, or man-made issues. System will support implementation of any future updates to the City's local hazard mitigation plan and safety element, use the best available local data on hazard extent and location to inform development and redevelopment within the City. *Hazards Mitigated:* Dam Failure, Earthquake, Flood					
New & Existing	1, 2, 5, 7	Emergency Management Office	Low	Grant funding-EMPG/HSGP grants	Long term
Action NOR-16—Acquire a GIS mapping tool that can create visual representations of City critical facilities and how they may be impacted by hazards such as flooding, dam failure, earthquakes. The goal is to help identify locations that might be impacted by hazards and to look at strategies to mitigate them. *Hazards Mitigated:* Dam Failure, Drought/Extreme Heat, Earthquake, Flood					
New & Existing	1, 2, 5, 7	Emergency Management Office	Low	Grant funding BRIC (C&CB), HMGP (5% Initiative)	Long term

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

15.2 ACTION PLAN PRIORITIZATION

The actions recommended in the action plan were prioritized based on the following factors:

- Cost and availability of funding
- Benefit, based on likely risk reduction to be achieved
- Number of plan objectives achieved
- Timeframe for project implementation
- Eligibility for grant funding programs

Two priorities were assigned for each action:

- A high, medium, or low priority for implementing the action
- A high, medium, or low priority for pursuing grant funding for the action

The sections below describe the analysis of benefits and costs and the assignment of the two priority ratings.

15.2.1 Benefit/Cost Review

The action plan must be prioritized according to a benefit/cost analysis of the proposed actions (44 CFR, Section 201.6(c)(3)(iii)). For this hazard mitigation plan, a qualitative benefit-cost review was performed for each action by assigning ratings for benefit and cost as follows:

- Cost:
  - **High**—Existing funding will not cover the cost of the action; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases).
  - **Medium**—The action could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the action would have to be spread over multiple years.

  - **Low**—The action could be funded under the existing budget. The action is part of or can be part of an ongoing existing program.

- Benefit:
  - **High—**Action will provide an immediate reduction of risk exposure for life and property.
  - **Medium—**Action will have a long-term impact on the reduction of risk exposure for life and property, or action will provide an immediate reduction in the risk exposure for property.
  - **Low—**Long-term benefits of the action are difficult to quantify in the short term.

To assign priorities, each action with a benefit rating equal to or higher than its cost rating (such as high benefit/medium cost, medium benefit/medium cost, medium benefit/low cost, etc.) was considered to be cost-beneficial. This is not the detailed level of benefit/cost analysis required for some FEMA hazard-related grant programs. Such analysis would be performed at the time a given action is being submitted for grant funding.

15.2.2 Implementation Priority

The priority for implementing each action was assigned based on the following definitions:

- **High Priority**—An action that meets multiple objectives, has benefits that exceed costs, and has a secured source of funding. Action can be completed in the short term (1 to 5 years).
- **Medium Priority**—An action that meets multiple objectives, has benefits that exceed costs, and is eligible for funding though no funding has yet been secured for it. Action can be completed in the short term (1 to 5 years) once funding is secured. Medium-priority actions become high-priority actions once funding is secured.
- **Low Priority**—An action that will mitigate the risk of a hazard, has benefits that do not exceed the costs or are difficult to quantify, has no secured source of funding, and is not eligible for any known grant funding. Action can be completed in the long term (1 to 10 years). Low-priority actions are generally "wish-list" actions. They may be eligible for grant funding from programs that have not yet been identified.

15.2.3 Grant Pursuit Priority

The priority for pursuing grant funding for each action was assigned based on the following definitions:

- **High Priority**—An action that meets identified grant eligibility requirements, has high benefits, and is listed as high or medium implementation priority; local funding options are unavailable or available local funds could be used instead for actions that are not eligible for grant funding.
- **Medium Priority**—An action that meets identified grant eligibility requirements, has medium or low benefits, and is listed as medium or low implementation priority; local funding options are unavailable.
- **Low Priority**—An action that has not been identified as meeting any grant eligibility requirements.

15.2.4 Prioritization Summary for Mitigation Actions

Table 15-2 lists the priority of each recommended action.

Table 15-2. Prioritization of Actions

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority	Grant Priority
NOR-1	5	Medium	Low	Yes	Yes	Yes	High	Medium
NOR-2	4	High	High	Yes	Yes	No	Medium	High
NOR-3	3	High	High	Yes	Yes	No	Medium	High
NOR-4	3	High	Medium	Yes	Yes	Yes	Medium	High
NOR-5	5	High	High	Yes	Yes	No	Medium	High
NOR-6	5	Medium	Medium	Yes	Yes	Yes	High	Medium
NOR-7	4	Medium	Low	Yes	No	Yes	High	N/A
NOR-8	7	High	Medium	Yes	Yes	Yes	High	High
NOR-9	3	Medium	Low	Yes	No	Yes	High	N/A
NOR-10	6	High	Medium	Yes	Yes	Yes	High	High
NOR-11	4	High	High	Yes	Yes	No	Medium	High
NOR-12	6	High	Low	Yes	No	Yes	High	N/A
NOR-13	5	High	Low	Yes	No	Yes	High	N/A
NOR-14	3	High	Low	Yes	Yes	Yes	High	High
NOR-15	4	High	Medium	Yes	Yes	No	Medium	High
NOR-16	4	High	Meduim	Yes	Yes	No	Medium	High

15.3 CLASSIFICATION OF ACTIONS

Each recommended action was classified based on the hazard it addresses and the type of mitigation it involves. Mitigation types used for this classification are as follows:

- **Prevention**—Government, administrative or regulatory actions that influence the way land and buildings are developed to reduce hazard losses. Includes planning and zoning, floodplain laws, capital improvement programs, open space preservation, and stormwater management regulations.
- **Property Protection**—Modification of buildings or structures to protect them from a hazard or removal of structures from a hazard area. Includes acquisition, elevation, relocation, structural retrofit, storm shutters, and shatter-resistant glass.
- **Public Education and Awareness**—Actions to inform residents and elected officials about hazards and ways to mitigate them. Includes outreach projects, real estate disclosure, hazard information centers, and school-age and adult education.
- **Natural Resource Protection**—Actions that minimize hazard loss and preserve or restore the functions of natural systems. Includes sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, wetland restoration and preservation, and green infrastructure.
- **Emergency Services**—Actions that protect people and property during and immediately after a hazard event. Includes warning systems, emergency response services, and the protection of essential facilities.
- **Structural Projects**—Actions that involve the construction of structures to reduce the impact of a hazard. Includes dams, setback levees, floodwalls, retaining walls, and safe rooms.
- **Climate Resiliency**—Actions that incorporate methods to mitigate and/or adapt to the impacts of climate change. Includes aquifer storage and recovery activities, incorporating future conditions projections in

project design or planning, or actions that specifically address jurisdiction-specific climate change risks, such as sea level rise or urban heat island effect.

- **Community Capacity Building**—Actions that increase or enhance local capabilities to adjust to potential damage, to take advantage of opportunities, or to respond to consequences. Includes staff training, memorandums of understanding, development of plans and studies, and monitoring programs.

Table 15-3 shows the classification based on this analysis.

Table 15-3. Classification of Actions

Hazard	Actions That Address the Hazard, by Mitigation Type							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resiliency	Community Capacity Building
Dam Failure	6, 9, 11, 12, 13	3, 12, 15, 16	1, 6, 7, 12	11	4, 14, 15, 16	3,15,16	11, 13	1, 7, 9, 11, 12, 14
Drought/Extreme Heat	6, 8, 10, 11, 13		1, 6, 7	11	4, 14		8, 11, 13	1, 7, 10, 11, 14
Earthquake	6, 13	2, 5,15,16	1, 6, 7		4, 14,15,16	2,15,16	13	1, 7, 14
Flooding	6, 8, 11, 12, 13	3, 12,15,16	1, 6, 7, 12	11	4, 14,15,16	3,15,16	8, 11, 13	1, 7, 11, 12, 14

16. PLAN ADOPTION, IMPLEMENTATION AND MAINTENANCE

16.1 PLAN ADOPTION

A hazard mitigation plan must document that it has been formally adopted by the governing body of the jurisdiction requesting federal approval of the plan (44 CFR Section 201.6(c)(5)). DMA compliance and its benefits cannot be achieved until the plan is adopted. This plan was submitted for a pre-adoption review to Cal OES and FEMA prior to adoption. Once pre-adoption approval was provided, the City of Norwalk formally adopted the plan. FEMA then issued final approval of the adopted plan. The City's adoption resolution and FEMA's final approval letter are provided in Appendix D.

16.2 PLAN IMPLEMENTATION

The effectiveness of the hazard mitigation plan depends on its implementation and the incorporation of its action items into existing local plans, policies, and programs. Together, the action items in the plan provide a framework for activities that the City of Norwalk can implement over the next five years. The planning team and the Steering Committee have established goals and objectives and have prioritized mitigation actions that will be implemented through existing plans, policies, and programs.

The City of Norwalk Emergency Management Office will have lead responsibility for overseeing the plan implementation and maintenance strategy. Plan implementation and evaluation will be a shared responsibility among all agencies identified as lead agencies in the mitigation action plan.

16.3 PLAN MAINTENANCE

Plan maintenance is the formal process for achieving the following:

- Ensuring that the hazard mitigation plan remains an active and relevant document and that the City maintains its eligibility for applicable funding sources
- Monitoring and evaluating the plan annually and producing an updated plan every five years
- Integrating public participation throughout the plan maintenance and implementation process
- Incorporating the mitigation strategies outlined in this plan into existing planning mechanisms and programs, such as any relevant comprehensive land-use planning process, capital improvement planning process, and building code enforcement and implementation

To achieve these ends, a hazard mitigation plan must present a plan maintenance process that includes the following (44 CFR Section 201.6(c)(4)):

- A method and schedule for monitoring, evaluating, and updating the mitigation plan within a 5-year cycle
- An approach for how the community will continue public participation in the plan maintenance process
- A process by which local governments will incorporate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate

Table 16-1 summarizes the plan maintenance strategy. The sections below further describe each element.

Table 16-1. Plan Maintenance Matrix

Approach	Timeline	Lead Responsibility
Integration into Other Planning Mechanisms		
Create a linkage between the hazard mitigation plan and the City's general plan or similar plans identified in the core capability assessments	Continuous over the 5-year performance period of the plan	City of Norwalk Planning Department
Plan Monitoring		
Track the implementation of actions over the performance period of the plan	Continuous over the 5-year performance period of the plan	Emergency Management Office
Plan Evaluation		
Review the status of previous actions; assess changes in risk; evaluate success of integration	Upon initiation of hazard mitigation plan update, comprehensive general plan update, or major disaster	Emergency Management Office
Grant Monitoring and Coordination		
As grant opportunities present themselves, the City will consider options to pursue grants to fund actions identified in this plan	As grants become available	Emergency Management Office
Plan Update		
Begin the process, at a minimum, every 5 years to develop a comprehensive update of the plan.	Every 5 years or upon comprehensive update to General Plan or major disaster; funding and organizing for plan update will begin in FY 2021/2022	Emergency Management Office
Continuing Public Participation		
Keep the website maintained, hold public meeting review once a year (these meetings are also televised and on public notices in community newspaper), and receive comments through the website. The website and comments will be maintained over the course of the plan.	Continuous over the 5-year performance period of the plan	Emergency Management Office

16.3.1 Integration with Other Planning Mechanisms

It is the intent of the City of Norwalk to fully integrate the hazard mitigation plan into existing plans and programs, such as comprehensive land-use planning processes, capital improvement planning, and building enforcement implementation. The hazard mitigation plan's format allows sections to be reviewed and updated as new data becomes available, resulting in a plan that remains current and relevant.

The City of Norwalk, through adoption of a General Plan and zoning ordinance, has planned for the impact of natural hazards. The process of updating this hazard mitigation plan provided the opportunity to review and expand on policies in these planning mechanisms. The information on hazard, risk, vulnerability, and mitigation contained in this hazard mitigation plan is based on the best science and technology available at the time this plan was prepared. The General Plan and the hazard mitigation plan are complementary documents that work together

to achieve the goal of reducing risk exposure. The General Plan is an integral part of this plan. An update to the General Plan may trigger an update to the hazard mitigation plan.

The City of Norwalk will create a linkage between the hazard mitigation plan and the General Plan by identifying a mitigation action as such and giving that action a high priority. Other planning processes and programs to be coordinated with the recommendations of the hazard mitigation plan include the following:

- City of Norwalk General Plan
- Climate action/Adaptation plans
- Resilience plans
- Recovery plan
- Emergency response plans
- Capital improvement programs
- Municipal codes
- Community design guidelines
- Water-efficient landscape design guidelines
- Stormwater management programs
- Water system vulnerability assessments
- Master fire protection plans

Some action items do not need to be implemented through regulation. Instead, these items can be implemented through the creation of new educational programs, continued interagency coordination, or improved public participation. As information becomes available from other planning mechanisms that can enhance this plan, that information will be integrated via the update process.

16.3.2 Plan Monitoring

The City of Norwalk Emergency Management Office will be the lead agency responsible for monitoring the plan by tracking the status of all recommended mitigation actions in the action plan.

16.3.3 Plan Evaluation

The plan will be evaluated by how successfully the implementation of identified actions has helped to achieve the goals and objectives identified of the plan. This will be assessed by a review of the changes in risk that occur over the performance period and by the degree to which mitigation goals and objectives are incorporated into existing plans, policies and programs. Plan evaluation will be the responsibility of the City of Norwalk Emergency Management Office. The Norwalk Mayor and City Council may recommend changes to the hazard mitigation plan based on evaluation findings.

16.3.4 Midterm Progress Report

Completion of a midterm progress report would be an effective tool to position the City for future updates. This report will provide the City with a streamlined approach for fulfilling update requirements delineated in 44 CFR

201.6(d)(3) during the next plan update initiative. Any trigger of a comprehensive update to the *City of Norwalk Hazard Mitigation Plan* as described in Section 16.3.6 will require completion of a performance period progress report.

The objective of the progress report will be to evaluate the progress of individual actions at the midterm of the performance period of this plan. The progress report will be completed two and a half years from the date of plan approval by FEMA, or upon initiation of an accelerated plan update as described under Section 16.3.6, whichever occurs first. The review will include the following:

- Summary of any hazard events that occurred during the performance period and the impact these events had on the planning area
- Review of mitigation success stories
- Review of continuing public involvement
- Brief discussion about why targeted strategies were not completed
- Reevaluation of the action plan to determine if the timeline for identified projects needs to be amended (such as changing a long-term project to a short-term one because of new funding)
- Recommendations for new projects
- Changes in or potential for new funding options (grant opportunities)
- Impact of any other planning programs or initiatives that involve hazard mitigation

The City has created a template to guide its departments in preparing a progress report (see Appendix E). This report will be used as follows:

- Posted on the hazard mitigation website dedicated to the hazard mitigation plan
- Provided to the local media through a press release
- Presented to City Council to inform council members of the progress of actions implemented during the reporting period

Progress reporting is not a requirement specified under 44 CFR. However, it may enhance the City's opportunities for funding. While failure to implement this component of the plan maintenance strategy will not jeopardize the City's compliance under the DMA, it may jeopardize its opportunity to partner and leverage funding opportunities with other stakeholders within the planning area.

16.3.5 Grant Monitoring and Evaluation

The City of Norwalk Emergency Management Office will identify grant funding opportunities. Once these opportunities are identified, City agency stakeholders will convene in a short meeting to review the hazard mitigation plan and pursue a strategy to capture that grant funding. The Emergency Management Division will assume lead responsibility for planning and facilitating grant opportunity meetings. Review of the hazard mitigation plan at these meetings can include the following:

- Discussion of any hazard events that occurred during the prior year and their impact on the planning area
- Impact of potential grant opportunities on the implementation of mitigation actions
- Re-evaluation of the action plans to determine if the timeline for identified actions needs to be amended (such as changing a long-term action to a short-term action because of funding availability)

- Recommendations for new actions
- Impact of any other planning programs or initiatives that involve hazard mitigation

16.3.6 Plan Update

FEMA requires the hazard mitigation plan to be revised and resubmitted for review and approval by Cal OES and FEMA prior to the five-year anniversary date of the plan's adoption in order to remain eligible for benefits under the DMA (44 CFR, Section 201.6(d)(3)). To meet this timeline, the Emergency Management Division will implement the Steering Committee's plan revision process at least one year prior to the anniversary date of the adoption. This cycle may be accelerated to less than five years based on the following triggers:

- A federal disaster declaration that impacts the City of Norwalk
- A hazard event that causes loss of life
- A comprehensive update of the City of Norwalk general plan

The hazard mitigation plan five-year revision will, at a minimum, include the following elements:

- The revision process will be convened through a new steering committee
- The hazard risk assessment will be reviewed and, if necessary, revised using best available information and technologies
- The action plan will be reviewed for any actions completed, ongoing, or withdrawn, and will be reconciled to account for changes in the risk assessment or new policies identified under other plans (such as the general plan)
- The draft plan revision will be sent to appropriate departments and divisions for comment
- The public will be given an opportunity to comment on the revised plan prior to adoption
- The Norwalk City Council will adopt the updated plan once the reviews by Cal OES and FEMA have been conducted

16.3.7 Continuing Public Involvement

The public will continue to be apprised of the plan's progress through the City website and by providing copies of biennial progress reports on the City website and through posting them in locations throughout the City for the public to review. The website will house the final plan and provide information regarding the plan, plan implementation, and the beginning of the revision process. Copies of the plan will be distributed to local libraries. Upon initiation of future update processes, a new public involvement strategy will be initiated based on guidance from a new steering committee. This strategy will be based on the needs and capabilities of the City of Norwalk at the time of the update. At a minimum, this strategy will include the use of local media outlets within the planning area.

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Appendix A. Public Outreach Materials

Steering Committee Meeting Information

City of Norwalk Hazard Mitigation Plan
Steering Committee Meeting #1

Date/Time of Meeting:	Friday, February 12, 2021
Location:	Digital
Subject:	Steering Committee Meeting No. 1
Project Name:	City of Norwalk Hazard Mitigation Plan
In Attendance	**Attendees:** *DMAC, SoCal Gas, Athens Servics, SoCal Edison, NLMUSD, LLCSD*
	Planning Team: Gabriela Garcia, Eric Wosick, Rob Flaner, Bart Spencer, Jeana Wiser, Des Alexander
Not Present:	*LASD, LAFD (both representatives), Golden State, Liberty Utilities*
Summary Prepared by:	Des Alexander
Quorum – Yes or No	Yes

Welcome and Introductions

- Gabriela and Eric introduced themselves as co-emergency managers and the chairs of this committee
- Committee members were asked to introduce themselves and
- Tetra Tech introduced their team and their roles in the project

Core Planning Team

- Bart Spencer discusses the purpose and the membership of the Core Planning Team. He explains that the purpose of the CPT is to develop the framework for the plan, and to discuss relevant hazards and other information regarding the plan. The CPT is made up of City of Norwalk staff, the Tetra Tech team, and other departments that may be relevant to plan development. The work of the CPT will be brought to the steering committee for review.

Steering Committee Role

- Bart then discusses the purpose and expectations of the steering committee. The purpose of the SC is to engage outside stakeholders and the public, as well as to provide guidance to the CPT. The SC can provide a greater perspective on the hazards and needs of the community.
- Bart also goes through the ground rules of the SC with the committee.
    - Attendance – SC members are asked to commit to attending all meetings (5-6 currently planned) and to let the Chair or Vice Chair know if they cannot attend
    - Quorum – 6 out of 13 members currently, but will adjust if needed
    - Alternates – Bart said they are not required, unless organizations know they have conflicts. SoCal Gas said they will need an alternate and the representative is currently working with someone from their emergency services department who they will keep informed of process
    - Decision-Making – City of Norwalk wants to go with consensus but will utilize voting in case there is dissention. If there's a need to reflect a dissenting opinion, that will be reflected in the steering committee summary

- Spokespersons – The Chair and/or the Vice Chair will speak on behalf of the plan process. Tetra Tech recommended using the PIO, if they are willing, since they would already have connections with community members and other public outreach outlets. Chair says that since the old PIO left, the department has been very busy, so she'd prefer that Chair remains the POC. The Chair will keep the current acting PIO informed of all processes.
- Public Involvement – Public must be engaged throughout the process. Steering committee is one way and providing a public comment period will be another.
- Courtesy is expected among all committee members
- Meetings – Second Friday of the month from 3pm-4pm is selected for March and April. Times for future meetings will be discussed on a later date.

Project Overview

- Bart briefly went over the work plan, timeline, and important milestones. He stated that the current timeline is not firm, but the Chair and Vice Chair have been informed of the work plan as it stands. The most important milestones will be the development of hazard profiles, in addition to completing the hazard analysis and risk assessments. Once those are complete, a draft of the plan will be made available for public comment. After the comment period, the plan is submitted to CalOES for a 45-day review period. If they approve, it is then sent to FEMA for their 45-day review process. After FEMA review, it is sent back to the city as an APA (approval pending adoption) plan. The Norwalk City Council would then need to adopt the plan in order for it to be approved.

- Bart then discussed the strategy around the analysis of the Hazards of Concern. This will involve collecting information through CPT and identifying the most relevant hazards and risks to the community. The hazards of concern have been identified by the committee and will be used to create the hazard profiles for the plan. Then, action items will be developed that can deal with those risks. These action items will be designed to be grant-eligible and relevant to hazards analyzed. FEMA's BRIC program is anticipated to have $3.7 billion worth of funding for the 2021 round.
- Bart then discussed the CPT's draft of a mission statement, as well as goals and objectives for the plan. The goals create parameters around the scope of the plan and the objectives discuss how the success of the plan will be measured. The drafts of these will be sent to the SC so that they all can be reviewed and voted upon at the next meeting.

Public Involvement Strategy

- Jeana Wiser then discusses public outreach and strategies.
  - Website
    - Will be available on the City's website
    - Will be available for review by March 2nd
    - Standard language
  - Survey
    - Also available for review on March 2nd
    - Goal is to assess residents' perception of risk, preparedness levels, and general demographics

- Social Media
  - Will be used to share survey, website links
- Press/media
  - Article in *Norwalk Now* will be released to inform of project process and participation progress. There is also a City Council presentation on the plan scheduled for the 15th or 16th of March.
- Steering Committee
  - Zoom link to listen in will be provided on the website and time at the end of meetings will be provided for public comment.
- Comments from Committee
  - NLMUSD representative asked for SC meeting schedule clarification and wanted to know if committee will receive feedback on public outreach before next meeting. The DMAC representative stated that evacuation planning needs to be part of LHMP process according to some state discussions. They will find information and share with Vice Chair.

Adjourn

- Occurred at 3:54 PM

City of Norwalk Hazard Mitigation Plan
Steering Committee Meeting #2

Date/Time of Meeting:	Friday, March 12, 2021
Location:	Digital
Subject:	Steering Committee Meeting No. 2
Project Name:	City of Norwalk Hazard Mitigation Plan
In Attendance	**Attendees:** *SoCal Gas, LA County Fire, Athens Services, DMAC, Golden State Water, NLMUSD, SoCal Edison*
	Planning Team: Gabriela Garcia, Eric Wosick, Grissel Chavez, Rob Flaner, Bart Spencer, Jeana Wiser, Des Alexander
Not Present:	*LASD, Liberty Utilities, LLCSD*
Summary Prepared by:	Des Alexander
Quorum – Yes or No	Yes

Welcome and Introductions

- Gabriela Garcia and Eric Wosick welcomed the committee to the 2nd steering committee meeting
- Des Alexander took the roll and a quorum was achieved
- Gabriela asked the committee to accept the summary of the 1st steering committee meeting. A motion was made by Eric Wosick and seconded by Elaine Williams. The minutes were then approved by the committee.

Project Planning

- Bart stated that the project is currently on-track for completion by current timeline.
- Rob Flaner discussed the goal of categorizing the city's core capabilities through a "SWOO" session (Strengths, Weaknesses, Obstacles, Opportunities). The goal of the SWOO is to more easily identify action items that would be the most impactful as well as grant eligible.
- Tetra Tech will send the SWOO exercise SurveyMonkey link to the committee. The committee is asked to share it with any interdepartmental and/or neighboring stakeholders for input. Strategies for addressing gaps will be discussed both by the committee and the core planning team.

Hazard Analysis

- The hazards of concern for the City of Norwalk have been finalized. Tetra Tech is working to have mapping of hazard exposure to show at the next meeting.
- Tetra Tech will use the critical facilities lists provided by the city to display how much risk and exposure the city has around each of these sites regarding specific hazards. Bart reminds the group that the facility list will not be shared with the public.

Public Involvement Strategy

- Jeana Wiser provided updates on the survey and other outreach measures. The website is now live, including the link to the survey on SurveyMonkey. There have been 14 responses thus far, with extreme community concern regarding earthquake, drought, and public health. Severe weather and climate change are also hazards of high concern, while dam failure has been ranked low thus far. The survey will remain live until April 30th
- There is also a city council update presentation during the week of March 15th, which will be a good opportunity for the city to publicly announce the LHMP process. The first public meeting will likely be in May, in addition to steering committee meetings that will be open to public participation.

Steering Committee Members Requests and/or Comments

- No additional requests or comments were made.

Public Comment

- No members of the public made any comment.

Adjourn

- Occurred at 3:39 PM

City of Norwalk Hazard Mitigation Plan
Steering Committee Meeting #3

Date/Time of Meeting:	Friday, April 9, 2021, 3:05 PM
Location:	Digital
Subject:	Steering Committee Meeting No. 3
Project Name:	City of Norwalk Hazard Mitigation Plan
In Attendance	**Attendees:** Gabriela Garcia (Norwalk), Eric Wosick (Norwalk), Wendy Bruget (Athens), David Ashman (DMAC), Bill Crean (LLCSD), Elaine Williams (NLMUSD)
	Planning Team: Grissel Chavez, Rob Flaner, Bart Spencer, Jeana Wiser, Des Alexander
	Members of the Public: Ken White
Not Present:	*SoCal Gas, LASD, LAFD, Liberty Utilities, SoCal Edison*
Summary Prepared by:	Des Alexander
Quorum – Yes or No	Yes

Welcome and Introductions

- Gabriela Garcia and Eric Wosick welcomed the committee to the 3rd steering committee meeting
- Des Alexander took the roll and a quorum was achieved
- Gabriela asked the committee to accept the summary of the 2nd steering committee meeting. A motion was made by Eric Wosick and seconded by Elaine Williams. The minutes were then approved by the committee. Bill Crean abstained from voting.

Project Planning

- Bart gave a brief overview of the project status. The city is on track for submittal in line with the current timeline.
- Bart provided an overview of the SWOO survey responses.
    - Weaknesses
        - Accessibility of information (general risks, flood insurance, hazard info) to the public
        - Public perceptions of risk
        - City preparation for climate impacts
        - Real estate disclosure
        - Communication of hazard to the public
    - Strengths
        - Clearly defined emergency management roles
        - Strong collaboration & coordination within the city and with other entities
        - Strong enforcement of codes & standards
    - Discussion
        - City needs to clarify emergency management and risk mitigation definitions/capacity with the public

- City can leverage strengths to create impactful public messaging
- Bart suggests that the CPT examine the results and use them to create action items for the plan

Hazard Analysis

- Carol has been working to complete the exposure analyses. Those results are forthcoming and will be shared with the committee upon completion.

Public Involvement Strategy

- Jeana Wiser provided updates on the survey. As of 4/9 there were 113 responses. Initial survey responses cite residents as *extremely concerned* about earthquake & pandemic. Residents are also *highly concerned* about climate change, cyber terror, & severe weather.
- Jeana also discussed methods of increasing public awareness. She complemented the city's Instagram video and stated that the SWOO results could be used to guide interdepartmental outreach strategies. She said that the exposure results will also be great for public outreach efforts.

Steering Committee Members Requests and/or Comments

- No additional requests or comments were made by the committee.

Public Comment

- Ken White asked if the LHMP process could be used to reignite the CERT program in the city. He also asked about hazard analysis maps that used the Whittier Narrows dam collapse scenario in their data.
  - Eric Wosick said it can be incorporated into the response, and David Ashman says there is a statewide initiative to increase CERT capacity
  - David Ashman says the map updates are in the works and will include data on Whittier Narrows

Adjourn

- Occurred at 4:03 PM

City of Norwalk Hazard Mitigation Plan
Steering Committee Meeting #4

Date/Time of Meeting:	Friday, May 21, 2021, 3:06 PM
Location:	Digital
Subject:	Steering Committee Meeting No. 4
Project Name:	City of Norwalk Hazard Mitigation Plan
In Attendance	**Attendees:** Gabriela Garcia (Norwalk), Eric Wosick (Norwalk), Julia Emerson (SoCal Gas), David Ashman (DMAC), Bill Crean (LLCSD), Elaine Williams (NLMUSD), Adrian Garcia (Edison), Dennis Kato (Norwalk) **Planning Team:** Rob Flaner, Bart Spencer, Jeana Wiser, Des Alexander **Members of the Public:** Michael Rosoff
Not Present:	*LASD, LAFD, Athens, Liberty Utilities*
Summary Prepared by:	Des Alexander
Quorum – Yes or No	Yes

Welcome and Introductions

- Gabriela Garcia and Eric Wosick welcomed the committee to the 4th steering committee meeting
- Des Alexander took the roll and a quorum was achieved
- Gabriela asked the committee to accept the summary of the 3rd steering committee meeting. A motion was made by Eric Wosick and seconded by Elaine Williams. The minutes were then approved by the committee.

Hazard Analysis

- Bart went over the Core Capabilities (SWOO) results with the committee. The goals of the SWOO were to gauge the strengths and weaknesses of the district from the perspective of district employees and partners; and to use those strengths and weaknesses to guide the formation of action items.
    - Weaknesses: public knowledge of finding hazard information, Norwalk community understanding of hazard exposure and risk, flood insurance information is readily available, real estate disclosure of hazards
    - Strengths: clearly defined emergency management roles, strong collaboration/coordination with neighboring jurisdictions
    - Questions/Comments
        - Eric asked about how public engagement actions will line up with HMP goals, given many actions will be structural changes. What kind of communications can be used given the wide amount of exposure?
            - Bart said that the idea is creating a more resilient community, which puts public engagement in an important position.
            - Rob stated that risk communication is part of continuing public engagement. Core capabilities can be identified to communicate risk.

These actions likely will not be grant funded, but they are important to the process

- Julia Emerson stated that Whittier Narrows Dam is biggest threat to city. Bart clarifies threat of Whittier Narrows Dam as a dam failure threat rather than a flooding threat. Rob stated that he would discuss the Whittier Narrows Dam in his section.

- Rob went over some of the initial risk exposure data, specifically a map of the Whittier Narrows Dam inundation area. Almost all the city's populations and structures would be exposed to damages in the event of a dam failure. Since dam failures are not predictive and changing hydrographs (resulting from climate change) can result in dam failures; flood insurance actions (public information) could be useful given the exposure of a dam failure
- Rob also showed the committee the exposure results from the earthquake models. The Compton and Puente Hills scenarios both would expose 100% of Norwalk structures to earthquake damage.
  - Questions/Comments
    - Eric: With high numbers like these, do you anticipate that coming up with public outreach actions will be challenging?
      - Rob offered a strategy of targeted outreach should be to those who will be most exposed to floor-level flooding and damages. Since risk and exposure are clear, gaining grant funding should not be difficult.
    - Dennis: What is the timeline for a dam failure event? Does your model show where the initial failure will be? He suggested this information could be used to plan evacuation routes
      - Rob said that time lapsed 2-D models are available, but Hazus does not show that level of information
      - Julia: Since fire evacuations have caused major clogs in traffic, this should be factored into evacuation initiatives

Project Planning

- Plan Maintenance
  - Once the plan is submitted and returned APA, it needs to be approved by the council to be official
  - Plan is in effect for the next five years; strategy of maintaining action items must be developed by Gaby and Eric
  - Public engagement is required – this can be an action item that is tied to plan maintenance
  - All action items must be reconciled at the end of five years
- Action Items
  - Tetra Tech has done preliminary work with the CPT to identify action items
    - Examples: Portable generators, infrastructure improvements, new codes/standards, public outreach
  - There needs to be at least 1 action item for each high hazard item
    - Earthquake will be major for Norwalk
    - The CPT will look at funding sources available and develop rankings for cost
  - Question

- Julia – Could we do an action item about real estate disclosures?
  - Bart said that although this has been mentioned by several parties, since this is not a policy plan an action item cannot be used for enforcement of real estate policy

Public Involvement Strategy

- Outreach and Strategies status update
  - Recorded presentation will be made available to go over Hazard Mitigation and initial risk exposure results for the public. Can be distributed through all channels.
- Public survey results
  - Final survey results shared by Jeana
    - 168 completed surveys
    - Public health, earthquake, severe weather, climate change are most experienced hazards
    - Government sources & local media are trusted hazard information sources; social media is most trusted
    - #6 showed that a high percentage of respondents are not concerned about dam failure, reflecting a clear gap in public awareness of exposure

Steering Committee Members Requests and/or Comments

- No additional requests or comments were made by the committee.

Public Comment

- No comments were made.

Next Steps

- Next Steering Committee meeting will be on June 18th from 3 – 4:30
  - Zoom information will be included in the invite and meeting agenda
- The CPT's next meeting will be used to examine the risk rankings and develop action items

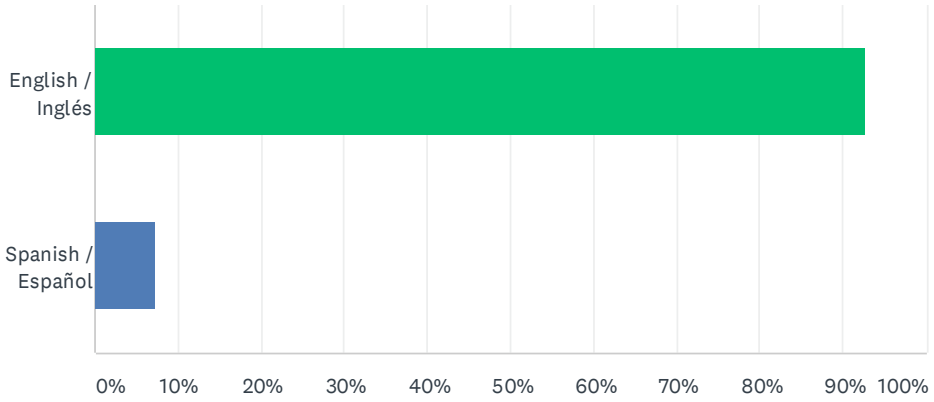
Adjourn

- Occurred at 4:15 PM

Hazard Mitigation Survey Results

Q1 What is your primary language? / ¿Cual es tu primer idioma?

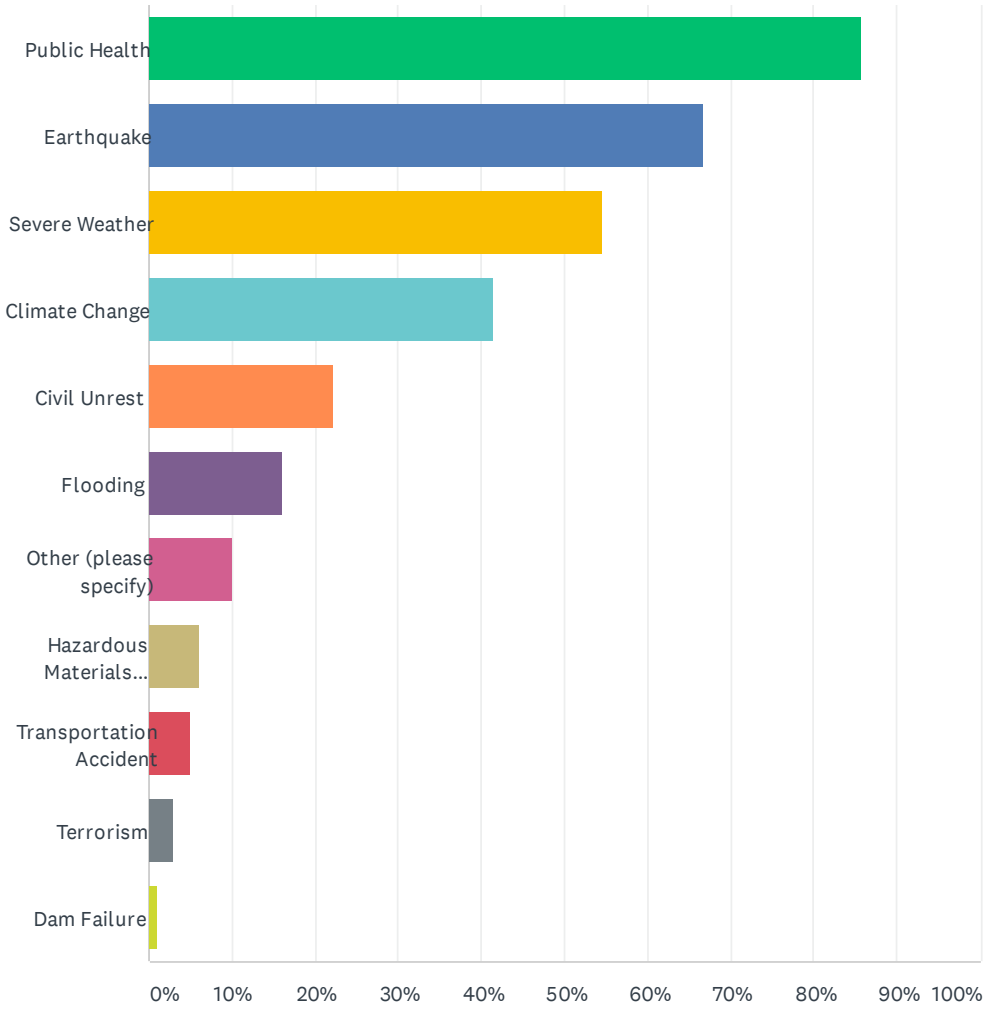
Answered: 166 Skipped: 3



ANSWER CHOICES	RESPONSES	
English / Inglés	92.77%	154
Spanish / Español	7.23%	12
TOTAL		166

Q2 Which of the following natural hazard events have you or anyone in your household experienced or been affected by in the past within the Norwalk area? The hazards are listed in alphabetical order. (Check all that apply)

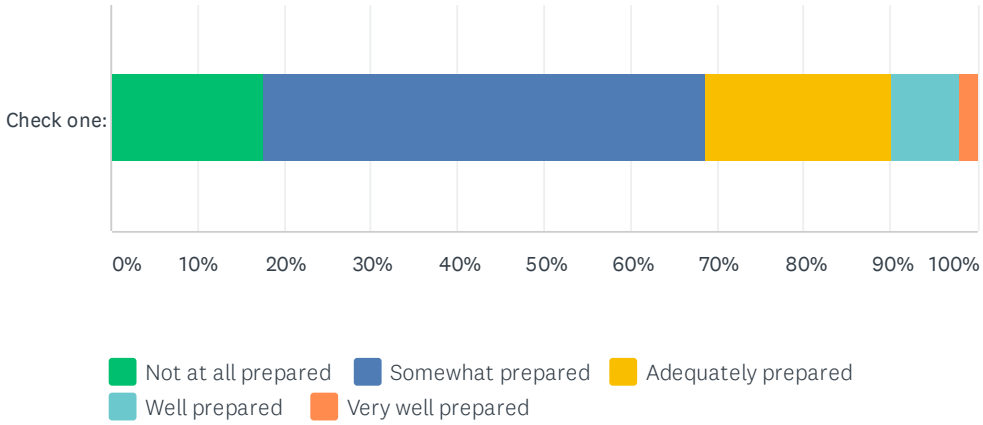
Answered: 99 Skipped: 70



ANSWER CHOICES	RESPONSES	
Public Health	85.86%	85
Earthquake	66.67%	66
Severe Weather	54.55%	54
Climate Change	41.41%	41
Civil Unrest	22.22%	22
Flooding	16.16%	16
Other (please specify)	10.10%	10
Hazardous Materials Incident	6.06%	6
Transportation Accident	5.05%	5
Terrorism	3.03%	3
Dam Failure	1.01%	1
Total Respondents: 99		

Q3 How prepared is your household to deal with a hazard event?

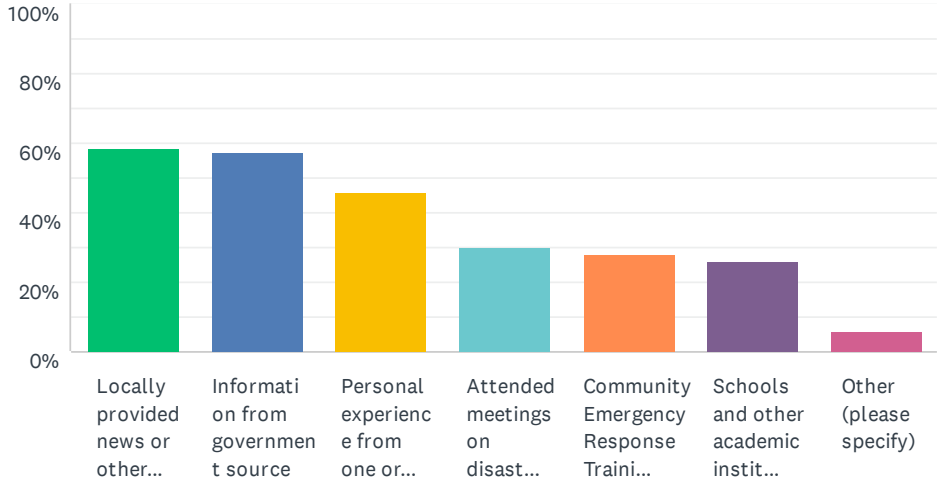
Answered: 102 Skipped: 67



	NOT AT ALL PREPARED	SOMEWHAT PREPARED	ADEQUATELY PREPARED	WELL PREPARED	VERY WELL PREPARED	TOTAL	WEIGHTED AVERAGE
Check one:	17.65% 18	50.98% 52	21.57% 22	7.84% 8	1.96% 2	102	2.25

Q4 Please select any of the means listed below that have helped your household increase preparedness for emergencies and disasters. (Check all that apply)

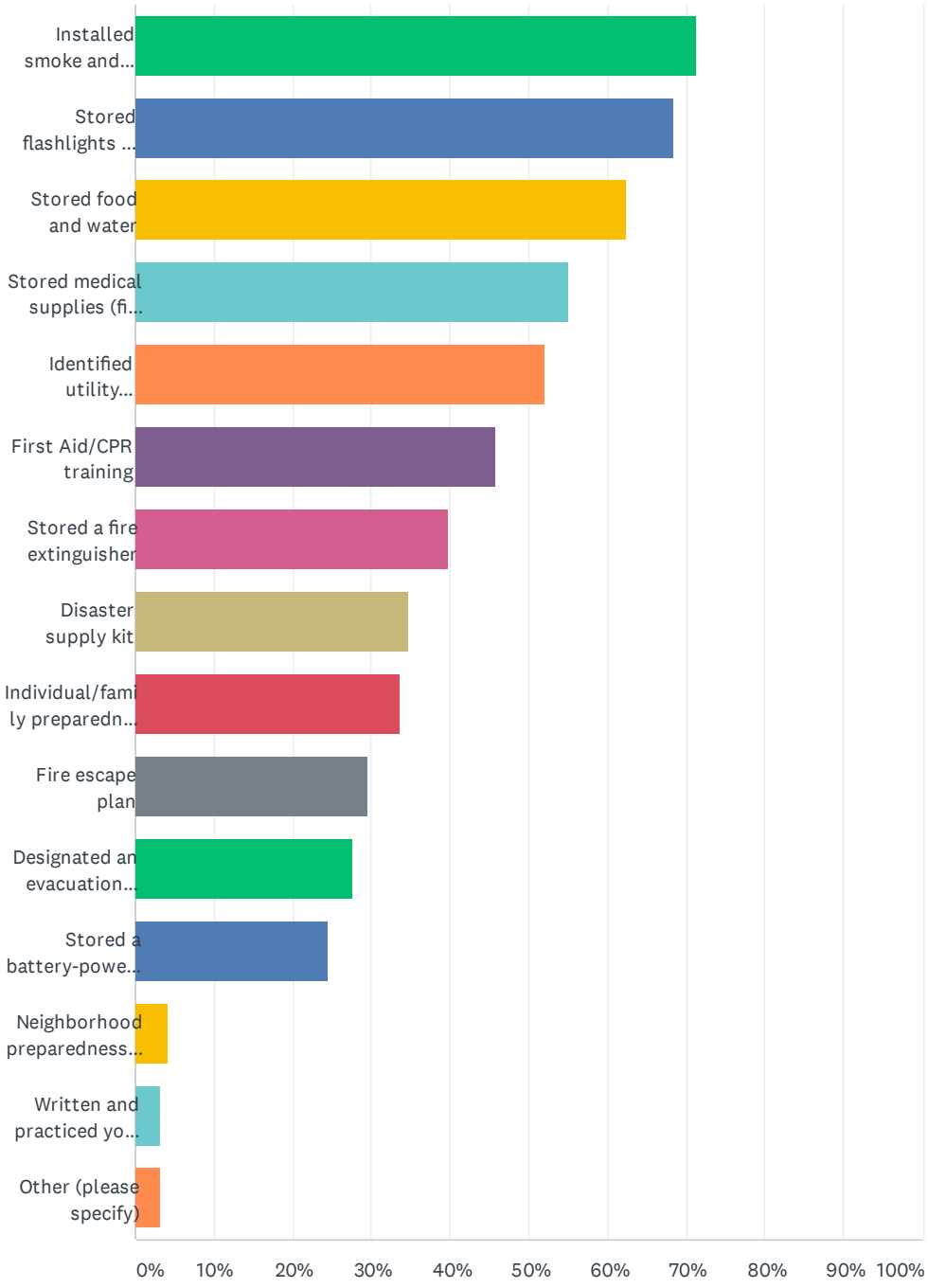
Answered: 96 Skipped: 73



ANSWER CHOICES	RESPONSES	
Locally provided news or other media information	58.33%	56
Information from government source	57.29%	55
Personal experience from one or more hazards or disasters	45.83%	44
Attended meetings on disaster preparedness	30.21%	29
Community Emergency Response Training (CERT) or other disaster training program	28.13%	27
Schools and other academic institutions	26.04%	25
Other (please specify)	6.25%	6
Total Respondents: 96		

Q5 Which of the following steps has your household taken to prepare for a disaster? (Check all that apply)

Answered: 98 Skipped: 71

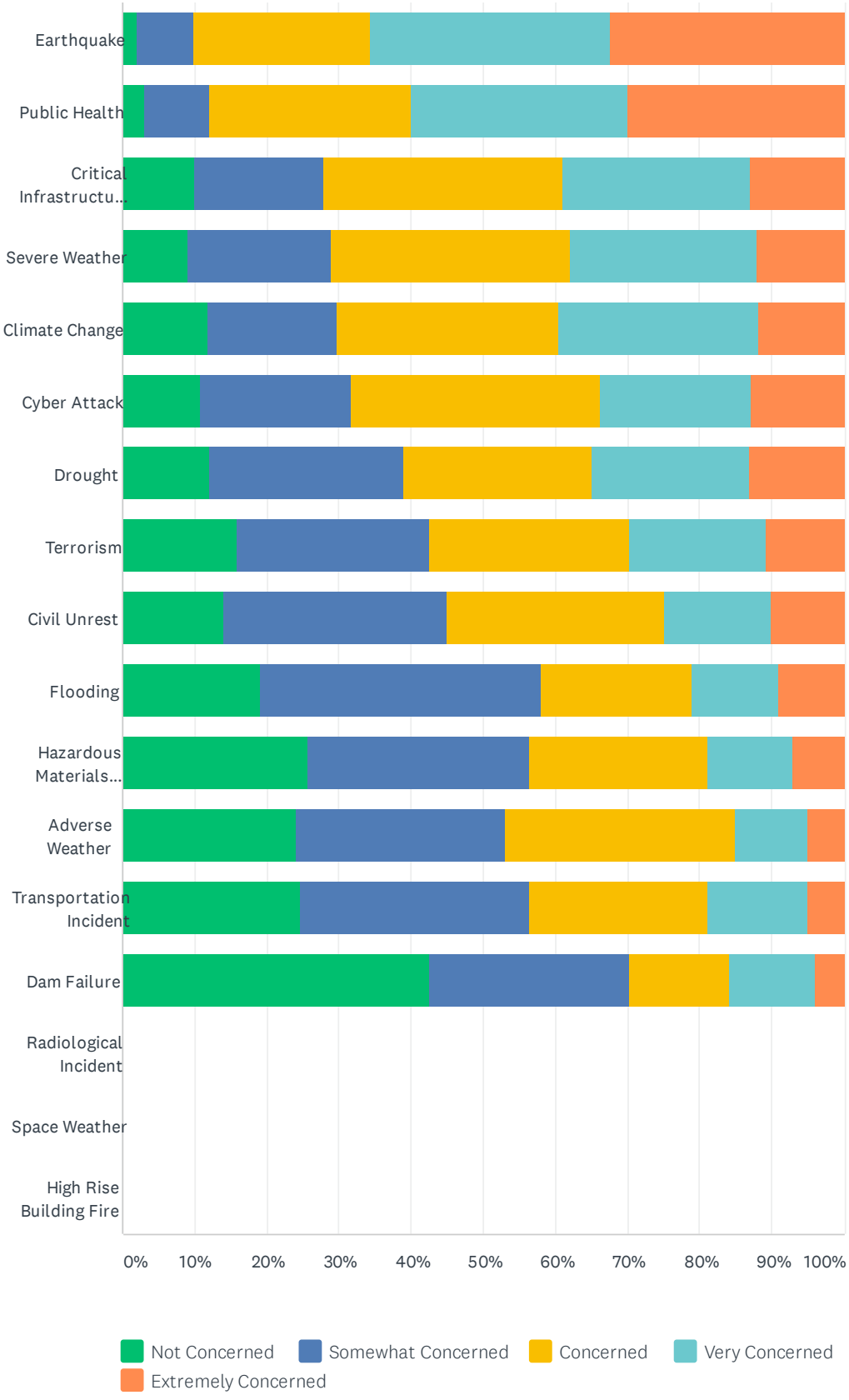


ANSWER CHOICES	RESPONSES	
Installed smoke and carbon monoxide detectors on each level of the house	71.43%	70
Stored flashlights and batteries	68.37%	67
Stored food and water	62.24%	61
Stored medical supplies (first aid kit, medications)	55.10%	54
Identified utility shutoffs	52.04%	51
First Aid/CPR training	45.92%	45
Stored a fire extinguisher	39.80%	39
Disaster supply kit	34.69%	34
Individual/family preparedness planning	33.67%	33
Fire escape plan	29.59%	29
Designated an evacuation meeting place	27.55%	27
Stored a battery-powered radio	24.49%	24
Neighborhood preparedness/planning	4.08%	4
Written and practiced your family disaster plan	3.06%	3
Other (please specify)	3.06%	3
Total Respondents: 98		

Q6 How concerned are you about the following hazards in the City of Norwalk? (Check one response for each hazard)

Answered: 102 Skipped: 67

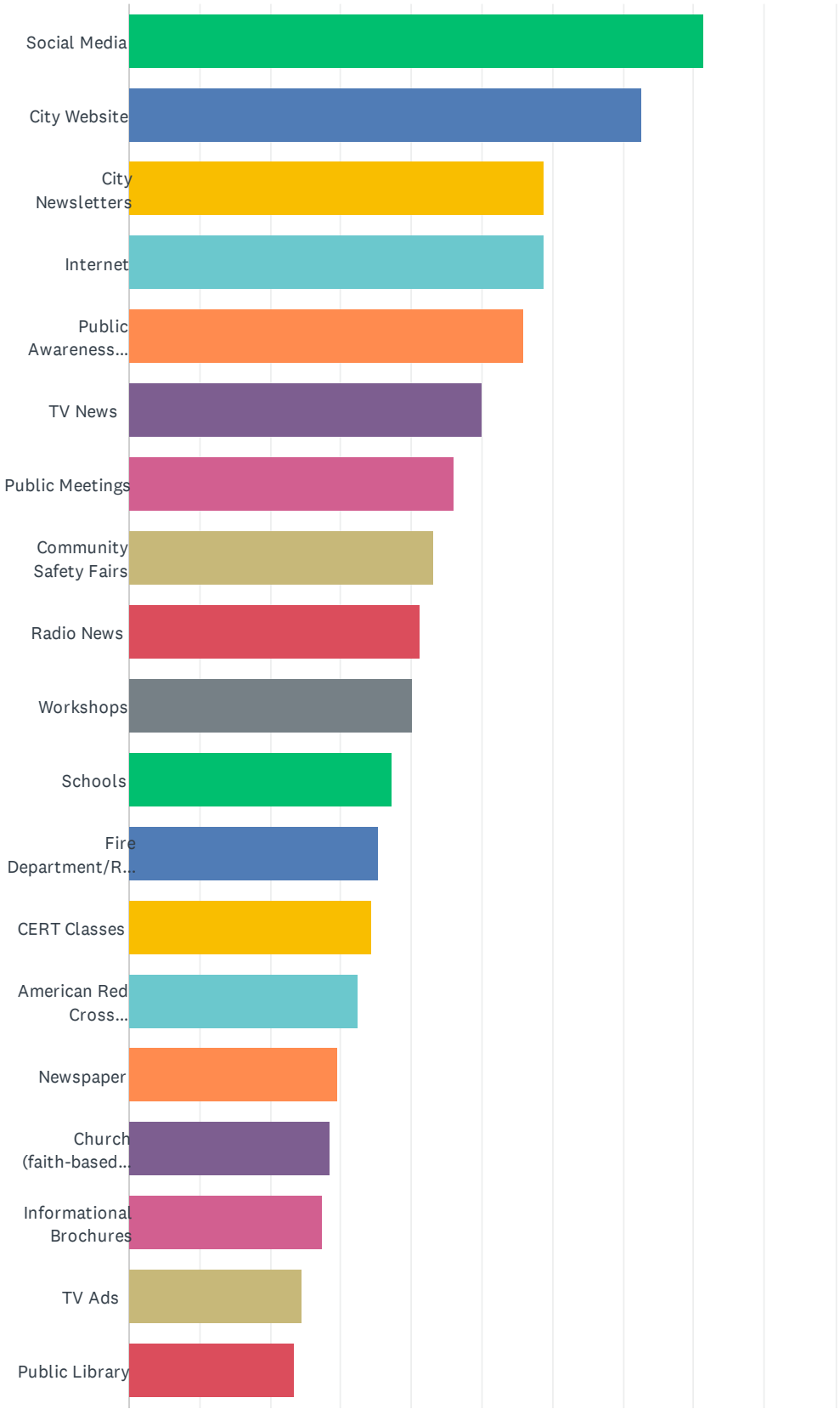
City of Norwalk Local Hazard Mitigation Plan Survey 2021 / Encuesta del Plan Local de Mitigación de Peligros de la Ciudad de Norwalk 2021

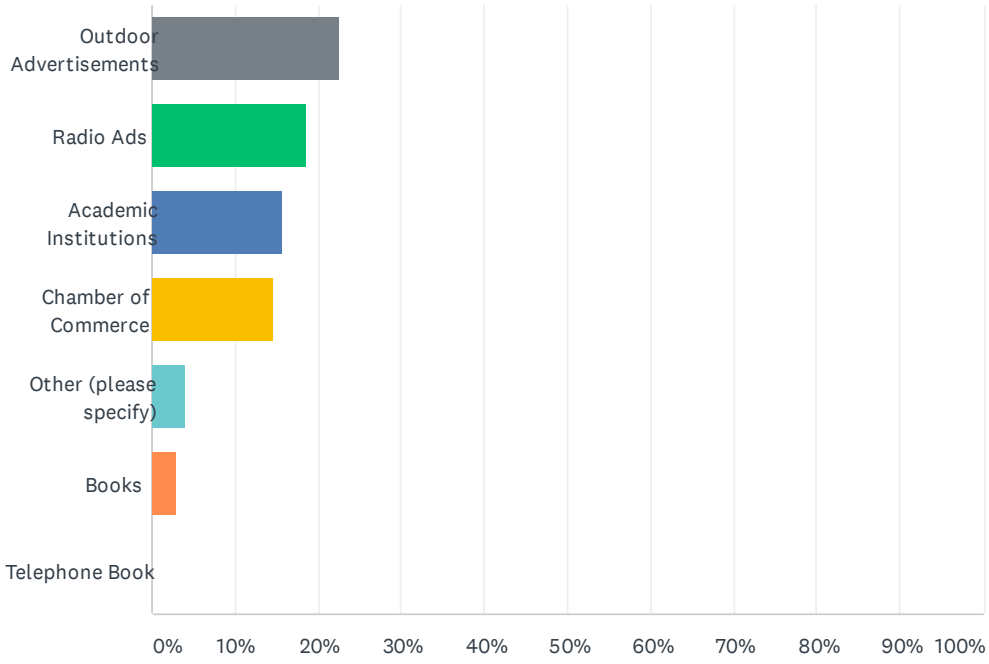


	NOT CONCERNED	SOMEWHAT CONCERNED	CONCERNED	VERY CONCERNED	EXTREMELY CONCERNED	TOTAL	WEIGHTED AVERAGE
Earthquake	1.96% 2	7.84% 8	24.51% 25	33.33% 34	32.35% 33	102	3.86
Public Health	3.00% 3	9.00% 9	28.00% 28	30.00% 30	30.00% 30	100	3.75
Critical Infrastructure Failure	10.00% 10	18.00% 18	33.00% 33	26.00% 26	13.00% 13	100	3.14
Severe Weather	9.00% 9	20.00% 20	33.00% 33	26.00% 26	12.00% 12	100	3.12
Climate Change	11.88% 12	17.82% 18	30.69% 31	27.72% 28	11.88% 12	101	3.10
Cyber Attack	10.89% 11	20.79% 21	34.65% 35	20.79% 21	12.87% 13	101	3.04
Drought	12.00% 12	27.00% 27	26.00% 26	22.00% 22	13.00% 13	100	2.97
Terrorism	15.84% 16	26.73% 27	27.72% 28	18.81% 19	10.89% 11	101	2.82
Civil Unrest	14.00% 14	31.00% 31	30.00% 30	15.00% 15	10.00% 10	100	2.76
Flooding	19.00% 19	39.00% 39	21.00% 21	12.00% 12	9.00% 9	100	2.53
Hazardous Materials Incident	25.74% 26	30.69% 31	24.75% 25	11.88% 12	6.93% 7	101	2.44
Adverse Weather	24.00% 24	29.00% 29	32.00% 32	10.00% 10	5.00% 5	100	2.43
Transportation Incident	24.75% 25	31.68% 32	24.75% 25	13.86% 14	4.95% 5	101	2.43
Dam Failure	42.57% 43	27.72% 28	13.86% 14	11.88% 12	3.96% 4	101	2.07
Radiological Incident	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0	0.00
Space Weather	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0	0.00
High Rise Building Fire	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0	0.00

Q7 Which of the following methods do you think are most effective for providing information on emergency preparedness? (Check all that apply)

Answered: 102 Skipped: 67

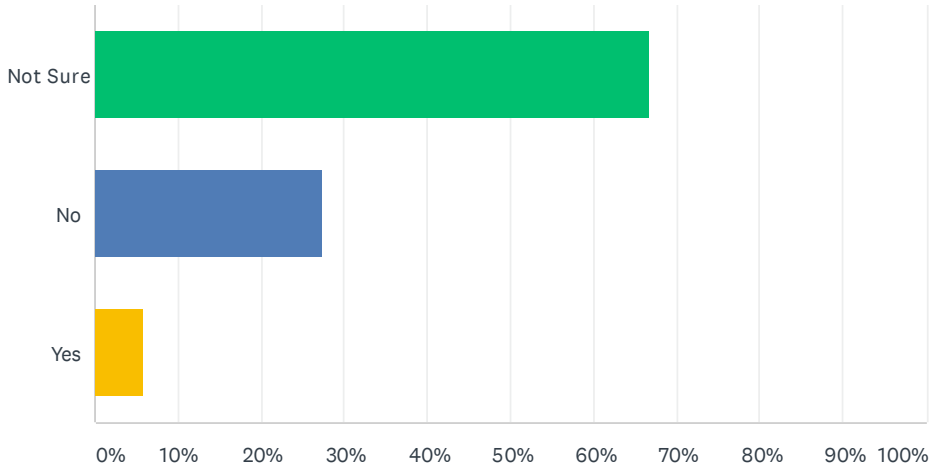



Outdoor Advertisements
Radio Ads
Academic Institutions
Chamber of Commerce
Other (please specify)
Books
Telephone Book
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

ANSWER CHOICES	RESPONSES	
Social Media	81.37%	83
City Website	72.55%	74
City Newsletters	58.82%	60
Internet	58.82%	60
Public Awareness Campaign (e.g., Flood Awareness Week, Winter Storm Preparedness Month)	55.88%	57
TV News	50.00%	51
Public Meetings	46.08%	47
Community Safety Fairs	43.14%	44
Radio News	41.18%	42
Workshops	40.20%	41
Schools	37.25%	38
Fire Department/Rescue	35.29%	36
CERT Classes	34.31%	35
American Red Cross Information	32.35%	33
Newspaper	29.41%	30
Church (faith-based institutions)	28.43%	29
Informational Brochures	27.45%	28
TV Ads	24.51%	25
Public Library	23.53%	24
Outdoor Advertisements	22.55%	23
Radio Ads	18.63%	19
Academic Institutions	15.69%	16
Chamber of Commerce	14.71%	15
Other (please specify)	3.92%	4
Books	2.94%	3
Telephone Book	0.00%	0
Total Respondents: 102		

Q8 Is your household located in or near a FEMA designated floodplain?

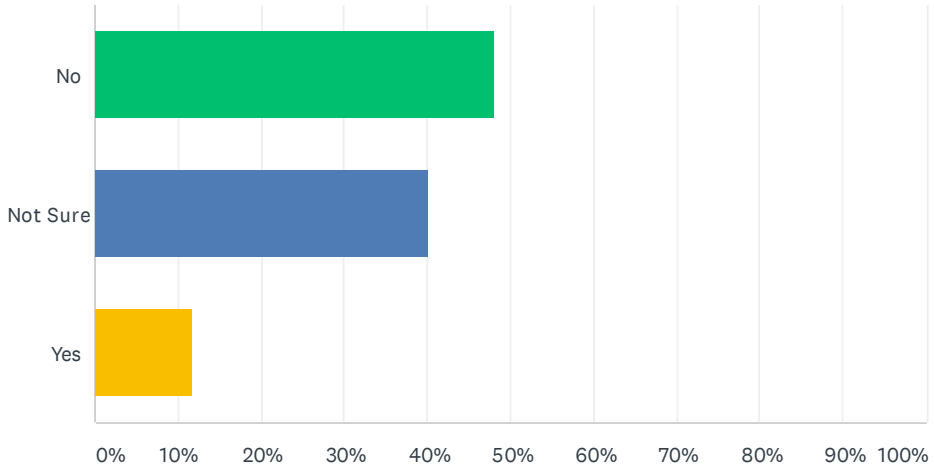
Answered: 102 Skipped: 67



ANSWER CHOICES	RESPONSES	
Not Sure	66.67%	68
No	27.45%	28
Yes	5.88%	6
TOTAL		102

Q9 Do you (or the owner of your home) have flood insurance?

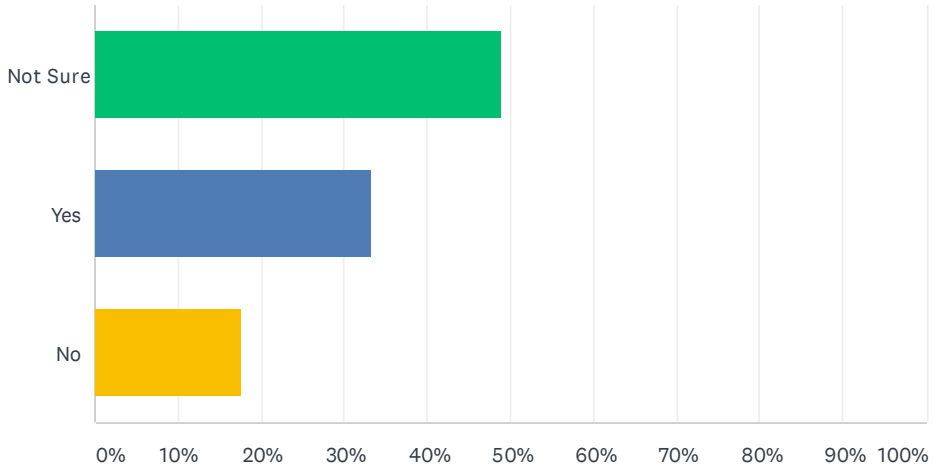
Answered: 102 Skipped: 67



ANSWER CHOICES	RESPONSES	
No	48.04%	49
Not Sure	40.20%	41
Yes	11.76%	12
TOTAL		102

Q10 Is your household located near an earthquake fault?

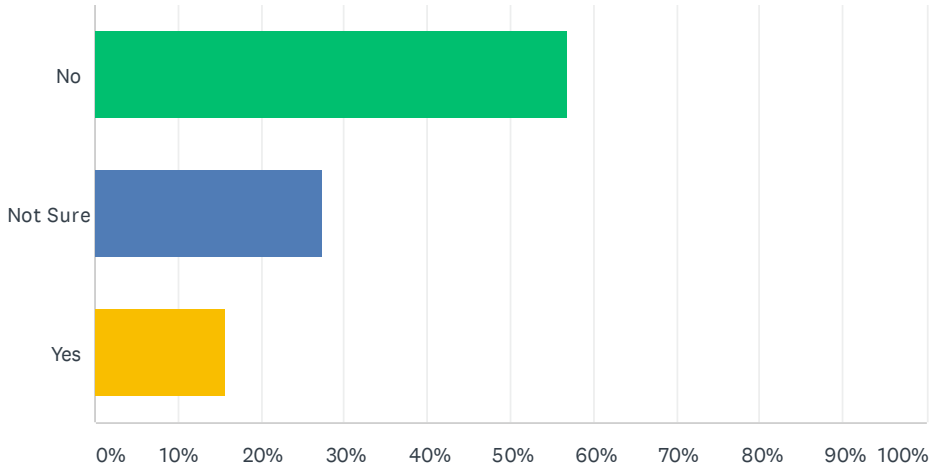
Answered: 102 Skipped: 67



ANSWER CHOICES	RESPONSES	
Not Sure	49.02%	50
Yes	33.33%	34
No	17.65%	18
TOTAL		102

Q11 Do you (or the owner of your home) have earthquake insurance?

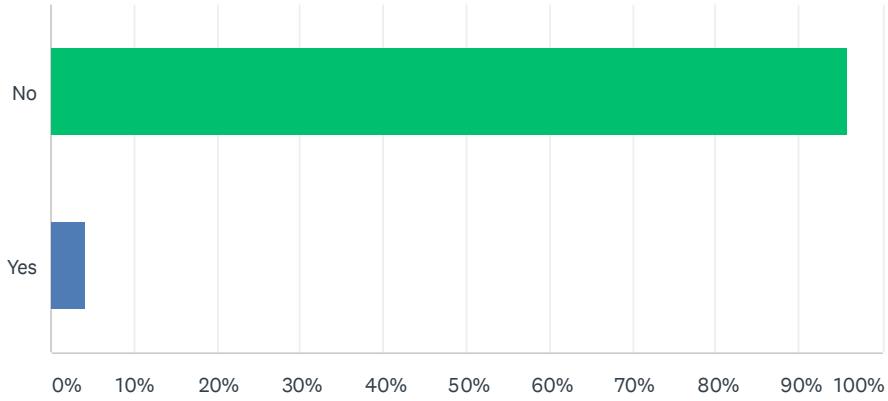
Answered: 102 Skipped: 67



ANSWER CHOICES	RESPONSES	
No	56.86%	58
Not Sure	27.45%	28
Yes	15.69%	16
TOTAL		102

Q12 Have you ever had problems getting homeowners or renters insurance due to risks from hazards?

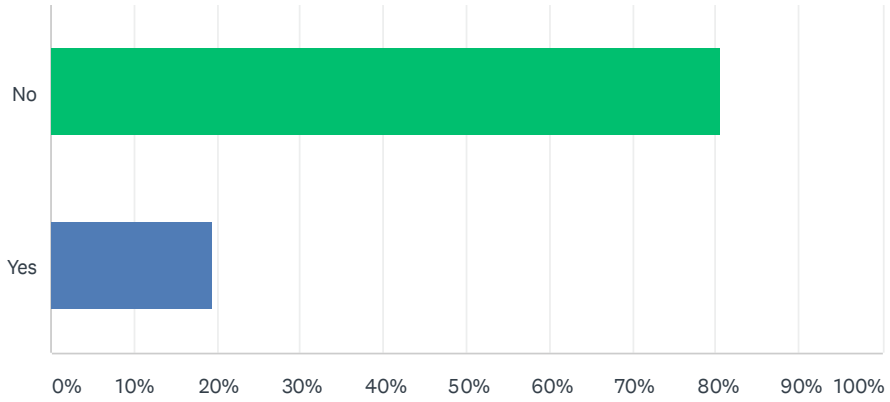
Answered: 95 Skipped: 74



ANSWER CHOICES	RESPONSES	
No	95.79%	91
Yes	4.21%	4
TOTAL		95

Q13 Was the presence of a hazard risk zone (e.g., earthquake fault zone, dam failure zone, flood zone, or high fire risk area) disclosed to you by a real estate agent, seller, or landlord before you purchased or moved into your home?

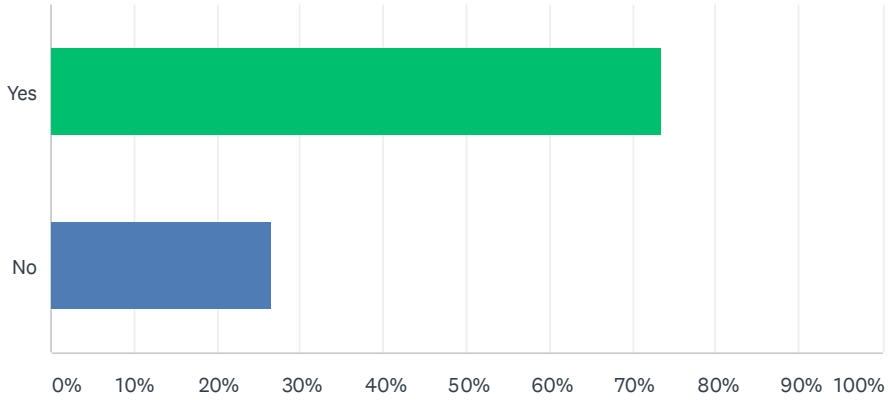
Answered: 98 Skipped: 71



ANSWER CHOICES	RESPONSES	
No	80.61%	79
Yes	19.39%	19
TOTAL		98

Q14 Would the disclosure of this type of information influence your decision to purchase or move into a home?

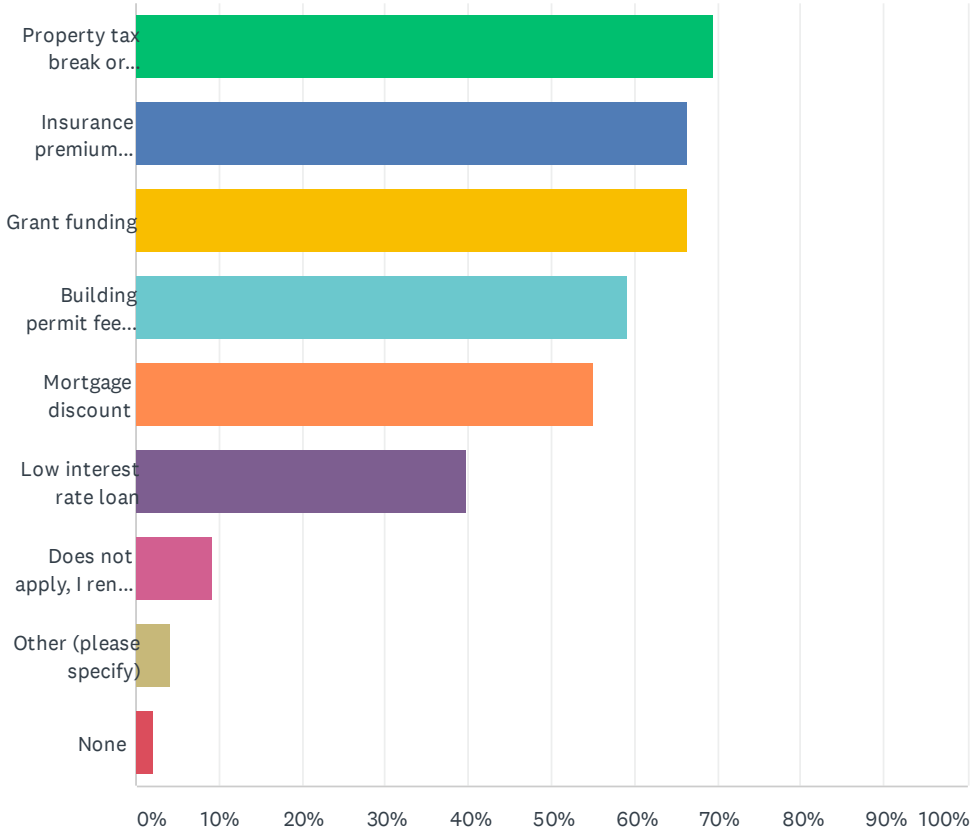
Answered: 98 Skipped: 71



ANSWER CHOICES	RESPONSES	
Yes	73.47%	72
No	26.53%	26
TOTAL		98

Q15 Which of the following incentives would encourage you to spend money to retrofit your home to protect against disasters? (Check all that apply)

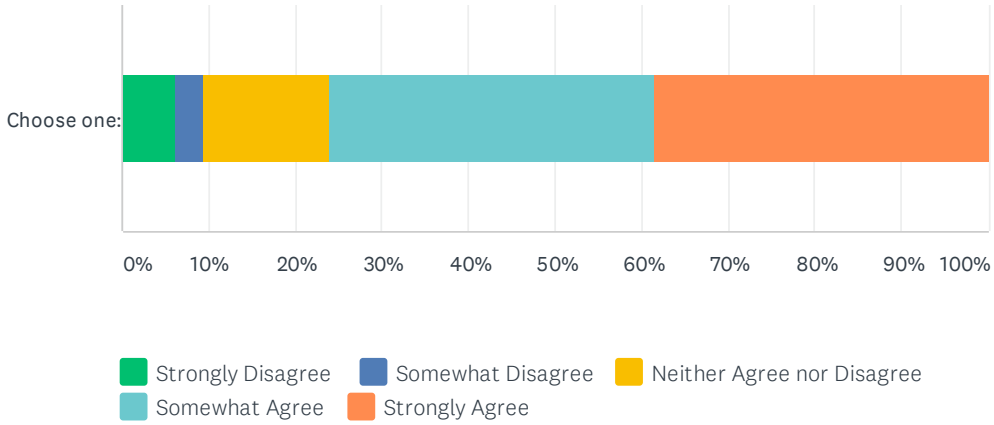
Answered: 98 Skipped: 71



ANSWER CHOICES	RESPONSES	
Property tax break or incentive	69.39%	68
Insurance premium discount	66.33%	65
Grant funding	66.33%	65
Building permit fee waiver	59.18%	58
Mortgage discount	55.10%	54
Low interest rate loan	39.80%	39
Does not apply, I rent my home	9.18%	9
Other (please specify)	4.08%	4
None	2.04%	2
Total Respondents: 98		

Q16 Please indicate how you feel about the following statement:"I believe it is the responsibility of government (local, state and federal) to provide education and programs that promote its residents to take action to reduce their exposure and risk to natural hazards."

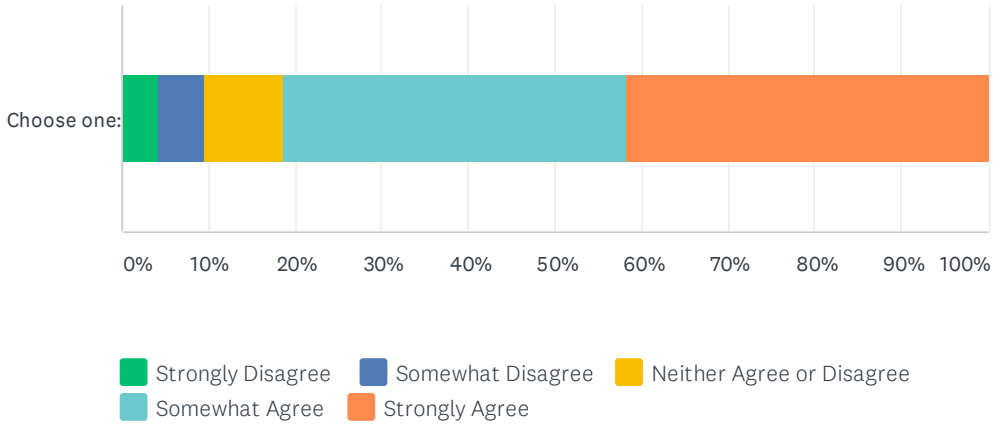
Answered: 96 Skipped: 73



	STRONGLY DISAGREE	SOMEWHAT DISAGREE	NEITHER AGREE NOR DISAGREE	SOMEWHAT AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
Choose one:	6.25% 6	3.13% 3	14.58% 14	37.50% 36	38.54% 37	96	3.99

Q17 Please indicate how you feel about the following statement: "I believe it is my responsibility to educate myself about programs that reduce my exposure to natural hazards."

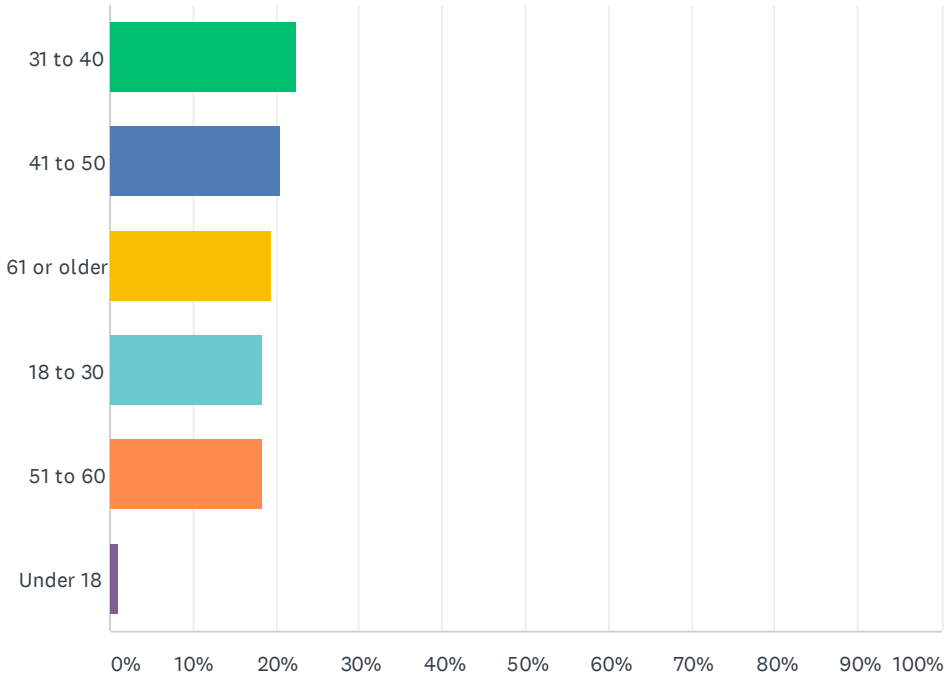
Answered: 96 Skipped: 73



	STRONGLY DISAGREE	SOMEWHAT DISAGREE	NEITHER AGREE OR DISAGREE	SOMEWHAT AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
Choose one:	4.17% 4	5.21% 5	9.38% 9	39.58% 38	41.67% 40	96	4.09

Q18 Please indicate your age range:

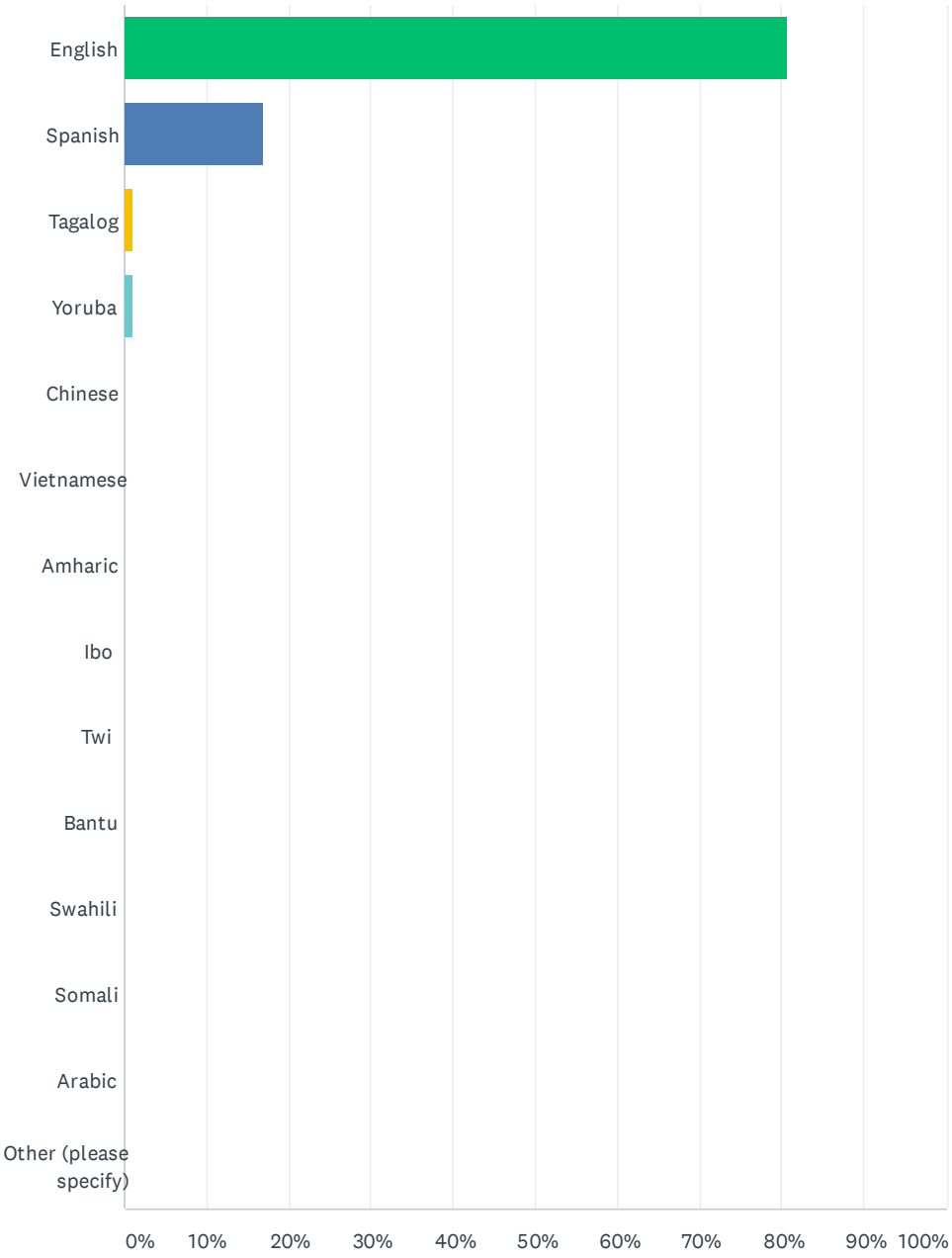
Answered: 98 Skipped: 71



ANSWER CHOICES	RESPONSES	
31 to 40	22.45%	22
41 to 50	20.41%	20
61 or older	19.39%	19
18 to 30	18.37%	18
51 to 60	18.37%	18
Under 18	1.02%	1
TOTAL		98

Q19 Please indicate the primary language spoken in your household.

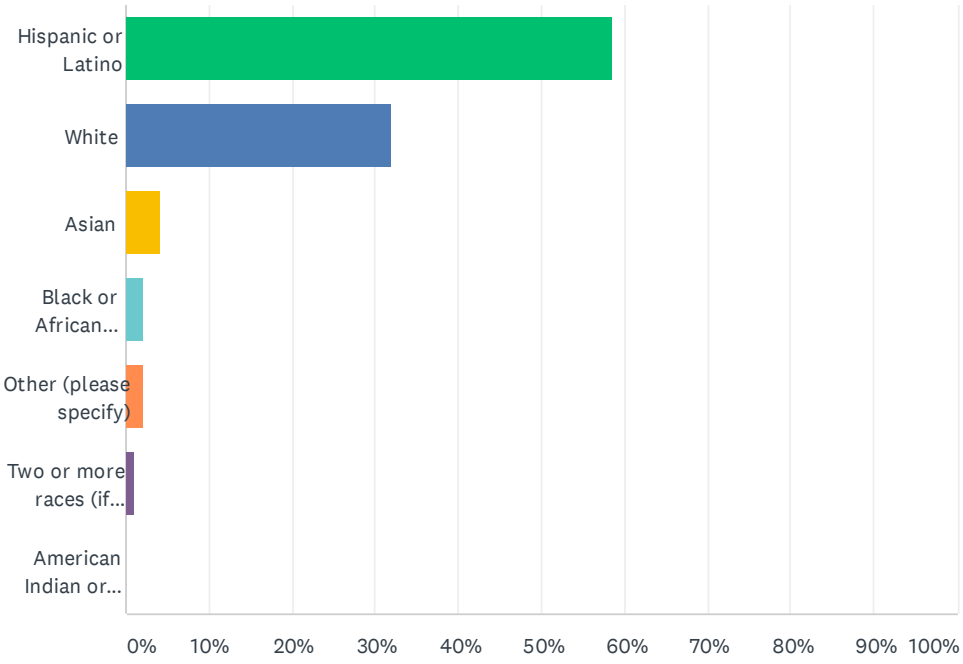
Answered: 94 Skipped: 75



ANSWER CHOICES	RESPONSES	
English	80.85%	76
Spanish	17.02%	16
Tagalog	1.06%	1
Yoruba	1.06%	1
Chinese	0.00%	0
Vietnamese	0.00%	0
Amharic	0.00%	0
Ibo	0.00%	0
Twi	0.00%	0
Bantu	0.00%	0
Swahili	0.00%	0
Somali	0.00%	0
Arabic	0.00%	0
Other (please specify)	0.00%	0
TOTAL		94

Q20 What is your race?

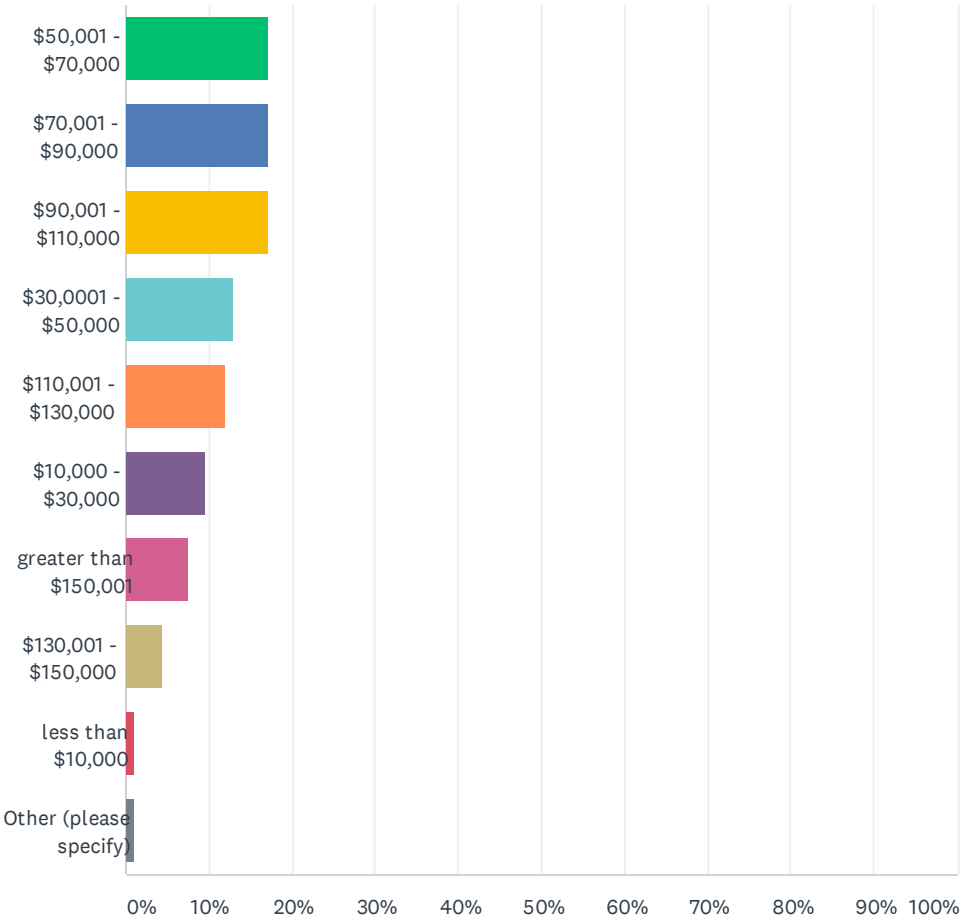
Answered: 94 Skipped: 75



ANSWER CHOICES	RESPONSES	
Hispanic or Latino	58.51%	55
White	31.91%	30
Asian	4.26%	4
Black or African American	2.13%	2
Other (please specify)	2.13%	2
Two or more races (if selected, please explain below)	1.06%	1
American Indian or Alaska Native	0.00%	0
TOTAL		94

Q21 What is your household income?

Answered: 93 Skipped: 76



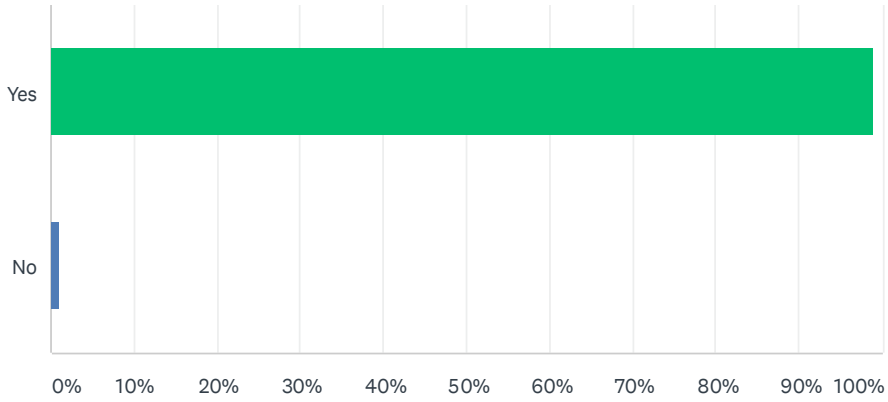
ANSWER CHOICES	RESPONSES	
$50,001 - $70,000	17.20%	16
$70,001 - $90,000	17.20%	16
$90,001 - $110,000	17.20%	16
$30,0001 - $50,000	12.90%	12
$110,001 - $130,000	11.83%	11
$10,000 - $30,000	9.68%	9
greater than $150,001	7.53%	7
$130,001 - $150,000	4.30%	4
less than $10,000	1.08%	1
Other (please specify)	1.08%	1
TOTAL		93

Q22 What is your zipcode?

Answered: 98 Skipped: 71

Q23 Do you have access to the Internet?

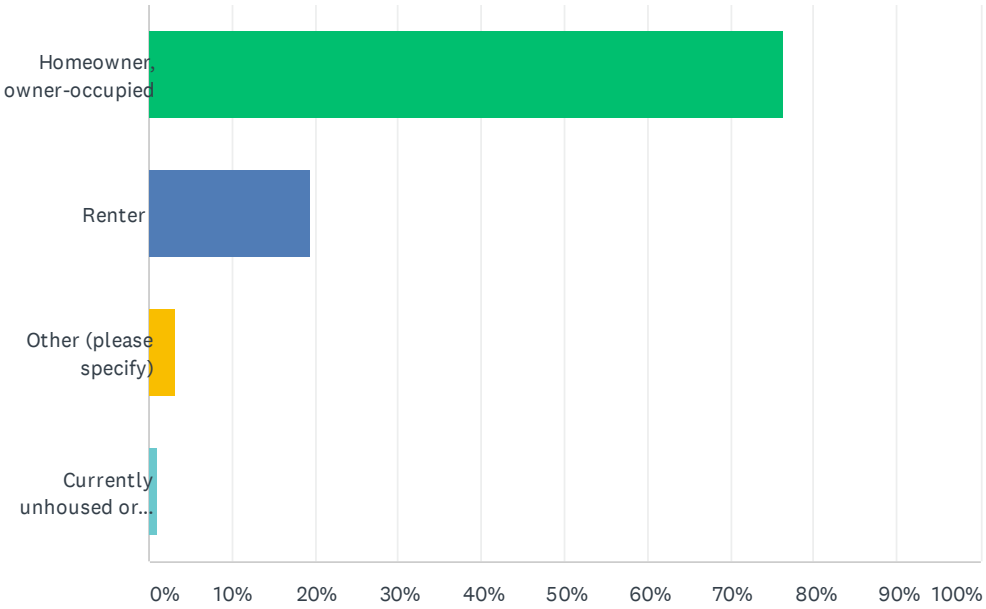
Answered: 95 Skipped: 74



ANSWER CHOICES	RESPONSES	
Yes	98.95%	94
No	1.05%	1
TOTAL		95

Q24 What is your housing status?

Answered: 93 Skipped: 76



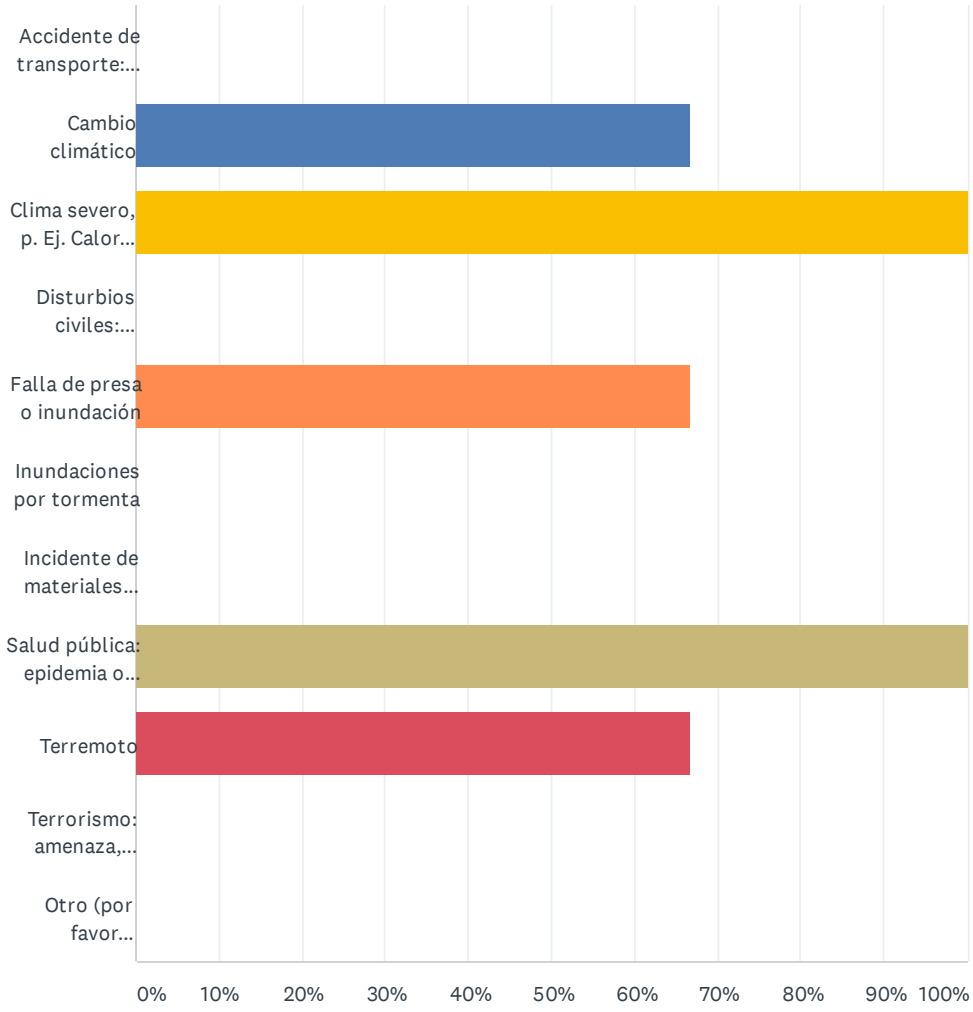
ANSWER CHOICES	RESPONSES	
Homeowner, owner-occupied	76.34%	71
Renter	19.35%	18
Other (please specify)	3.23%	3
Currently unhoused or temporary housing	1.08%	1
TOTAL		93

Q25 Comments

Answered: 21 Skipped: 148

Q26 ¿Cuáles de los siguientes eventos de peligros naturales ha experimentado usted o alguien en su hogar o ha sido afectado en el pasado dentro del área de Norwalk? Los peligros se enumeran en orden alfabético. (Marque todo lo que corresponda)

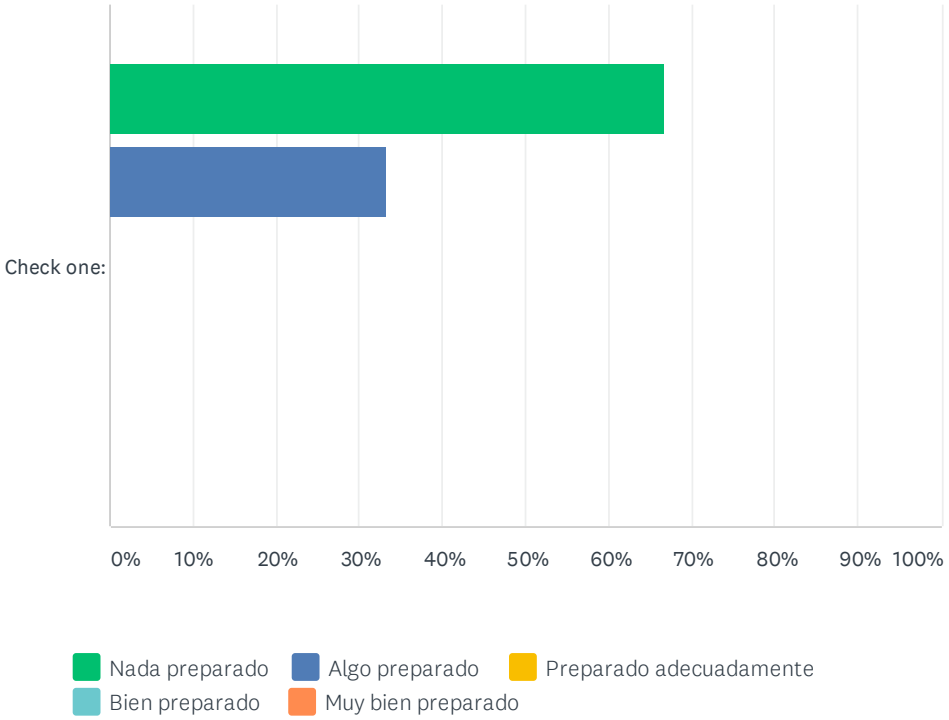
Answered: 3 Skipped: 166



ANSWER CHOICES	RESPONSES	
Accidente de transporte: avión o ferrocarril	0.00%	0
Cambio climático	66.67%	2
Clima severo, p. Ej. Calor extremo	100.00%	3
Disturbios civiles: disturbios públicos violentos	0.00%	0
Falla de presa o inundación	66.67%	2
Inundaciones por tormenta	0.00%	0
Incidente de materiales peligrosos - Incidente radiológico	0.00%	0
Salud pública: epidemia o pandemia	100.00%	3
Terremoto	66.67%	2
Terrorismo: amenaza, engaño, ciberataque	0.00%	0
Otro (por favor especifique)	0.00%	0
Total Respondents: 3		

Q27 ¿Qué tan preparado está su hogar para enfrentar un evento de peligro?Marque uno:

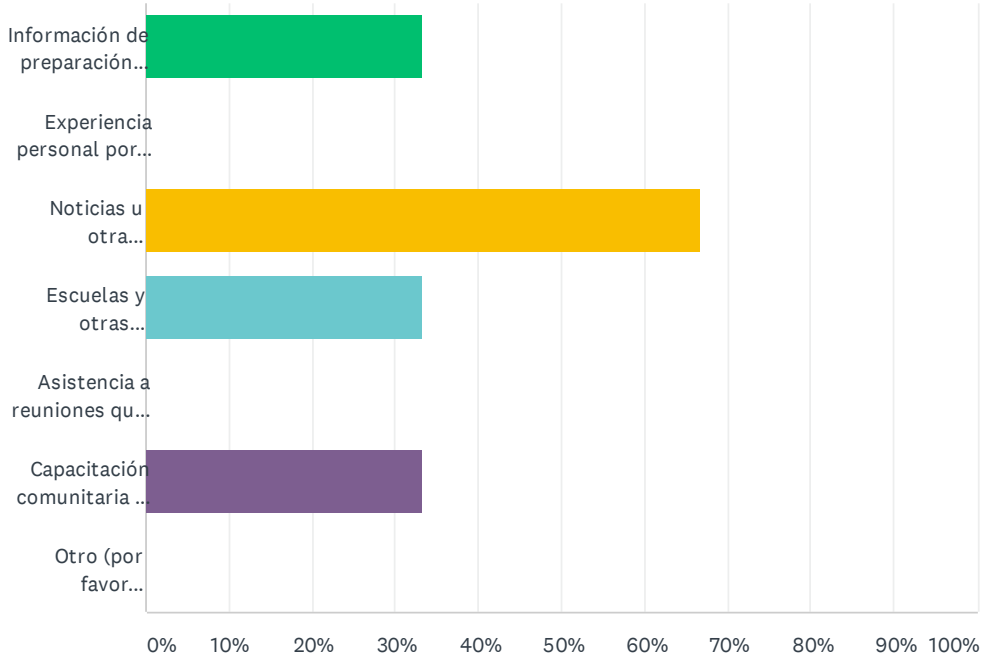
Answered: 3 Skipped: 166



	NADA PREPARADO	ALGO PREPARADO	PREPARADO ADECUADAMENTE	BIEN PREPARADO	MUY BIEN PREPARADO	TOTAL	WEIGHTED AVERAGE
Check one:	66.67% 2	33.33% 1	0.00% 0	0.00% 0	0.00% 0	3	1.33

Q28 Seleccione cualquiera de los medios enumerados a continuación que han ayudado a su hogar a aumentar la preparación para emergencias y desastres. (Marque todo lo que corresponda)

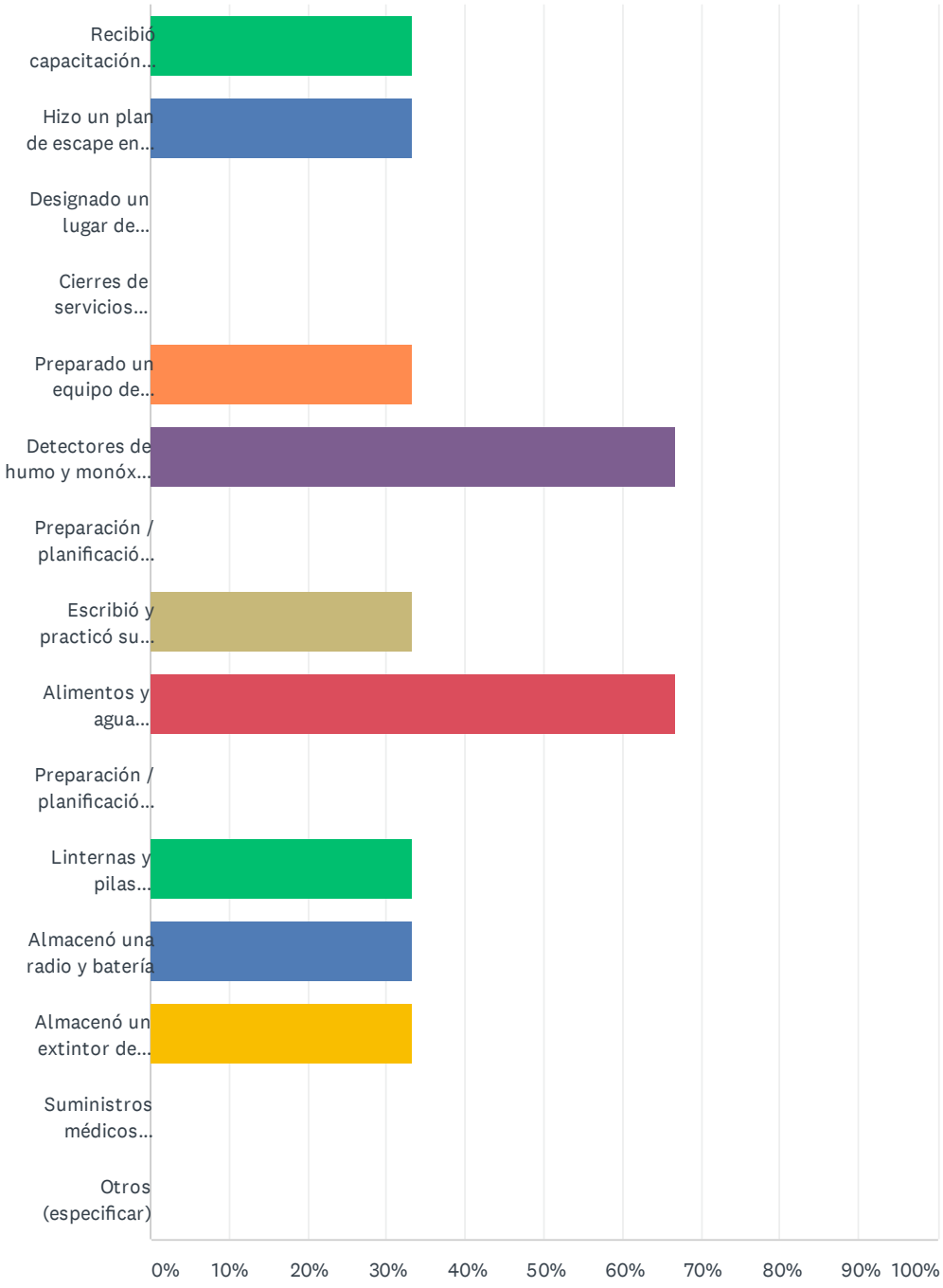
Answered: 3 Skipped: 166



ANSWER CHOICES	RESPONSES	
Información de preparación para emergencias de una fuente gubernamental (por ejemplo, manejo de emergencias federal, estatal o local)	33.33%	1
Experiencia personal por participación en uno o más peligros o desastres.	0.00%	0
Noticias u otra información de medios proporcionada localmente	66.67%	2
Escuelas y otras instituciones académicas	33.33%	1
Asistencia a reuniones que han proporcionado información sobre preparación para desastres	0.00%	0
Capacitación comunitaria en respuesta a emergencias (CERT) u otro programa de capacitación en casos de desastre	33.33%	1
Otro (por favor especificar)	0.00%	0
Total Respondents: 3		

Q29 ¿Cuál de los siguientes pasos ha tomado su hogar para prepararse para un desastre?(Marque todo lo que corresponda)

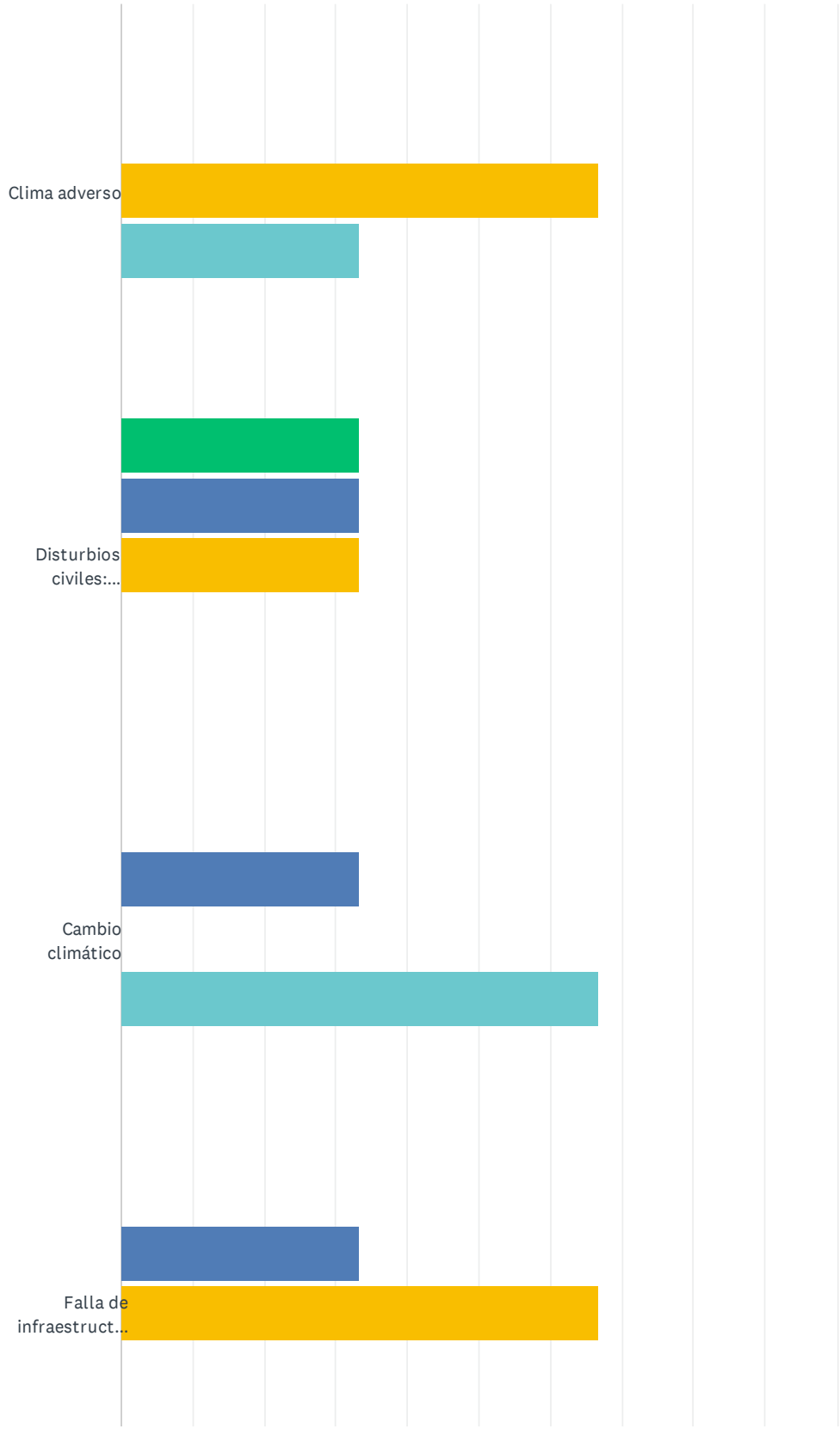
Answered: 3 Skipped: 166

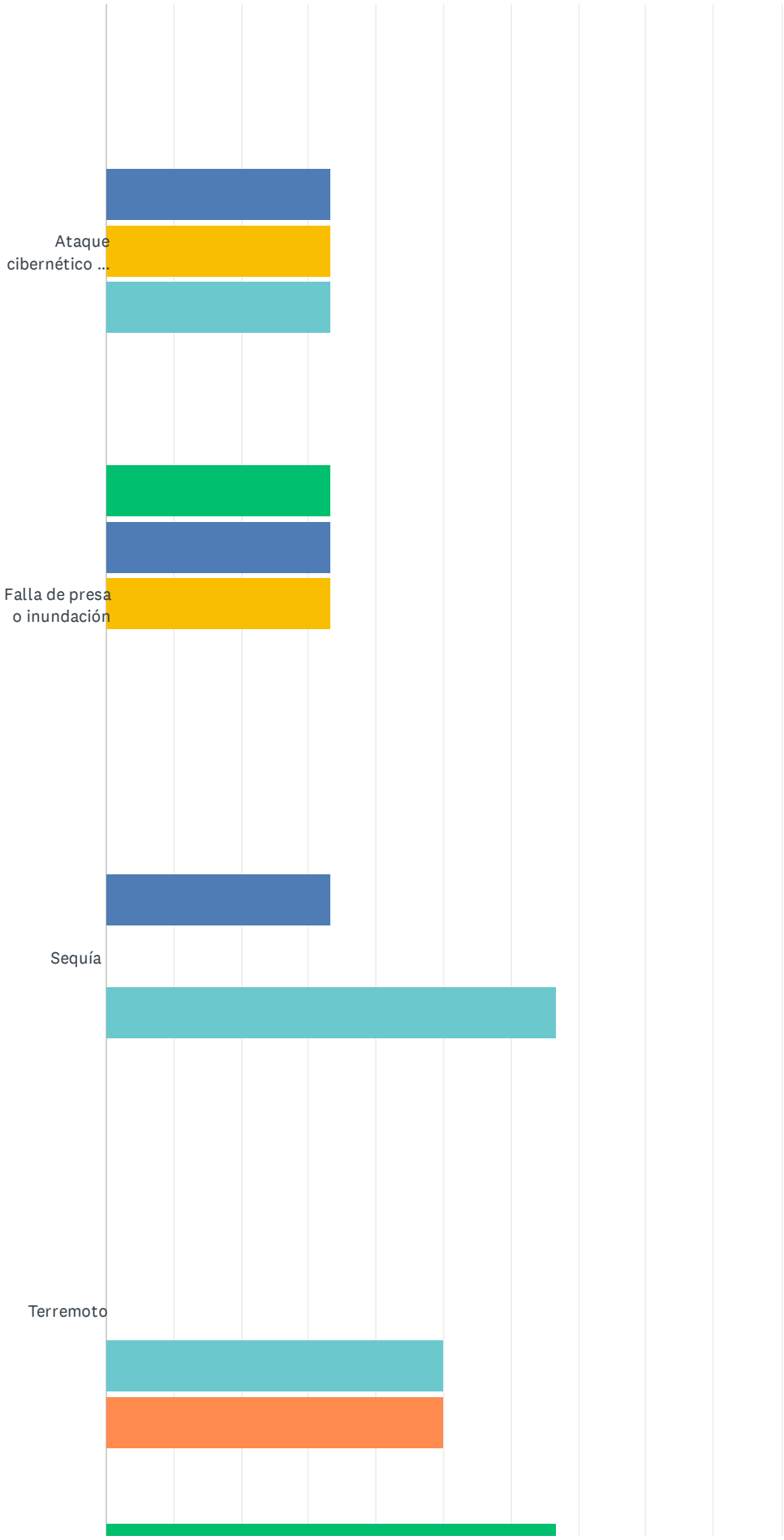


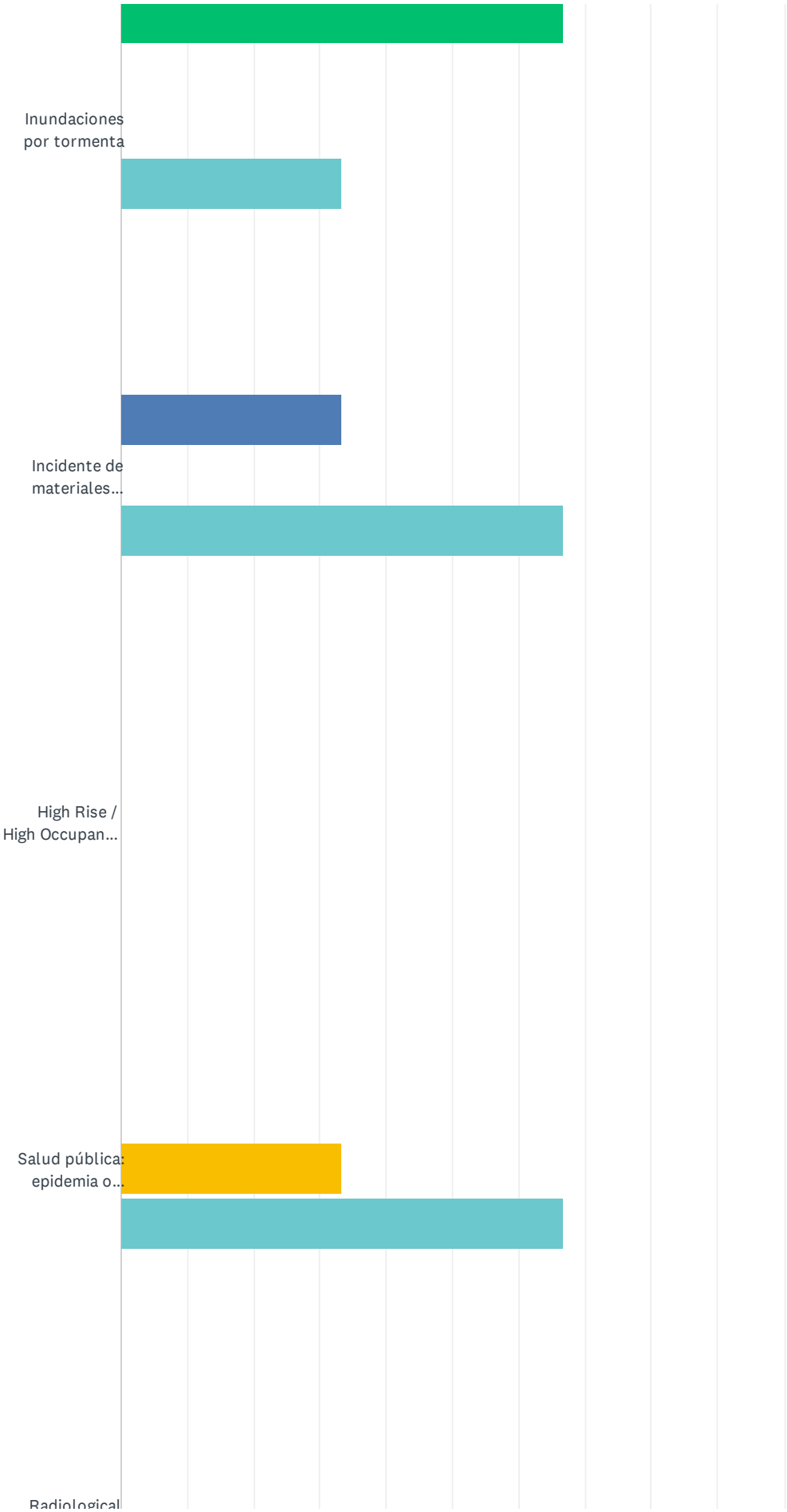
ANSWER CHOICES	RESPONSES	
Recibió capacitación en primeros auxilios / RCP	33.33%	1
Hizo un plan de escape en caso de incendio	33.33%	1
Designado un lugar de reunión de evacuación	0.00%	0
Cierres de servicios públicos identificados	0.00%	0
Preparado un equipo de suministros para desastres	33.33%	1
Detectores de humo y monóxido de carbono instalados en cada nivel de la casa	66.67%	2
Preparación / planificación individual / familiar	0.00%	0
Escribió y practicó su plan familiar para casos de desastre.	33.33%	1
Alimentos y agua almacenados	66.67%	2
Preparación / planificación del vecindario	0.00%	0
Linternas y pilas almacenadas	33.33%	1
Almacenó una radio y batería	33.33%	1
Almacenó un extintor de incendios	33.33%	1
Suministros médicos almacenados (botiquín de primeros auxilios, medicamentos)	0.00%	0
Otros (especificar)	0.00%	0
Total Respondents: 3		

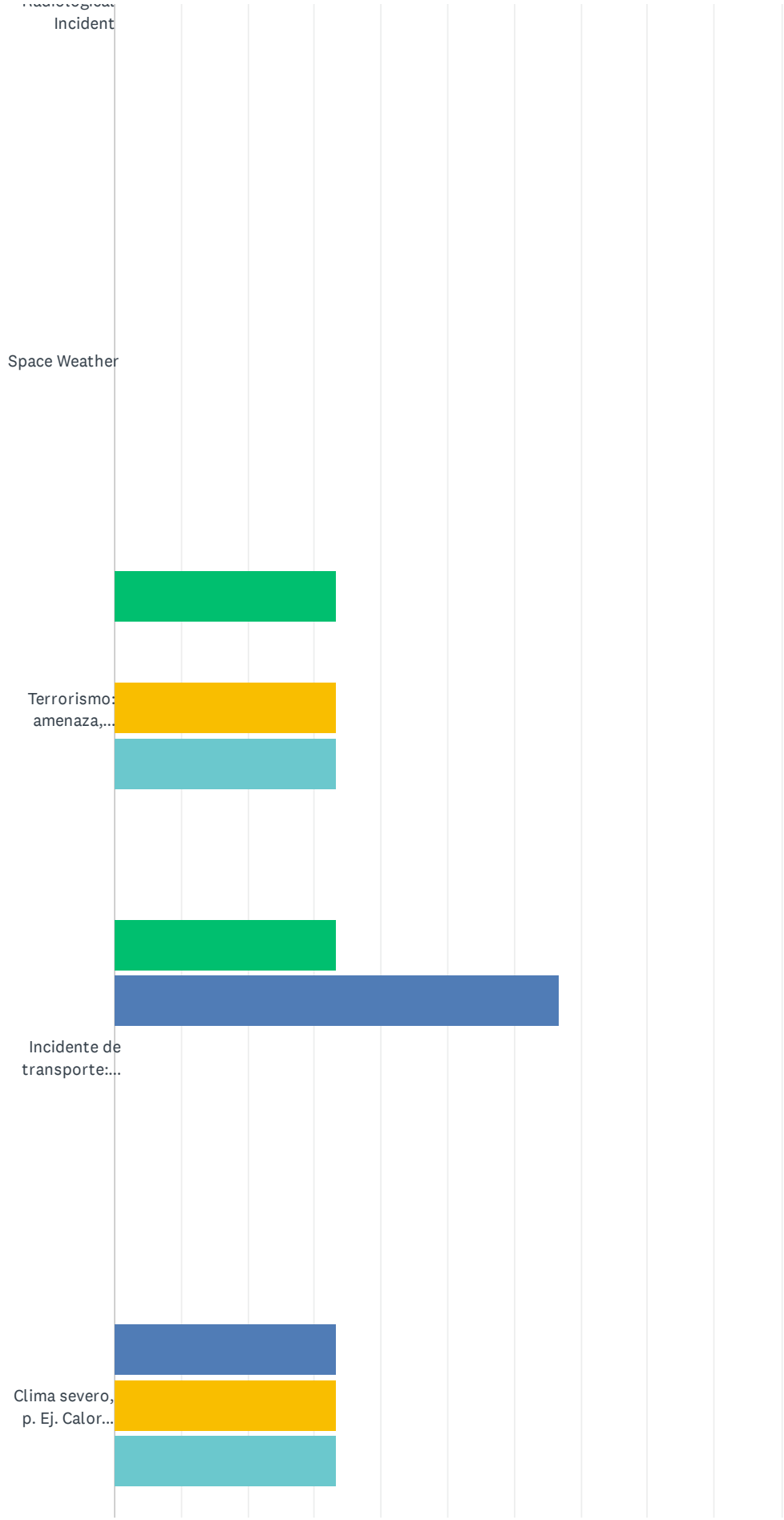
Q30 ¿Qué tan preocupado está por los siguientes peligros en la ciudad de Norwalk?(Marque una respuesta para cada peligro)

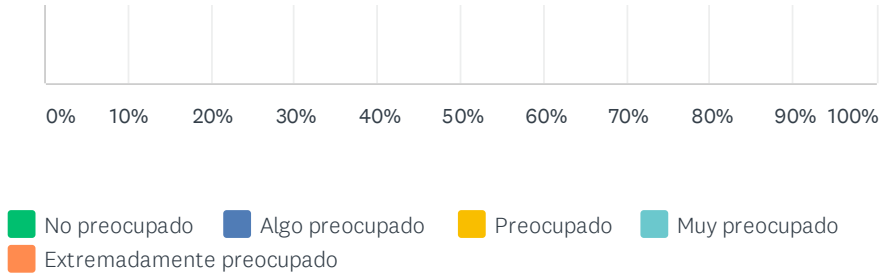
Answered: 3 Skipped: 166




Ataque cibernético ...
Falla de presa o inundación
Sequía
Terremoto


Inundaciones por tormenta
Incidente de materiales...
High Rise / High Occupan...
Salud pública: epidemia o...
Radiological

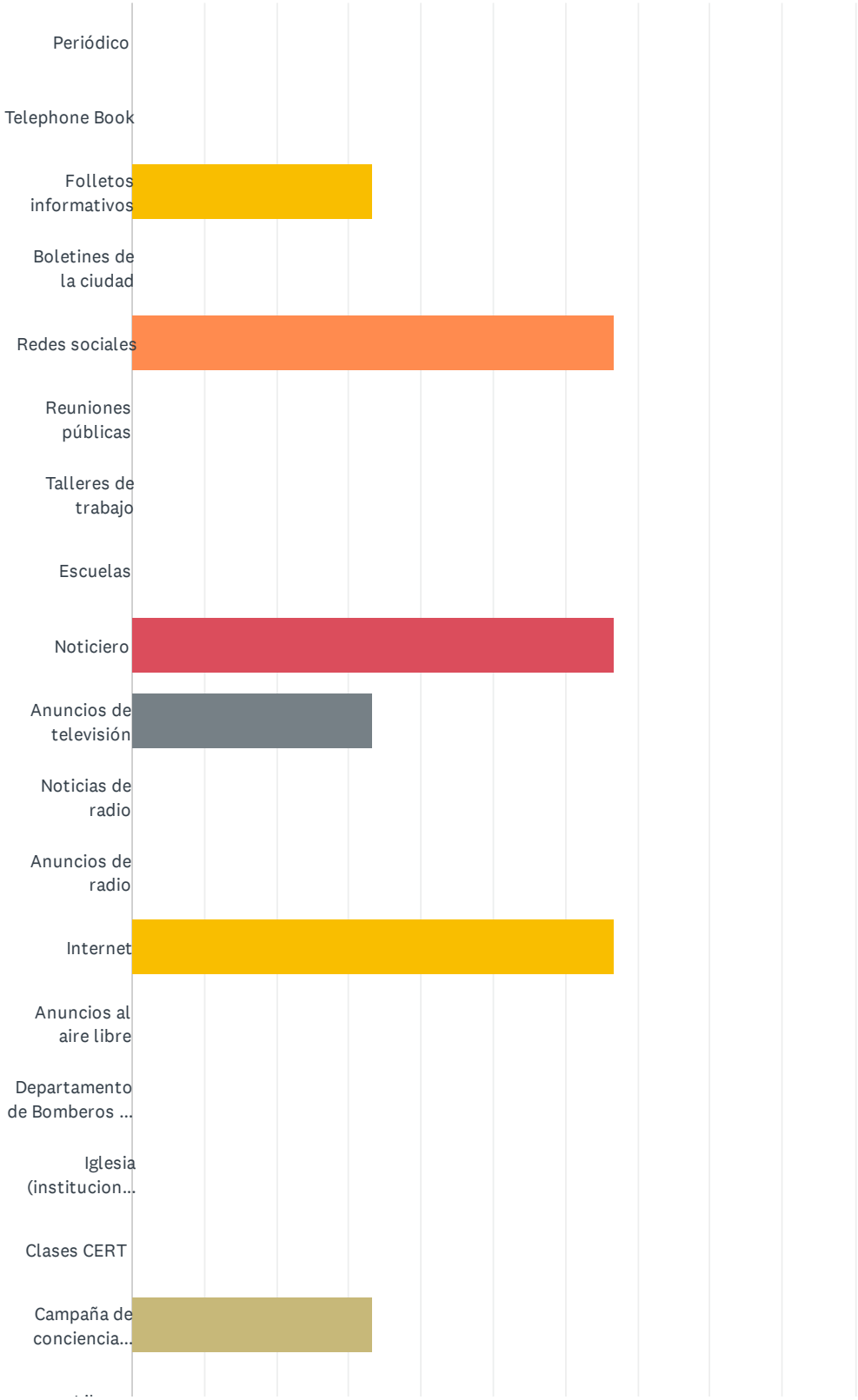

Incident
Space Weather
Terrorismo: amenaza,...
Incidente de transporte:...
Clima severo, p. Ej. Calor...

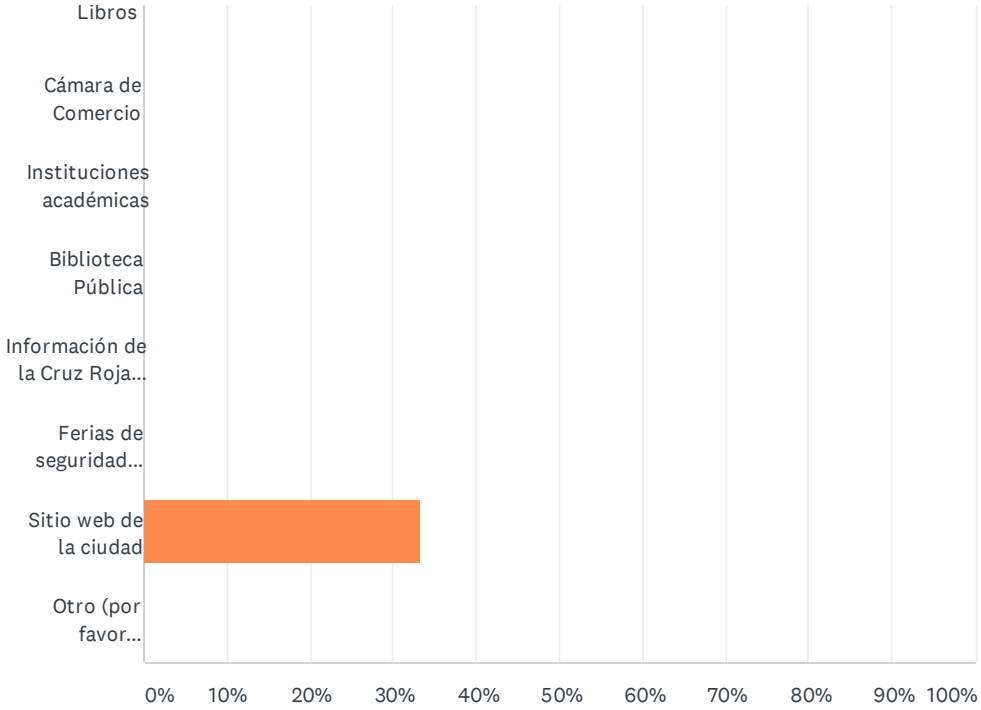

0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
No preocupado
Algo preocupado
Preocupado
Muy preocupado
Extremadamente preocupado

	NO PREOCUPADO	ALGO PREOCUPADO	PREOCUPADO	MUY PREOCUPADO	EXTREMADAMENTE PREOCUPADO	TOTAL	WEIGHTE AVERAGE
Clima adverso	0.00% 0	0.00% 0	66.67% 2	33.33% 1	0.00% 0	3	3.3
Disturbios civiles: disturbios públicos violentos	33.33% 1	33.33% 1	33.33% 1	0.00% 0	0.00% 0	3	2.0
Cambio climático	0.00% 0	33.33% 1	0.00% 0	66.67% 2	0.00% 0	3	3.3
Falla de infraestructura crítica	0.00% 0	33.33% 1	66.67% 2	0.00% 0	0.00% 0	3	2.6
Ataque cibernético o incidente de seguridad	0.00% 0	33.33% 1	33.33% 1	33.33% 1	0.00% 0	3	3.0
Falla de presa o inundación	33.33% 1	33.33% 1	33.33% 1	0.00% 0	0.00% 0	3	2.0
Sequía	0.00% 0	33.33% 1	0.00% 0	66.67% 2	0.00% 0	3	3.3
Terremoto	0.00% 0	0.00% 0	0.00% 0	50.00% 1	50.00% 1	2	4.5
Inundaciones por tormenta	66.67% 2	0.00% 0	0.00% 0	33.33% 1	0.00% 0	3	2.0
Incidente de materiales peligrosos	0.00% 0	33.33% 1	0.00% 0	66.67% 2	0.00% 0	3	3.3
High Rise / High Occupancy Building Fire	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0	0.0
Salud pública: epidemia o pandemia	0.00% 0	0.00% 0	33.33% 1	66.67% 2	0.00% 0	3	3.6
Radiological Incident	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0	0.0
Space Weather	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0	0.0
Terrorismo: amenaza, engaño, ciberataque	33.33% 1	0.00% 0	33.33% 1	33.33% 1	0.00% 0	3	2.6
Incidente de transporte: avión o ferrocarril	33.33% 1	66.67% 2	0.00% 0	0.00% 0	0.00% 0	3	1.6
Clima severo, p. Ej. Calor extremo	0.00% 0	33.33% 1	33.33% 1	33.33% 1	0.00% 0	3	3.0

Q31 ¿Cuál de los siguientes métodos cree que es más eficaz para proporcionar información sobre preparación para emergencias? (Marque todo lo que corresponda)

Answered: 3 Skipped: 166

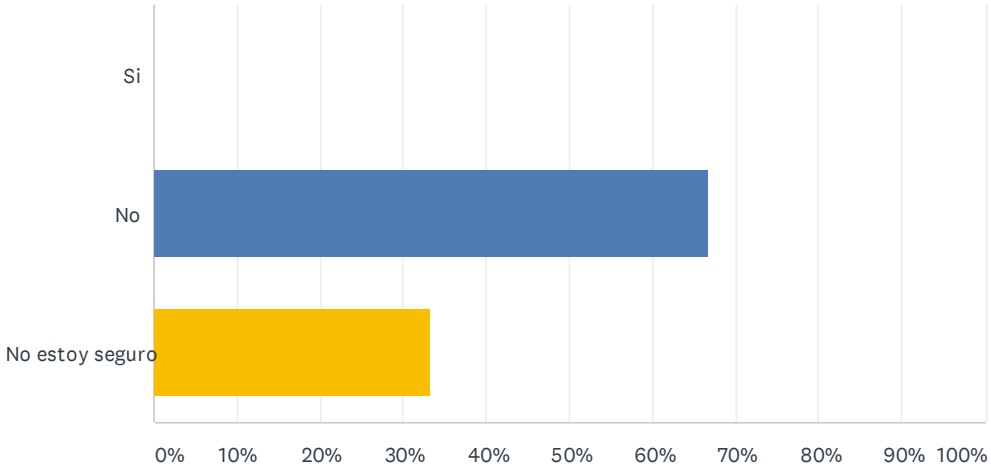



Libros
Cámara de Comercio
Instituciones académicas
Biblioteca Pública
Información de la Cruz Roja...
Ferias de seguridad...
Sitio web de la ciudad
Otro (por favor...
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

ANSWER CHOICES	RESPONSES	
Periódico	0.00%	0
Telephone Book	0.00%	0
Folletos informativos	33.33%	1
Boletines de la ciudad	0.00%	0
Redes sociales	66.67%	2
Reuniones públicas	0.00%	0
Talleres de trabajo	0.00%	0
Escuelas	0.00%	0
Noticiero	66.67%	2
Anuncios de televisión	33.33%	1
Noticias de radio	0.00%	0
Anuncios de radio	0.00%	0
Internet	66.67%	2
Anuncios al aire libre	0.00%	0
Departamento de Bomberos / Rescate	0.00%	0
Iglesia (instituciones religiosas)	0.00%	0
Clases CERT	0.00%	0
Campaña de conciencia pública (por ejemplo, Semana de concienciación sobre inundaciones, Mes de preparación para tormentas de invierno)	33.33%	1
Libros	0.00%	0
Cámara de Comercio	0.00%	0
Instituciones académicas	0.00%	0
Biblioteca Pública	0.00%	0
Información de la Cruz Roja Americana	0.00%	0
Ferias de seguridad comunitaria	0.00%	0
Sitio web de la ciudad	33.33%	1
Otro (por favor especifique)	0.00%	0
Total Respondents: 3		

Q32 ¿Está su hogar ubicado en o cerca de una llanura aluvial designada por FEMA?

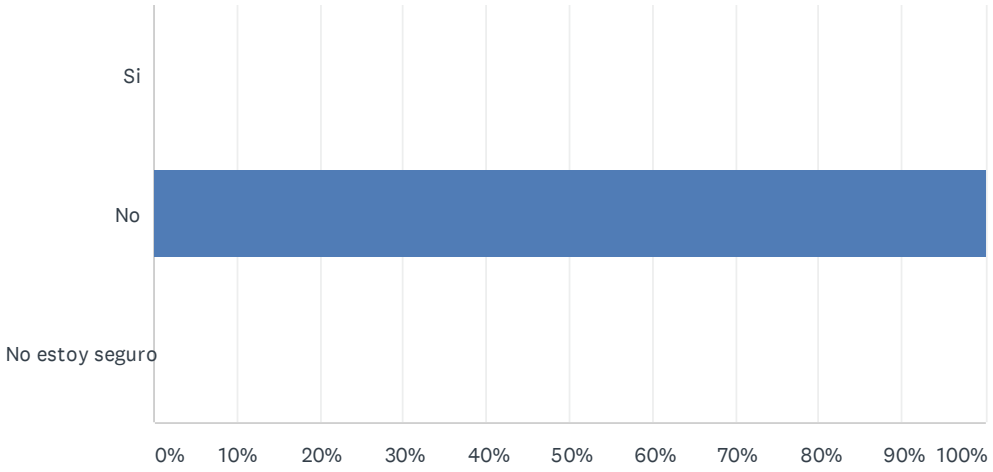
Answered: 3 Skipped: 166



ANSWER CHOICES	RESPONSES	
Si	0.00%	0
No	66.67%	2
No estoy seguro	33.33%	1
TOTAL		3

Q33 ¿Tiene usted (o el dueño de su casa) seguro contra inundaciones?

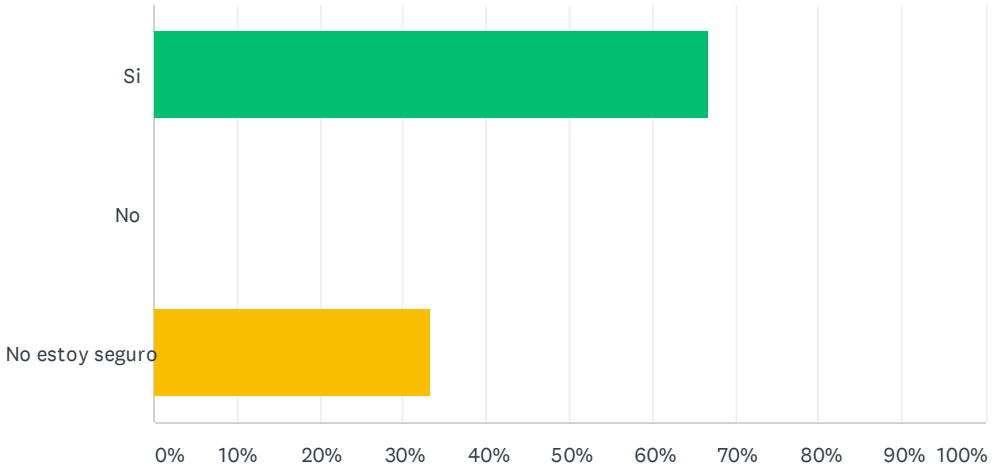
Answered: 3 Skipped: 166



ANSWER CHOICES	RESPONSES	
Si	0.00%	0
No	100.00%	3
No estoy seguro	0.00%	0
TOTAL		3

Q34 ¿Está su hogar ubicado cerca de una falla sísmica?

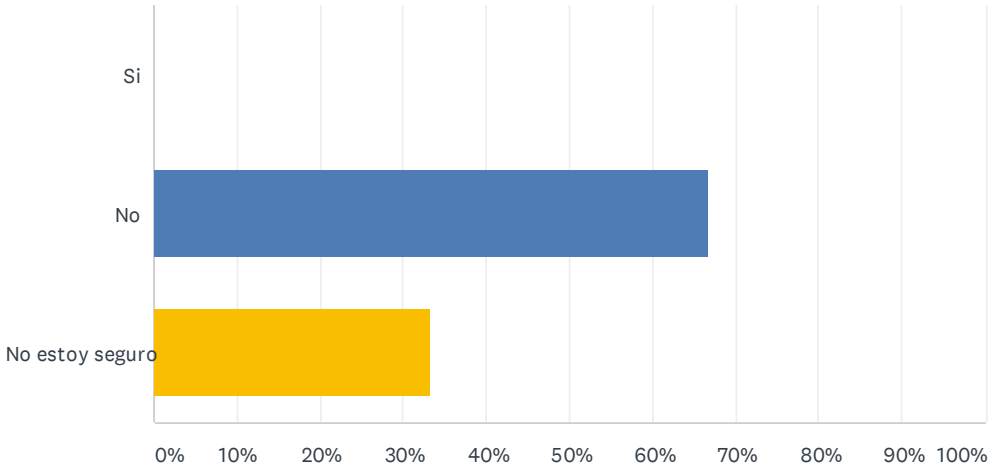
Answered: 3 Skipped: 166



ANSWER CHOICES	RESPONSES	
Si	66.67%	2
No	0.00%	0
No estoy seguro	33.33%	1
TOTAL		3

Q35 ¿Tiene usted (o el dueño de su casa) seguro contra terremotos?

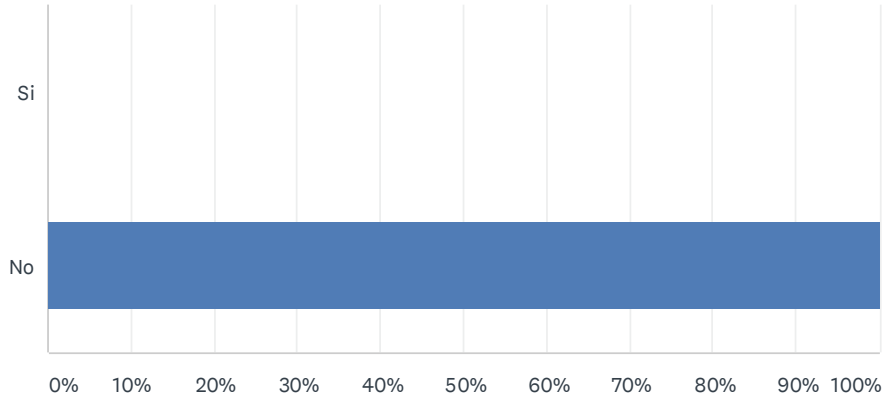
Answered: 3 Skipped: 166



ANSWER CHOICES	RESPONSES	
Si	0.00%	0
No	66.67%	2
No estoy seguro	33.33%	1
TOTAL		3

Q36 ¿Alguna vez ha tenido problemas para obtener un seguro para propietarios o inquilinos debido a los riesgos de los peligros?

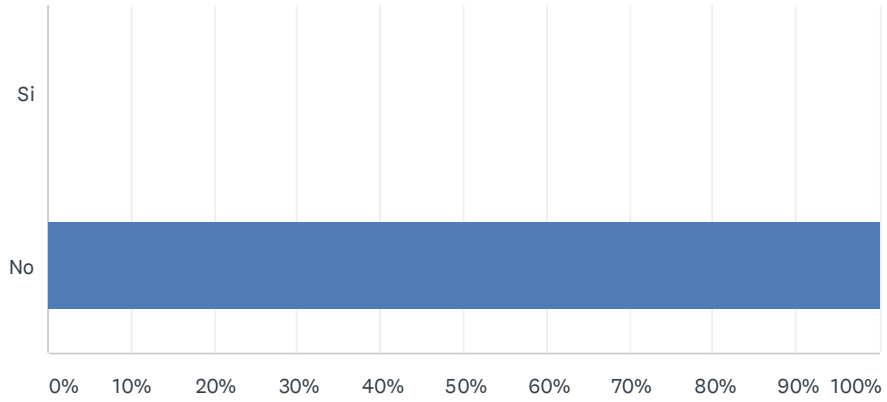
Answered: 3 Skipped: 166



ANSWER CHOICES	RESPONSES	
Si	0.00%	0
No	100.00%	3
TOTAL		3

Q37 ¿La presencia de una zona de riesgo de peligro (por ejemplo, zona de falla de terremoto, zona de falla de presa, zona de inundación o área de alto riesgo de incendio) le reveló un agente de bienes raíces, vendedor o arrendador antes de comprar o mudarse a su ¿hogar?

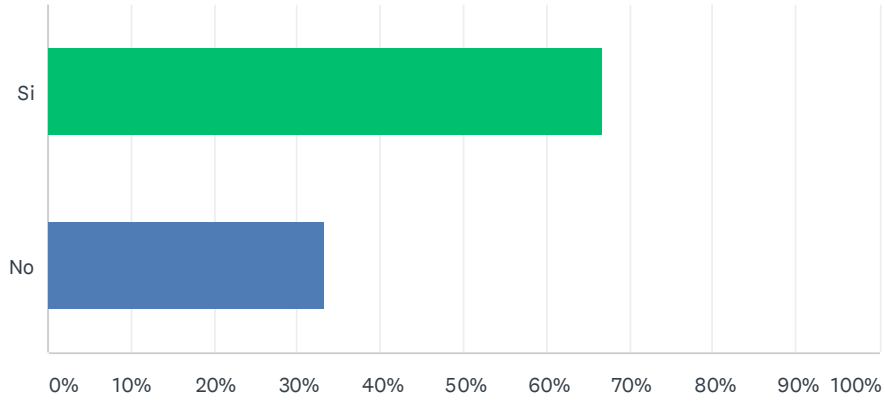
Answered: 3 Skipped: 166



ANSWER CHOICES	RESPONSES	
Si	0.00%	0
No	100.00%	3
TOTAL		3

Q38 ¿La divulgación de este tipo de información influiría en su decisión de comprar o mudarse a una casa?

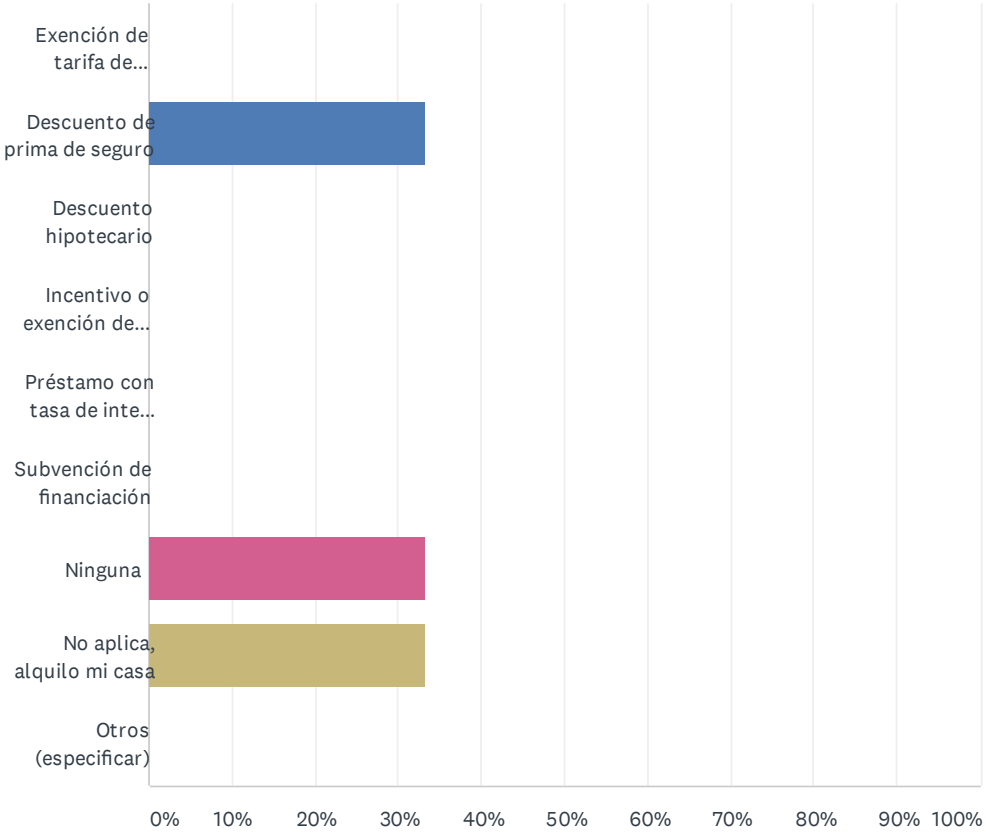
Answered: 3 Skipped: 166



ANSWER CHOICES	RESPONSES	
Si	66.67%	2
No	33.33%	1
TOTAL		3

Q39 ¿Cuál de los siguientes incentivos lo alentaría a gastar dinero para modernizar su casa para protegerse contra desastres? (Marque todo lo que corresponda)

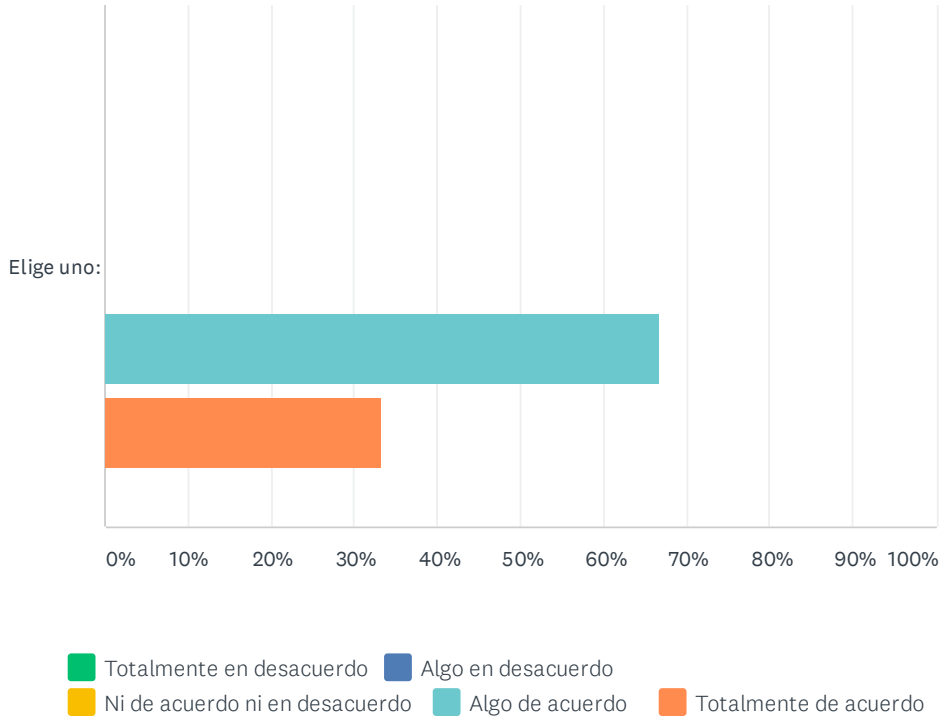
Answered: 3 Skipped: 166



ANSWER CHOICES	RESPONSES	
Exención de tarifa de permiso de construcción	0.00%	0
Descuento de prima de seguro	33.33%	1
Descuento hipotecario	0.00%	0
Incentivo o exención de impuestos sobre la propiedad	0.00%	0
Préstamo con tasa de interés baja	0.00%	0
Subvención de financiación	0.00%	0
Ninguna	33.33%	1
No aplica, alquilo mi casa	33.33%	1
Otros (especificar)	0.00%	0
Total Respondents: 3		

Q40 Indique cómo se siente acerca de la siguiente afirmación:"Creo que es responsabilidad del gobierno (local, estatal y federal) proporcionar educación y programas que promuevan a sus residentes a tomar medidas para reducir su exposición y riesgo a los peligros naturales".

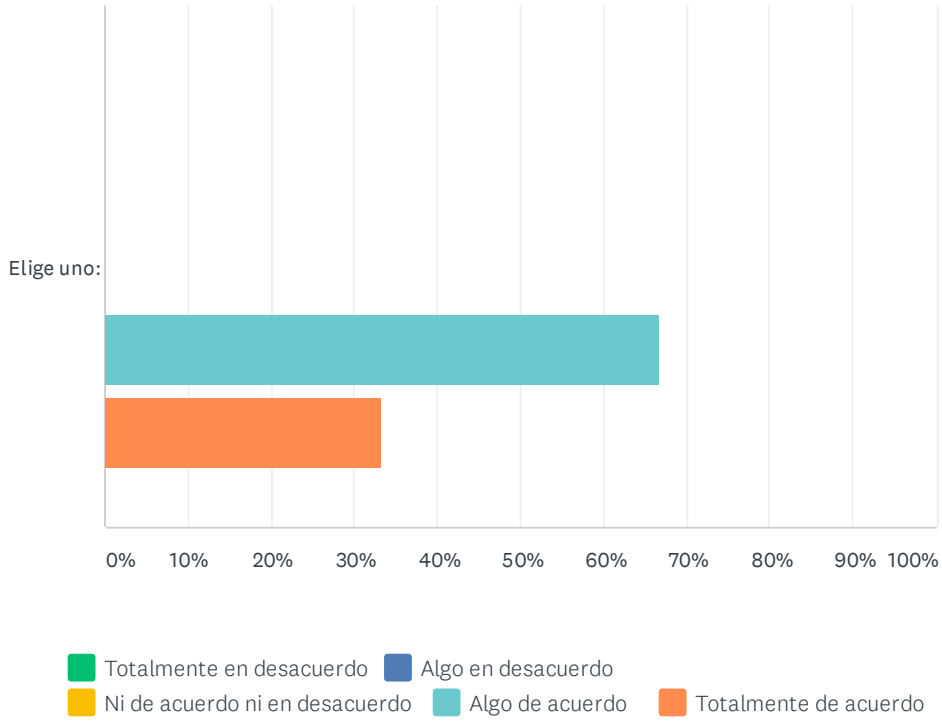
Answered: 3 Skipped: 166



	TOTALMENTE EN DESACUERDO	ALGO EN DESACUERDO	NI DE ACUERDO NI EN DESACUERDO	ALGO DE ACUERDO	TOTALMENTE DE ACUERDO	TOTAL	WEIGHTED AVERAGE
Elige uno:	0.00% 0	0.00% 0	0.00% 0	66.67% 2	33.33% 1	3	4.33

Q41 Indique cómo se siente acerca de la siguiente declaración:"Creo que es mi responsabilidad educarme sobre los programas que reducen mi exposición a los peligros naturales"

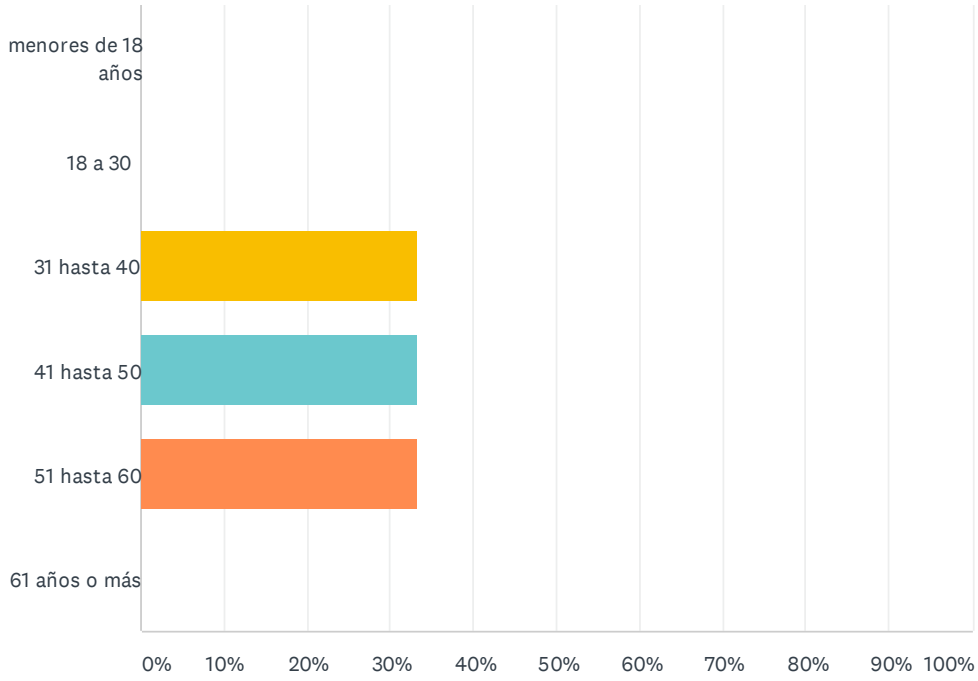
Answered: 3 Skipped: 166



	TOTALMENTE EN DESACUERDO	ALGO EN DESACUERDO	NI DE ACUERDO NI EN DESACUERDO	ALGO DE ACUERDO	TOTALMENTE DE ACUERDO	TOTAL	WEIGHTED AVERAGE
Elige uno:	0.00% 0	0.00% 0	0.00% 0	66.67% 2	33.33% 1	3	4.33

Q42 Indique su rango de edad:

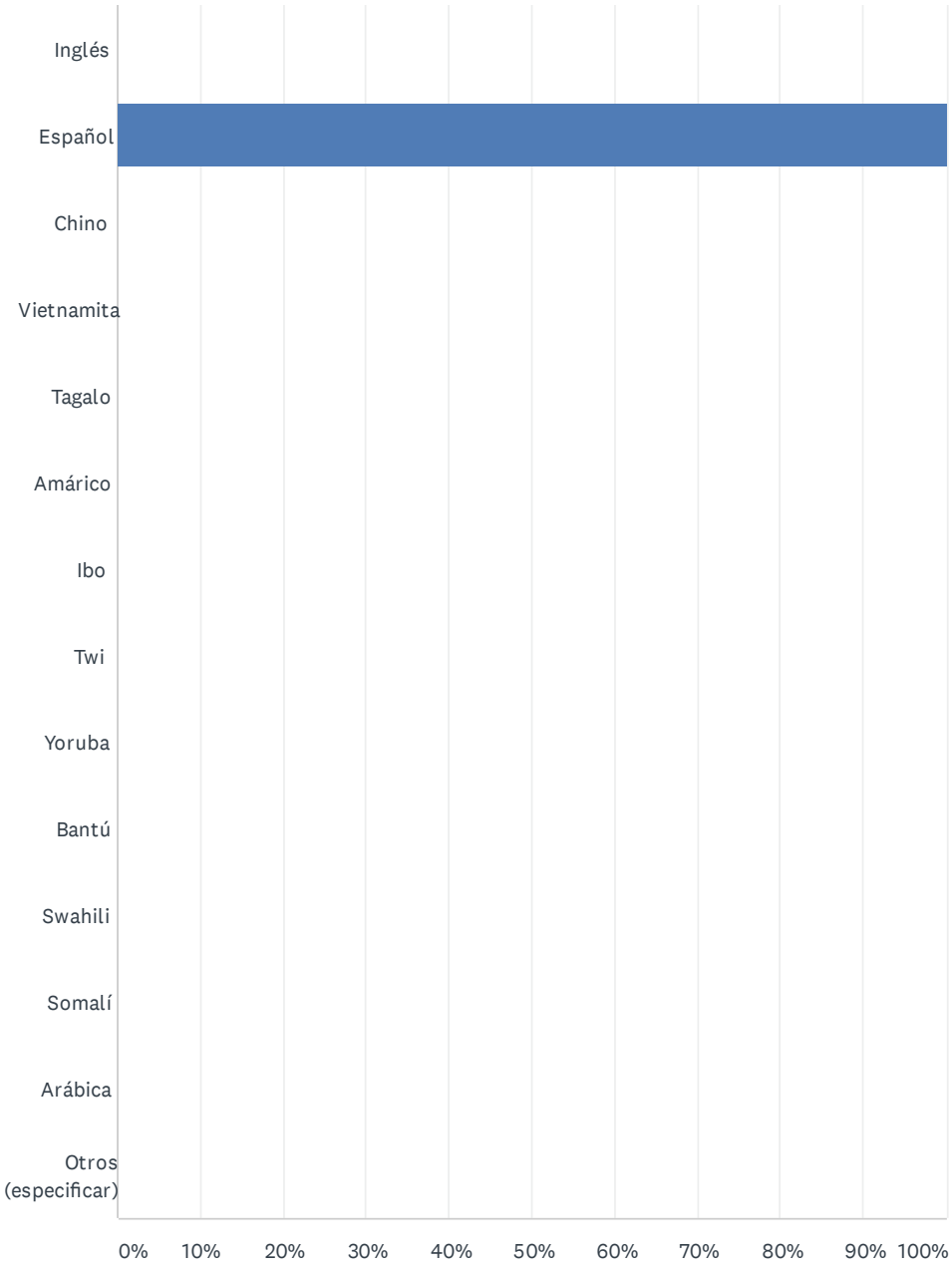
Answered: 3 Skipped: 166



ANSWER CHOICES	RESPONSES	
menores de 18 años	0.00%	0
18 a 30	0.00%	0
31 hasta 40	33.33%	1
41 hasta 50	33.33%	1
51 hasta 60	33.33%	1
61 años o más	0.00%	0
TOTAL		3

Q43 Indique el idioma principal que se habla en su hogar.

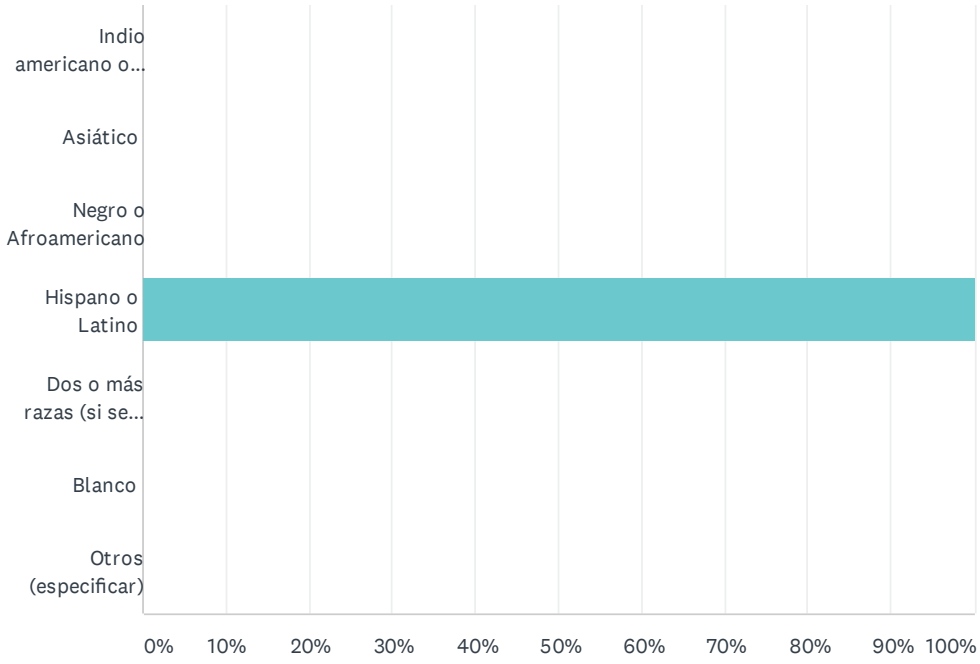
Answered: 3 Skipped: 166



ANSWER CHOICES	RESPONSES	
Inglés	0.00%	0
Español	100.00%	3
Chino	0.00%	0
Vietnamita	0.00%	0
Tagalo	0.00%	0
Amárico	0.00%	0
Ibo	0.00%	0
Twi	0.00%	0
Yoruba	0.00%	0
Bantú	0.00%	0
Swahili	0.00%	0
Somalí	0.00%	0
Arábica	0.00%	0
Otros (especificar)	0.00%	0
TOTAL		3

Q44 ¿Cuál es tu raza?

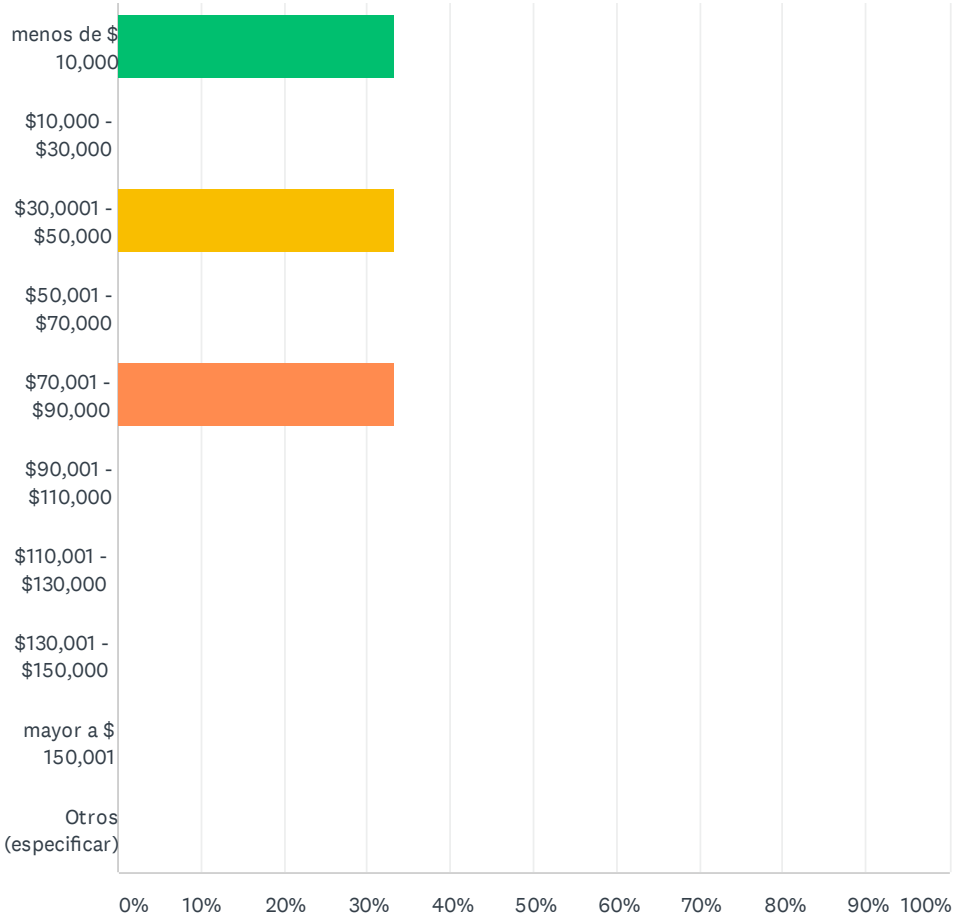
Answered: 3 Skipped: 166



ANSWER CHOICES	RESPONSES	
Indio americano o nativo de Alaska	0.00%	0
Asiático	0.00%	0
Negro o Afroamericano	0.00%	0
Hispano o Latino	100.00%	3
Dos o más razas (si se seleccionan, explique a continuación)	0.00%	0
Blanco	0.00%	0
Otros (especificar)	0.00%	0
TOTAL		3

Q45 ¿Cuáles son los ingresos de su hogar?

Answered: 3 Skipped: 166



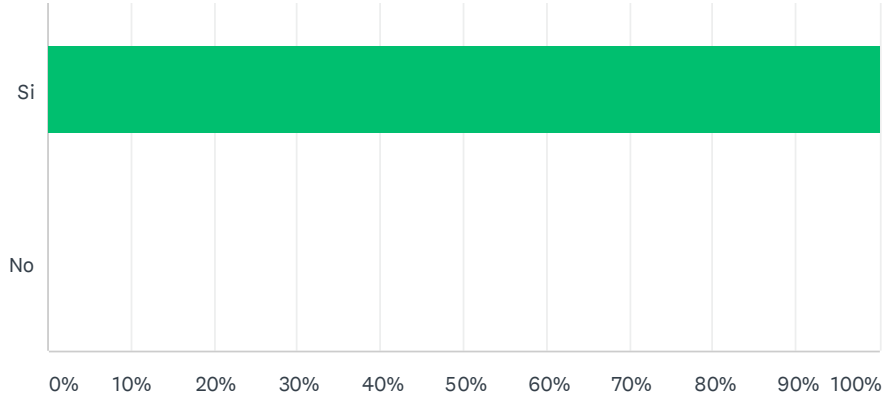
ANSWER CHOICES	RESPONSES	
menos de $ 10,000	33.33%	1
$10,000 - $30,000	0.00%	0
$30,0001 - $50,000	33.33%	1
$50,001 - $70,000	0.00%	0
$70,001 - $90,000	33.33%	1
$90,001 - $110,000	0.00%	0
$110,001 - $130,000	0.00%	0
$130,001 - $150,000	0.00%	0
mayor a $ 150,001	0.00%	0
Otros (especificar)	0.00%	0
TOTAL		3

Q46 ¿Cuál es su código postal?

Answered: 3 Skipped: 166

Q47 ¿Tiene acceso a Internet?

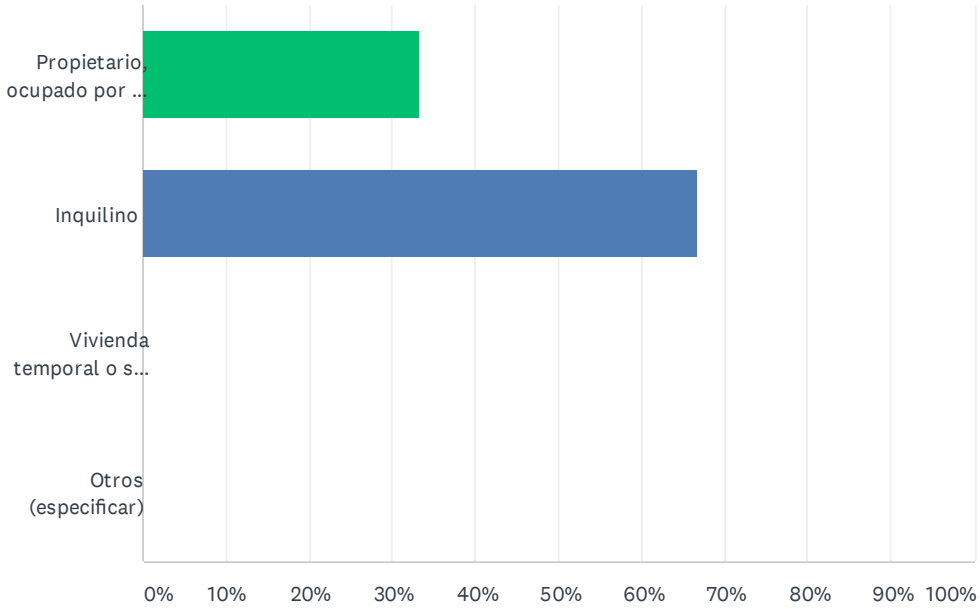
Answered: 3 Skipped: 166



ANSWER CHOICES	RESPONSES	
Si	100.00%	3
No	0.00%	0
TOTAL		3

Q48 ¿Cuál es su situación de vivienda?

Answered: 3 Skipped: 166



ANSWER CHOICES	RESPONSES	
Propietario, ocupado por el propietario	33.33%	1
Inquilino	66.67%	2
Vivienda temporal o sin vivienda actual	0.00%	0
Otros (especificar)	0.00%	0
TOTAL		3

Q49 Comentarios

Answered: 2 Skipped: 167

Appendix B. Summary of Federal and State Agencies, Programs and Regulation

B. Summary of Federal and State Agencies, Programs and Regulation

Existing laws, ordinances, plans and programs at the federal and state level can support or impact hazard mitigation actions identified in this plan. Hazard mitigation plans are required to include a review and incorporation, if appropriate, of existing plans, studies, reports, and technical information as part of the planning process (44 CFR, Section 201.6(b)(3)). The following federal and state programs have been identified as programs that may interface with the actions identified in this plan. Each program enhances capabilities to implement mitigation actions or has a nexus with a mitigation action in this plan. Information presented in this section can be used to review local capabilities to implement the actions found in the action plan presented in Chapter 15

FEDERAL

Americans with Disabilities Act

The Americans with Disabilities Act (ADA) seeks to prevent discrimination against people with disabilities in employment, transportation, public accommodation, communications, and government activities. Title II of the ADA deals with compliance with the Act in emergency management and disaster-related programs, services, and activities. It applies to state and local governments as well as third parties, including religious entities and private nonprofit organizations.

The ADA has implications for sheltering requirements and public notifications. During an emergency alert, officials must use a combination of warning methods to ensure that all residents have all necessary information. Those with hearing impairments may not hear radio, television, sirens, or other audible alerts, while those with visual impairments may not see flashing lights or other visual alerts. Two technical documents for shelter operators address physical accessibility needs of people with disabilities, as well as medical needs and service animals.

The ADA intersects with disaster preparedness programs in regards to transportation, social services, temporary housing, and rebuilding. Persons with disabilities may require additional assistance in evacuation and transit (e.g., vehicles with wheelchair lifts or paratransit buses). Evacuation and other response plans should address the unique needs of residents. Local governments may be interested in implementing a special-needs registry to identify the home addresses, contact information, and needs for residents who may require more assistance.

FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Civil Rights Act of 1964

The Civil Rights Act of 1964 prohibits discrimination based on race, color, religion, sex or nation origin and requires equal access to public places and employment. The Act is relevant to emergency management and hazard mitigation in that it prohibits local governments from favoring the needs of one population group over another. Local government and emergency response must ensure the continued safety and well-being of all residents equally, to the extent possible. FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Clean Water Act

The federal Clean Water Act (CWA) employs regulatory and non-regulatory tools to reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's surface waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water."

Evolution of CWA programs over the last decade has included a shift from a program-by-program, source-by-source, and pollutant-by-pollutant approach to more holistic watershed-based strategies. Under the watershed approach, equal emphasis is placed on protecting healthy waters and restoring impaired ones. Numerous issues are addressed, not just those subject to CWA regulatory authority. Involvement of stakeholder groups in the development and implementation of strategies for achieving and maintaining water quality and other environmental goals is a hallmark of this approach.

The CWA is important to hazard mitigation in several ways. There are often permitting requirements for any construction within 200 feet of water of the United States, which may have implications for mitigation projects identified by a local jurisdiction. Additionally, CWA requirements apply to wetlands, which serve important functions related to preserving and protecting the natural and beneficial functions of floodplains and are linked with a community's floodplain management program. Finally, the National Pollutant Discharge Elimination System is part of the CWA and addresses local stormwater management programs. Stormwater management plays a critical role in hazard mitigation by addressing urban drainage or localized flooding issues within jurisdictions.

FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Community Development Block Grant Disaster Resilience Program

In response to disasters, Congress may appropriate additional funding for the U.S. Department of Housing and Urban Development Community Development Block Grant programs to be distributed as Disaster Recovery grants (CDBG-DR). These grants can be used to rebuild affected areas and provide seed money to start the recovery process. CDBG-DR assistance may fund a broad range of recovery activities, helping communities and neighborhoods that otherwise might not recover due to limited resources. CDBG-DR grants often supplement disaster programs of FEMA, the Small Business Administration, and the U.S. Army Corps of Engineers. Housing and Urban Development generally awards noncompetitive, nonrecurring CDBG-DR grants by a formula that considers disaster recovery needs unmet by other federal disaster assistance programs. To be eligible for CDBG-DR funds, projects must meet the following criteria:

- Address a disaster-related impact (direct or indirect) in a presidentially declared county for the covered disaster
- Be a CDBG-eligible activity (according to regulations and waivers)
- Meet a national objective.

Incorporating preparedness and mitigation into these actions is encouraged, as the goal is to rebuild in ways that are safer and stronger. CDBG-DR funding is a potential alternative source of funding for actions identified in this plan.

Community Rating System

The CRS is a voluntary program within the NFIP that encourages floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premiums are discounted to reflect the reduced flood risk resulting from community actions meeting the following three goals of the CRS:

- Reduce flood losses.
- Facilitate accurate insurance rating.
- Promote awareness of flood insurance.

For participating communities, flood insurance premium rates are discounted in increments of 5 percent. For example, a Class 1 community would receive a 45 percent premium discount, and a Class 9 community would receive a 5 percent discount. (Class 10 communities are those that do not participate in the CRS; they receive no discount.) The discount partially depends on location of the property. Properties outside the special flood hazard area receive smaller discounts: a 10-percent discount if the community is at Class 1 to 6 and a 5-percent discount if the community is at Class 7 to 9. The CRS classes for local communities are based on 18 creditable activities in the following categories:

- Public information
- Mapping and regulations
- Flood damage reduction
- Flood preparedness.

CRS activities can help to save lives and reduce property damage. Communities participating in the CRS represent a significant portion of the nation's flood risk; over 66 percent of the NFIP's policy base is located in these communities. Communities receiving premium discounts through the CRS range from small to large and represent a broad mixture of flood risks, including both coastal and riverine flood risks.

Disaster Mitigation Act

The DMA is the current federal legislation addressing hazard mitigation planning. It emphasizes planning for disasters before they occur. It specifically addresses planning at the local level, requiring plans to be in place before Hazard Mitigation Assistance grant funds are available to communities. This plan is designed to meet the requirements of DMA, improving eligibility for future hazard mitigation funds.

Emergency Relief for Federally Owned Roads Program

The U.S. Forest Service's Emergency Relief for Federally Owned Roads Program was established to assist federal agencies with repair or reconstruction of tribal transportation facilities, federal lands transportation facilities, and other federally owned roads that are open to public travel and have suffered serious damage by a natural disaster over a wide area or by a catastrophic failure. The program funds both emergency and permanent repairs (Office of Federal Lands Highway, 2016). Eligible activities under this program meet some of the goals and objectives for this plan and the program is a possible funding source for actions identified in this plan.

Emergency Watershed Program

The U. S. Department of Agriculture Natural Resources Conservation Service administers the Emergency Watershed Protection Program, which responds to emergencies created by natural disasters. Eligibility for assistance is not dependent on a national emergency declaration. The program is designed to help people and conserve natural resources by relieving imminent hazards to life and property caused by floods, fires, windstorms, and other natural occurrences. Emergency Watershed Protection is an emergency recovery program. Financial and technical assistance are available for the following activities (Natural Resources Conservation Service, 2016):

- Remove debris from stream channels, road culverts, and bridges
- Reshape and protect eroded banks
- Correct damaged drainage facilities
- Establish cover on critically eroding lands
- Repair levees and structures
- Repair conservation practices.

This federal program could be a possible funding source for actions identified in this plan.

Endangered Species Act

The federal Endangered Species Act (ESA) was enacted in 1973 to conserve species facing depletion or extinction and the ecosystems that support them. The act sets forth a process for determining which species are threatened and endangered and requires the conservation of the critical habitat in which those species live. The ESA provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. The ESA outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species and contains exceptions and exemptions. It is the enabling legislation for the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Criminal and civil penalties are provided for violations of the ESA and the Convention.

Federal agencies must seek to conserve endangered and threatened species and use their authorities in furtherance of the ESA's purposes. The ESA defines three fundamental terms:

- Endangered means that a species of fish, animal or plant is "in danger of extinction throughout all or a significant portion of its range." (For salmon and other vertebrate species, this may include subspecies and distinct population segments.)

- Threatened means that a species "is likely to become endangered within the foreseeable future." Regulations may be less restrictive for threatened species than for endangered species.
- Critical habitat means "specific geographical areas that are…essential for the conservation and management of a listed species, whether occupied by the species or not."

Five sections of the ESA are of critical importance to understanding it:

- Section 4: Listing of a Species—The National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries) is responsible for listing marine species; the U.S. Fish and Wildlife Service is responsible for listing terrestrial and freshwater aquatic species. The agencies may initiate reviews for listings, or citizens may petition for them. A listing must be made "solely on the basis of the best scientific and commercial data available." After a listing has been proposed, agencies receive comment and conduct further scientific reviews for 12 to 18 months, after which they must decide if the listing is warranted. Economic impacts cannot be considered in this decision, but it may include an evaluation of the adequacy of local and state protections. Critical habitat for the species may be designated at the time of listing.
- Section 7: Consultation—Federal agencies must ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed or proposed species or adversely modify its critical habitat. This includes private and public actions that require a federal permit. Once a final listing is made, non-federal actions are subject to the same review, termed a "consultation." If the listing agency finds that an action will "take" a species, it must propose mitigations or "reasonable and prudent" alternatives to the action; if the proponent rejects these, the action cannot proceed.
- Section 9: Prohibition of Take—It is unlawful to "take" an endangered species, including killing or injuring it or modifying its habitat in a way that interferes with essential behavioral patterns, including breeding, feeding or sheltering.
- Section 10: Permitted Take—Through voluntary agreements with the federal government that provide protections to an endangered species, a non-federal applicant may commit a take that would otherwise be prohibited as long as it is incidental to an otherwise lawful activity (such as developing land or building a road). These agreements often take the form of a "Habitat Conservation Plan."
- Section 11: Citizen Lawsuits—Civil actions initiated by any citizen can require the listing agency to enforce the ESA's prohibition of taking or to meet the requirements of the consultation process.

FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Federal Energy Regulatory Commission Dam Safety Program

The Federal Energy Regulatory Commission (FERC) cooperates with a large number of federal and state agencies to ensure and promote dam safety. More than 3,000 dams are part of regulated hydroelectric projects in the FERC program. Two-thirds of these are more than 50 years old. As dams age, concern about their safety and integrity grows, so oversight and regular inspection are important. FERC inspects hydroelectric projects on an unscheduled basis to investigate the following:

- Potential dam safety problems
- Complaints about constructing and operating a project
- Safety concerns related to natural disasters

- Issues concerning compliance with the terms and conditions of a license.

Every five years, an independent engineer approved by the FERC must inspect and evaluate projects with dams higher than 32.8 feet (10 meters), or with a total storage capacity of more than 2,000 acre-feet.

FERC monitors seismic research and applies it in performing structural analyses of hydroelectric projects. FERC also evaluates the effects of potential and actual large floods on the safety of dams. During and following floods, FERC visits dams and licensed projects, determines the extent of damage, if any, and directs any necessary studies or remedial measures the licensee must undertake. The FERC publication Engineering Guidelines for the Evaluation of Hydropower Projects guides the FERC engineering staff and licensees in evaluating dam safety. The publication is frequently revised to reflect current information and methodologies.

FERC requires licensees to prepare emergency action plans and conducts training sessions on how to develop and test these plans. The plans outline an early warning system if there is an actual or potential sudden release of water from a dam due to failure. The plans include operational procedures that may be used, such as reducing reservoir levels and reducing downstream flows, as well as procedures for notifying affected residents and agencies responsible for emergency management. These plans are frequently updated and tested to ensure that everyone knows what to do in emergency situations.

National Dam Safety Act

Potential for catastrophic flooding due to dam failures led to passage of the National Dam Inspection Act in 1972, creation of the National Dam Safety Program in 1996, and reauthorization of the program through the Dam Safety Act in 2006. National Dam Safety Program, administered by FEMA requires a periodic engineering analysis of the majority of dams in the country; exceptions include the following:

- Dams under jurisdiction of the Bureau of Reclamation, Tennessee Valley Authority, or International Boundary and Water Commission
- Dams constructed pursuant to licenses issued under the Federal Power Act
- Dams that the Secretary of the Army determines do not pose any threat to human life or property.

The goal of this FEMA-monitored effort is to identify and mitigate the risk of dam failure so as to protect lives and property of the public. The National Dam Safety Program is a partnership among the states, federal agencies, and other stakeholders that encourages individual and community responsibility for dam safety. Under FEMA's leadership, state assistance funds have allowed all participating states to improve their programs through increased inspections, emergency action planning, and purchases of needed equipment. FEMA has also expanded existing and initiated new training programs. Grant assistance from FEMA provides support for improvement of dam safety programs that regulate most of the dams in the United States.

National Environmental Policy Act

The National Environmental Policy Act requires federal agencies to consider the environmental impacts of proposed actions and reasonable alternatives to those actions, alongside technical and economic considerations. The National Environmental Policy Act established the Council on Environmental Quality, whose regulations (40 CFR Parts 1500-1508) set standards for compliance. Consideration and decision-making regarding environmental impacts must be documented in an environmental impact statement or environmental assessment. Environmental impact assessment requires the evaluation of reasonable alternatives to a proposed action, solicitation of input

from organizations and individuals that could be affected, and an unbiased presentation of direct, indirect, and cumulative environmental impacts. FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

National Flood Insurance Program

The National Flood Insurance Program (NFIP) makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities that enact floodplain regulations. Participation and good standing under NFIP are prerequisites to grant funding eligibility under the Robert T. Stafford Act. NFIP participation is limited to local governments that possess permit authority and have the ability to adopt and enforce regulations that govern land use.

For most participating communities, FEMA has prepared a detailed Flood Insurance Study. The study presents water surface elevations for floods of various magnitudes, including the 1-percent-annual-chance flood and the 0.2-percent-annual-chance flood. Base flood elevations and the boundaries of the flood hazard areas are shown on Flood Insurance Rate Maps, which are the principle tool for identifying the extent and location of the flood hazard. Flood Insurance Rate Maps are the most detailed and consistent data source available, and for many communities they represent the minimum area of oversight under the local floodplain management program. In recent years, Flood Insurance Rate Maps have been digitized as Digital Flood Insurance Rate Maps, which are more accessible to residents, local governments and stakeholders.

NFIP participants must, at a minimum, regulate development in floodplain areas in accordance with NFIP criteria. Before issuing a permit to build in a floodplain, participating jurisdictions must ensure that three criteria are met:

- New buildings and those undergoing substantial improvements must, at a minimum, be elevated to protect against damage by the 1-percent-annual-chance flood.
- New floodplain development must not aggravate existing flood problems or increase damage to other properties.
- New floodplain development must exercise a reasonable and prudent effort to reduce its adverse impacts on threatened salmonid species.

In California, the Department of Water Resources (DWR) is the coordinating agency for floodplain management. DWR works with FEMA and local governments by providing grants and technical assistance, evaluating community floodplain management programs, reviewing local floodplain ordinances, participating in statewide flood hazard mitigation planning, and facilitating annual statewide workshops. Compliance is monitored by FEMA regional staff and by DWR.

National Incident Management System

The National Incident Management System (NIMS) is a systematic approach for government, nongovernmental organizations, and the private sector to work together to manage incidents involving hazards. The NIMS provides a flexible but standardized set of incident management practices. Incidents typically begin and end locally, and they are managed at the lowest possible geographical, organizational, and jurisdictional level. In some cases, success depends on the involvement of multiple jurisdictions, levels of government, functional agencies, and emergency responder disciplines. These cases necessitate coordination across a spectrum of organizations. Communities using NIMS follow a comprehensive national approach that improves the effectiveness of

emergency management and response personnel across the full spectrum of potential hazards (including natural hazards, technological hazards, and human-caused hazards) regardless of size or complexity.

Although participation is voluntary, federal departments and agencies are required to make adoption of NIMS by local and state jurisdictions a condition to receive federal preparedness grants and awards. The content of this plan is considered to be a viable support tool for any phase of emergency management. The NIMS program is considered as a response function, and information in this hazard mitigation plan can support the implementation and update of all NIMS-compliant plans within the planning area.

Presidential Executive Order 11988, Floodplain Management

Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. It requires federal agencies to provide leadership and take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values of floodplains. The requirements apply to the following activities (FEMA, 2015a):

- Acquiring, managing, and disposing of federal lands and facilities
- Providing federally undertaken, financed, or assisted construction and improvements
- Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing.

Presidential Executive Order 11990, Protection of Wetlands

Executive Order 11990 requires federal agencies to provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. The requirements apply to the following activities (National Archives, 2016):

- Acquiring, managing, and disposing of federal lands and facilities
- Providing federally undertaken, financed, or assisted construction and improvements
- Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing.

All actions identified in this plan will seek full compliance with all applicable presidential executive orders.

U.S. Army Corps of Engineers Dam Safety Program

The U.S. Army Corps of Engineers operates and maintains approximately 700 dams nationwide. It is also responsible for safety inspections of some federal and non-federal dams in the United States that meet the size and storage limitations specified in the National Dam Safety Act. The Corps has inventoried dams; surveyed each state and federal agency's capabilities, practices and regulations regarding design, construction, operation and maintenance of the dams; and developed guidelines for inspection and evaluation of dam safety. The Corps maintains the National Inventory of Dams, which contains information about a dam's location, size, purpose, type, last inspection and regulatory status (U.S. Army Corps of Engineers, 2017).

U.S. Army Corps of Engineers Flood Hazard Management

The following U.S. Army Corps of Engineers authorities and programs related to flood hazard management:

- The Floodplain Management Services program offers 100-percent federally funded technical services such as development and interpretation of site-specific data related to the extent, duration and frequency of flooding. Special studies may be conducted to help a community understand and respond to flood risk. These may include flood hazard evaluation, flood warning and preparedness, or flood modeling.
- For more extensive studies, the Corps of Engineers offers a cost-shared program called Planning Assistance to States and Tribes. Studies under this program generally range from $25,000 to $100,000 with the local jurisdiction providing 50 percent of the cost.
- The Corps of Engineers has several cost-shared programs (typically 65 percent federal and 35 percent non-federal) aimed at developing, evaluating and implementing structural and non-structural capital projects to address flood risks at specific locations or within a specific watershed:
  - The Continuing Authorities Program for smaller-scale projects includes Section 205 for Flood Control, with a $7 million federal limit and Section 14 for Emergency Streambank Protection with a $1.5 million federal limit. These can be implemented without specific authorization from Congress.
  - Larger scale studies, referred to as General Investigations, and projects for flood risk management, for ecosystem restoration or to address other water resource issues, can be pursued through a specific authorization from Congress and are cost-shared, typically at 65 percent federal and 35 percent non-federal.
  - Watershed management planning studies can be specifically authorized and are cost-shared at 50 percent federal and 50 percent non-federal.
- The Corps of Engineers provides emergency response assistance during and following natural disasters. Public Law 84-99 enables the Corps to assist state and local authorities in flood fight activities and cost share in the repair of flood protective structures. Assistance is provided in the flowing categories:
  - Preparedness—The Flood Control and Coastal Emergency Act establishes an emergency fund for preparedness for emergency response to natural disasters; for flood fighting and rescue operations; for rehabilitation of flood control and hurricane protection structures. Funding for Corps of Engineers emergency response under this authority is provided by Congress through the annual Energy and Water Development Appropriation Act. Disaster preparedness activities include coordination, planning, training and conduct of response exercises with local, state and federal agencies.
  - Response Activities—Public Law 84-99 allows the Corps of Engineers to supplement state and local entities in flood fighting urban and other non-agricultural areas under certain conditions (Engineering Regulation 500-1-1 provides specific details). All flood fight efforts require a project cooperation agreement signed by the public sponsor and the sponsor must remove all flood fight material after the flood has receded. Public Law 84-99 also authorizes emergency water support and drought assistance in certain situations and allows for “advance measures” assistance to prevent or reduce flood damage conditions of imminent threat of unusual flooding.
  - Rehabilitation—Under Public Law 84-99, an eligible flood protection system can be rehabilitated if damaged by a flood event. The flood system would be restored to its pre-disaster status at no cost to the federal system owner, and at 20-percent cost to the eligible non-federal system owner. All systems considered eligible for Public Law 84-99 rehabilitation assistance have to be in the Rehabilitation and Inspection Program prior to the flood event. Acceptable operation and maintenance by the public levee sponsor are verified by levee inspections conducted by the Corps on a regular basis. The Corps has the responsibility to coordinate levee repair issues with interested federal, state, and local agencies following natural disaster events where flood control works are damaged.

These authorities and programs are all available to support any related mitigation actions.

STATE

AB 32: The California Global Warming Solutions Act

This bill identifies the following potential adverse impacts of global warming:

> "… the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidences of infectious diseases, asthma, and other human health-related problems."

AB 32 establishes a state goal of reducing greenhouse gas emissions to 1990 levels by 2020 (a reduction of approximately 25 percent from forecast emission levels), with further reductions to follow. The law requires the state Air Resources Board to do the following:

- Establish a program to track and report greenhouse gas emissions.
- Approve a scoping plan for achieving the maximum technologically feasible and cost-effective reductions from sources of greenhouse gas emissions.
- Adopt early reduction measures to begin moving forward.
- Adopt, implement and enforce regulations—including market mechanisms such as "cap and-trade" programs—to ensure that the required reductions occur.

The Air Resources Board has adopted a statewide greenhouse gas emissions limit and an emissions inventory, along with requirements to measure, track, and report greenhouse gas emissions by the industries it determined to be significant sources of greenhouse gas emissions.

AB 70: Flood Liability

This bill provides that a city or county may be required to contribute a fair and reasonable share to compensate for property damage caused by a flood to the extent that it has increased the state's exposure to liability for property damage by unreasonably approving new development in a previously undeveloped area that is protected by a state flood control project, unless the city or county meets specified requirements.

AB 162: Flood Planning

This California State Assembly Bill passed in 2007 requires cities and counties to address flood-related matters in the land use, conservation, and safety and housing elements of their general plans. The land use element must identify and annually review the areas covered by the general plan that are subject to flooding as identified in floodplain mapping by either FEMA or the state Department of Water Resources (DWR). During the next revision of the housing element on or after January 1, 2009, the conservation element of the general plan must identify rivers, creeks, streams, flood corridors, riparian habitat, and land that may accommodate floodwater for the purpose of groundwater recharge and stormwater management. The safety element must identify information regarding flood hazards, including:

- Flood hazard zones

- Maps published by FEMA, DWR, the U.S. Army Corps of Engineers, the Central Valley Flood Protection Board, and the Governor's Office of Emergency Services (Cal OES)
- Historical data on flooding
- Existing and planned development in flood hazard zones.

The general plan must establish goals, policies and objectives related to flooding risks, including:

- Avoiding or minimizing the risks of flooding new development
- Evaluating whether new development should be located in flood hazard zones
- Identifying construction methods to minimize damage.

AB 162 establishes goals, policies and objectives related to flooding risks. It establishes procedures for the determination of available land suitable for urban development, which may exclude lands where FEMA or DWR has concluded that the flood management infrastructure is not adequate to avoid the risk of flooding.

AB 747: Required Information for General Plan Safety Elements

This bill requires California communities with general plans to address evacuation routes in the safety element of the general plan. Information on the evacuation routes and their capacity, safety and viability under a range of emergency scenarios must be provided. For communities that have not adopted a local hazard mitigation plan, the safety element must be updated with this information by January 1, 2022. For those with a local hazard mitigation plan, the requirement applies upon the next revision of the hazard mitigation plan on or after January 1, 2022. Communities that have adopted a local hazard mitigation plan, emergency operations plan, or other document that fulfills the goals and objectives of this law may comply with this requirement by summarizing and incorporating by reference the other plan or document in the safety element.

In subsequent revisions to the safety element, communities also will be required to identify new information relating to flood and fire hazards and climate adaptation and resiliency strategies applicable to the city or county that was not available during the previous revision of the safety element. These subsequent updates must occur upon each revision of the general plan housing element or local hazard mitigation plan and not less than once every eight years.

AB 2140: General Plans—Safety Element

This bill provides that the state may allow for more than 75 percent of public assistance funding under the California Disaster Assistance Act only if the local agency is in a jurisdiction that has adopted a local hazard mitigation plan as part of the safety element of its general plan. The local hazard mitigation plan needs to include elements specified in this legislation. In addition, this bill requires Cal OES to give preference for federal mitigation funding to cities and counties that have adopted local hazard mitigation plans. The intent of the bill is to encourage cities and counties to create and adopt hazard mitigation plans.

AB 2800: Climate Change—Infrastructure Planning

This California State Assembly bill passed in 2016 and until July 1, 2020, requires state agencies to take into account the current and future impacts of climate change when planning, designing, building, operating, maintaining, and investing in state infrastructure. The bill, by July 1, 2017, and until July 1, 2020, requires an

agency to establish a Climate-Safe Infrastructure Working Group to examine how to integrate scientific data concerning projected climate change impacts into state infrastructure engineering.

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was enacted in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. The Alquist-Priolo Earthquake Fault Zoning Act's main purpose is to prevent construction of buildings used for human occupancy on the surface trace of active faults. Before a new project is permitted, cities and counties require a geologic investigation to demonstrate that proposed buildings will not be constructed on active faults. The act addresses only the hazard of surface fault rupture and is not directed toward other earthquake hazards, such as liquefaction or seismically induced landslides. The law requires the State of California Geologist to establish regulatory zones around the surface traces of active faults and to issue appropriate maps. The maps are distributed to all affected cities, counties, and state agencies for their use in planning and controlling new or renewed construction. Local agencies must regulate most development projects within the zones. Projects include all land divisions and most structures for human occupancy. All seismic hazard mitigation actions identified in this plan will seek full compliance with the Alquist-Priolo Earthquake Fault Zoning Act.

California Department of Water Resources

In California, the DWR is the coordinating agency for floodplain management. The DWR works with FEMA and local governments by providing grants and technical assistance, evaluating community floodplain management programs, reviewing local floodplain ordinances, participating in statewide flood hazard mitigation planning, and facilitating annual statewide workshops. Compliance is monitored by FEMA regional staff and by the DWR.

California Division of Safety of Dams

California's Division of Safety of Dams (a division of the DWR) monitors the dam safety program at the state level and maintains a working list of dams in the state. When a new dam is proposed, Division engineers and geologists inspect the site and the subsurface. Upon submittal of an application, the Division reviews the plans and specifications prepared by the owner to ensure that the dam is designed to meet minimum requirements and that the design is appropriate for the known geologic conditions. After approval of the application, the Division inspects all aspects of the construction to ensure that the work is done in accordance with the approved plans and specifications. After construction, the Division inspects each dam to ensure that it is performing as intended and is not developing problems. The Division periodically reviews the stability of dams and their major appurtenances in light of improved design approaches and requirements, as well as new findings regarding earthquake hazards and hydrologic estimates in California. Over 1,200 dams are inspected by Division engineers on a yearly schedule to ensure performance and maintenance of dams (California Division of Safety of Dams, 2017).

California Environmental Quality Act

The California Environmental Quality Act (CEQA) was passed in 1970, shortly after the federal government enacted the National Environmental Policy Act, to institute a statewide policy of environmental protection. CEQA requires state and local agencies in California to follow a protocol of analysis and public disclosure of the potential environmental impacts of development projects. CEQA makes environmental protection a mandatory part of every California state and local agency's decision-making process.

CEQA establishes a statewide environmental policy and mandates actions all state and local agencies must take to advance the policy. Jurisdictions conduct analysis of the project to determine if there are potentially significant environmental impacts, identify mitigation measures, and possible project alternatives by preparing environmental reports for projects that requires CEQA review. This environmental review is required before an agency takes action on any policy, program, or project. Any project action identified in this plan will seek full CEQA compliance upon implementation.

California General Planning Law

California state law requires that every county and city prepare and adopt a comprehensive long-range plan to serve as a guide for community development. The general plan expresses the community's goals, visions, and policies relative to future land uses, both public and private. The general plan is mandated and prescribed by state law (Cal. Gov. Code §65300 et seq.), and forms the basis for most local government land use decision-making.

The plan must consist of an integrated, internally consistent set of goals, policies, and implementation measures. In addition, the plan must focus on issues of the greatest concern to the community and be written in a clear and concise manner. City and county actions, such as those relating to land use allocations, annexations, zoning, subdivision and design review, redevelopment, and capital improvements, must be consistent with the plan.

California Multi-Hazard Mitigation Plan

Under the DMA, California must adopt a federally approved state multi-hazard mitigation plan to be eligible for certain disaster assistance and mitigation funding. The intent of the State of California Multi-Hazard Mitigation Plan is to reduce or prevent injury and damage from hazards in the state through the following:

- Documenting statewide hazard mitigation planning in California
- Describing strategies and priorities for future mitigation activities
- Facilitating the integration of local and tribal hazard mitigation planning activities into statewide efforts
- Meeting state and federal statutory and regulatory requirements

The plan is an annex to the State Emergency Plan, and it identifies past and present mitigation activities, current policies and programs, and mitigation strategies for the future. It also establishes hazard mitigation goals and objectives. The plan will be reviewed and updated annually to reflect changing conditions and new information, especially information on local planning activities.

Under 44 CFR Section 201.6, local hazard mitigation plans must be consistent with their state's hazard mitigation plan. In updating this plan, the Steering Committee reviewed the California State Hazard Mitigation Plan to identify key relevant state plan elements (see Section 3.7).

California Residential Mitigation Program

The California Residential Mitigation Program was established in 2011 to help Californians strengthen their homes against damage from earthquakes. The program is a joint powers authority created by Cal OES and the California Earthquake Authority, which is a not-for-profit, publicly managed, privately funded provider of home earthquake insurance to California homeowners and renters.

Earthquake Brace + Bolt was developed to help homeowners lessen the potential for damage to their houses during an earthquake. A residential seismic retrofit strengthens an existing older house, making it more resistant to earthquake activity such as ground shaking and soil failure. The seismic retrofitting involves bolting the house to its foundation and adding bracing around the perimeter of the crawl space. Most homeowners hire a contractor to do the retrofit work, and owners of houses in ZIP Codes with house characteristics suitable for this type of retrofit are eligible for up to $3,000 toward the cost. A typical retrofit by a contractor may cost between $3,000 and $7,000, depending on the location and size of the house, contractor fees, and the amount of materials and work involved. If the homeowner is an experienced do-it-yourselfer, a retrofit can cost less than $3,000.

California State Building Code

California Code of Regulations Title 24 (CCR Title 24), also known as the California Building Standards Code, is a compilation of building standards from three sources:

- Building standards that have been adopted by state agencies without change from building standards contained in national model codes
- Building standards that have been adopted and adapted from the national model code standards to meet California conditions
- Building standards authorized by the California legislature that constitute extensive additions not covered by the model codes adopted to address particular California concerns

The state Building Standards Commission is authorized by California Building Standards Law (Health and Safety Code Sections 18901 through 18949.6) to administer the processes related to the adoption, approval, publication, and implementation of California's building codes. These building codes serve as the basis for the design and construction of buildings in California. The national model code standards adopted into Title 24 apply to all occupancies in California, except for modifications adopted by state agencies and local governing bodies. Since 1989, the Building Standards Commission has published new editions of Title 24 every three years.

On January 1, 2014, California Building Code Accessibility Standards found in Chapter 11B incorporated the 2010 Americans with Disabilities Act (ADA) Standards as the model accessibility code for California. The purpose was to ensure consistency with federal guidelines. As a result of this incorporation, the California standards will fully implement and include 2010 ADA Standards within the California Building Code while maintaining enhanced levels of accessibility already provided by existing California accessibility regulations.

Disadvantaged and Low-income Communities Investments

Senate Bill (SB) 535 directs state and local agencies to make investments that benefit California's disadvantaged communities. It also directs the California Environmental Protection Agency to identify disadvantaged communities for the purposes of these investments based on geographic, socio-economic, public health, and environmental hazard criteria. Assembly Bill (AB) 1550 increased the percent of funds for projects located in disadvantaged communities from 10 to 25 percent and added a focus on investments in low-income communities and households. This program is a potential alternative source of funding for actions identified in this plan.

Division of the State Architect's AB 300 List of Seismically At-Risk Schools

In 2002, California's Division of the State Architect completed an inventory of public school buildings built before 1978 that identifies buildings with characteristics that might make them unsafe in future earthquakes. This

inventory provides a list of potentially at-risk schools known as the AB 300 list (the inventory was authorized by Assembly Bill 300 in 1999). Using available information on school buildings' dates of construction, seismic retrofits, and structural systems (wood-frame, concrete shear wall, or steel moment frame, etc.), the inventory categorized California public school buildings into one of two categories: those expected to perform well in future earthquakes; and those that are not expected to perform well and require more detailed seismic evaluation.

The Division of the State Architect recommends that public schools on this list undergo detailed seismic evaluations to determine if they pose life safety risks, but the state has neither required nor funded school districts to do this.

Governor's Executive Order S-13-08

Governor's Executive Order S-13-08 enhances the state's management of climate impacts from sea level rise, increased temperatures, shifting precipitation and extreme weather events. There are four key actions in the executive order:

- Initiate California's first statewide climate change adaptation strategy to assess expected climate change impacts, identify where California is most vulnerable, and recommend adaptation policies. This effort will improve coordination within state government so that better planning can more effectively address climate impacts on human health, the environment, the state's water supply and the economy.
- Request that the National Academy of Science establish an expert panel to report on sea level rise impacts in California, to inform state planning and development efforts.
- Issue interim guidance to state agencies for how to plan for sea level rise in designated coastal and floodplain areas for new projects.
- Initiate a report on critical infrastructure projects vulnerable to sea level rise.

Senate Bill 92: Public Resources Portion of Biennial Budget Bill

The State of California updated its requirements regarding emergency action plans (EAPs) via Senate Bill 92, which became effective in June 2017 as part of the state Legislature's biennial budget process. The bill required dam owners to submit EAPs to Cal OES and the Department of Water Resources for approval by January 1, 2018 (for extremely high hazard dams), January 1, 2019 (for high-hazard dams), and January 1, 2021 (for significant hazard dams). The EAPs were to include the following (California Government Code Section 8589.5; Cal OES, 2018):

- Emergency notification flow charts
- Information on a four-step response process
- Description of agencies' roles and actions in response to an emergency incident
- Description of actions to be taken in advance of an emergency
- Inundation maps
- Additional information such as revision records and distribution lists

After the EAPs are approved by the state, the law requires dam owners to send the approved EAPs to relevant stakeholders. Local public agencies can then adopt emergency procedures that incorporate the information in the

EAP in a manner that conforms to local needs and includes methods and procedures for alerting and warning the public and other response and preparedness related items (State of California, 2018).

SB 92 also requires dams other than low-risk dams to have current inundation mapping, which must be updated every 10 years, or sooner if specific circumstances change. EAPs also must be updated every 10 years. It provides DWR with enforcement tools, including fines and operational restrictions for failure to comply. Cal OES is required by the law to work with state and federal agencies, dam owners, planners, and the public to make dam inundation maps available to citizens interested in learning their dam failure inundation risk.

Senate Bill 97: Guidelines for Greenhouse Gas Emissions

Senate Bill 97, enacted in 2007, amends CEQA to clearly establish that greenhouse gas emissions and the effects of greenhouse gas emissions are appropriate subjects for CEQA analysis. It directs the Governor's Office of Planning and Research to develop draft CEQA guidelines for the mitigation of greenhouse gas emissions or their effects by July 1, 2009 and directs the California Natural Resources Agency to certify and adopt the CEQA Guidelines by January 1, 2010.

Senate Bill 99: Evacuation Route Planning

Senate Bill 99, enacted in 2019, requires that cities' and counties' general plans address evacuation routes from any hazard area identified in the safety element. Under this law, the safety element must include information to identify residential developments in hazard areas that do not have at least two emergency evacuation routes. Each city or county must update its safety element with the new information upon the next revision of its housing element on or after January 1, 2020.

Senate Bill 379: General Plans: Safety Element—Climate Adaptation

Senate Bill 379 builds upon the flood planning inclusions into the safety and housing elements and the hazard mitigation planning safety element inclusions in general plans outlined in AB 162 and AB 2140, respectively. SB 379 focuses on a new requirement that cities and counties include climate adaptation and resiliency strategies in the safety element of their general plans beginning January 1, 2017. In addition, this bill requires general plans to include a set of goals, policies and objectives, and specified implementation measures based on the conclusions drawn from climate adaptation research and recommendations.

Senate Bill 1000: General Plan Amendments—Safety and Environmental Justice Elements

In 2016, Senate Bill 1000 amended California's Planning and Zoning Law in two ways:

- The original law established requirements for initial revisions of general plan safety elements to address flooding, fire, and climate adaptation and resilience. It also required subsequent review and revision as necessary based on new information. Senate Bill 1000 specifies that the subsequent reviews and revision based on new information are required to address only flooding and fires (not climate adaptation and resilience).
- Senate Bill 1000 adds a requirement that, upon adoption or revision of any two other general plan elements on or after January 1, 2018, an environmental justice element be adopted for the general plan or environmental justice goals, policies and objectives be incorporated into other elements of the plan.

Senate Bill 1035: Fire, Flood, and Adaptation Safety Element Updates

Senate Bill 1035 clarifies that revisions to a community's General Plan Safety Element—to address fire hazards, flood hazards, and climate adaptation and resilience strategies—must occur upon each revision to a Housing Element or Local Hazard Mitigation Program.

Standardized Emergency Management System

CCR Title 19 establishes the Standardized Emergency Management System (SEMS) to standardize the response to emergencies involving multiple jurisdictions. SEMS is intended to be flexible and adaptable to the needs of all emergency responders in California. It requires emergency response agencies to use basic principles and components of emergency management. Local governments must use SEMS by December 1, 1996, to be eligible for state funding of response-related personnel costs under CCR Title 19 (Sections 2920, 2925 and 2930). The roles and responsibilities of Individual agencies contained in existing laws or the state emergency plan are not superseded by these regulations. This hazard mitigation plan is considered to be a support document for all phases of emergency management, including those associated with SEMS.

Appendix C. Data Sources and Methods Used for Mapping

C. DATA SOURCES AND METHODS USED FOR MAPPING

DAM FAILURE INUNDATION MAPPING

The U.S. Army Corps of Engineers provided dam failure inundation zone data. This dataset was produced as part of the *Whittier Narrows Dam Safety Modification Study*. The Corps is proposing risk-management plans to reduce the potential for and consequences of catastrophic flooding resulting from failure of the Whittier Narrows Dam during very rare flood events. These risk-management plans include structural modifications to the dam to eliminate or minimize the potential for the dam to fail as a result of overtopping or seepage.

EARTHQUAKE MAPPING

Liquefaction Zones

The dataset "Seismic Hazard Zone Maps for Liquefaction" was downloaded from the California Geological Survey's geologic hazards data website (https://maps.conservation.ca.gov/geologichazards/). The seismic hazards zones datasets include areas where liquefaction may occur during a strong earthquake. Developers of properties falling within the zones may be required to investigate the potential hazard and mitigate its threat during the local permitting process. The data is used by cities and counties to regulate development and by property owners selling property within areas where seismic hazard zones have been identified. Local governments can withhold development permits until geologic or soils investigations are conducted for specific sites and mitigation measures are incorporated into development plans. Sellers of property use the data to check the location of their specific site and, if applicable, disclose to the buyer that the property lies within a seismic hazard zone as required by the Seismic Hazards Mapping Act of 1990 (Public Resources Code, Division 2, Chapter 7.8). This data may not show all areas that have potential for liquefaction. Also, a single earthquake capable of causing liquefaction will not uniformly affect the entire zone. The identification and location of liquefaction zones are based on the best available data. However, the quality of data used is varied. Zone boundaries have been drawn as accurately as possible at the map scale (1:24,000).

National Earthquake Hazard Reduction Program Soils

NEHRP soils information is derived from a shear wave velocity (Vs30) data produced by the California Geological Survey in 2015. The Vs30 data represents simplified geologic units that have been correlated to the time-averaged shear-wave velocity in the upper 30 meters of the earth's surface. The geologic units were compiled from published maps that range in scale from 1:250,000 to 1:24,000. (Wills, et. al., 2015)

Probabilistic Peak Ground Acceleration Maps

Probabilistic peak ground acceleration data, by Census tract, are generated by Hazus 4.2 SP03. In Hazus' probabilistic analysis procedure, the ground shaking demand is characterized by spectral contour maps developed by the U.S. Geological Survey (USGS) as part of a 2018 update of the National Seismic Hazard Maps. USGS probabilistic seismic hazard maps are revised about every six years to reflect newly published or thoroughly reviewed earthquake science and to keep pace with regular updates of the building code. Hazus includes maps for eight probabilistic hazard levels—ranging from ground shaking with a 39 percent probability of being exceeded in 50 years (100-year return period) to the ground shaking with a 2 percent probability of being exceeded in 50 years (2,500-year return period).

ShakeMaps

A ShakeMap is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on both estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and Modified Mercalli intensity. For this plan, ShakeMaps were prepared for three earthquake scenarios:

- An earthquake on the Compton fault with the following characteristics:
  - Magnitude: 7.45
  - Focal depth: 11.9 km
  - Epicenter: N33.95, W118.24
- An earthquake on the Puente Hills fault with the following characteristics:
  - Magnitude: 6.82
  - Focal depth: 10.4 km
  - Epicenter: N34.01, W117.95
- An earthquake on the Whittier fault with the following characteristics:
  - Magnitude: 6.98
  - Focal depth: 9.0 km
  - Epicenter: N33.94, W117.81

FLOOD MAPPING

Areas with reduced flood risk due to levee are from the countywide effective FEMA Digital Flood Insurance Rate Map (DFIRM) dated June 12, 2019.

REFERENCES

U.S. Army Corps of Engineers, 2018 https://www.spl.usace.army.mil/Missions/Civil-Works/Projects-Studies/Whittier-Narrows-Dam-Safety-Modification-Study/

Wills, C.J., Gutierrez, C.I., Perez, F.G., and Branum, D.B., 2015, A next-generation Vs30 map for California based on geology and topography: Bulletin of the Seismological Society of America.

Appendix D. City Adoption Resolution and FEMA Approval

RESOLUTION NO. 22-07

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF NORWALK ADOPTING THE NORWALK HAZARD MITIGATION PLAN

WHEREAS, the City of Norwalk has exposure to natural hazards that increase the risk to life, property, environment, and the City's economy; and

WHEREAS, pro-active mitigation of known hazards before a disaster event can reduce or eliminate long-term risk to life and property; and

WHEREAS, The Disaster Mitigation Act of 2000 (Public Law 106-390) established new requirements for pre- and post-disaster hazard mitigation programs; and

WHEREAS, a coalition of City stakeholders with like planning objectives has been formed to pool resources and create consistent mitigation strategies to be implemented within each partner's identified capabilities, within the City's Planning Area; and

WHEREAS, the coalition has completed a planning process that engages the public, assesses the risk and vulnerability to the impacts of natural hazards, develops a mitigation strategy consistent with a set of uniform goals and objectives, and creates a plan for implementing, evaluating, and revising this strategy.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF NORWALK HEREBY DETERMINES, FINDS, AND RESOLVES AS FOLLOWS:

Section 1. The City of Norwalk hereby approves and adopts the City of Norwalk Local Hazard Mitigation Plan that identifies and assess potential natural hazards to meet the requirements of the Disaster Mitigation and Cost Reduction Act of 2000 as it relates to lessening the impact of future disasters.

Section 2. The City Council authorizes the City Manager or his designees to oversee plan implementation, updates, and make minor, non-substance modifications to the plan.

Section 3. The Mayor, or presiding officer, is hereby authorized to affix his signature to this Resolution signifying its adoption by the City Council of the City of Norwalk and the City Clerk, or her duly appointed assistant, is directed to attest thereto.

APPROVED AND ADOPTED on this 18th day of January 2022.

RICK RAMIREZ
MAYOR

ATTEST:

I, **Marissa J. Asistin**, Assistant City Clerk of the City of Norwalk, California **DO HEREBY CERTIFY** that the foregoing Resolution, being **Resolution No. 22-07** has been duly signed by the Mayor and attested by the Assistant City Clerk, all at a regular meeting of the Norwalk City Council, held January 18, 2022, and that the same was approved and adopted by the following vote to wit:

AYES:	**Councilmembers Perez and Rios, Vice Mayor Valencia, and Mayor Ramirez**
NOES:	**None**
ABSENT:	**Councilmember Ayala**

MARISSA J. ASISTIN
ASSISTANT CITY CLERK

U.S. Department of Homeland Security
FEMA Region 9
1111 Broadway, Suite 1200
Oakland, CA 94607

FEMA

February 1, 2022

Eric Wosick
Public Safety Lieutenant
City of Norwalk Public Safety Department
12700 Norwalk Boulevard
Norwalk, CA 90650

Dear Mr. Wosick:

The *City of Norwalk Local Hazard Mitigation Plan 2021* was officially adopted by the City of Norwalk on January 18, 2022 and submitted for review and approval to the Federal Emergency Management Agency (FEMA). The review is complete, and FEMA finds the plan to be in conformance with the Code of Federal Regulations, Title 44, Part 201, Section 6 (44 C.F.R. 201.6).

This plan approval ensures the City of Norwalk's continued eligibility for funding under FEMA's Hazard Mitigation Assistance programs, including the Hazard Mitigation Grant Program (HMGP), the Building Resilient Infrastructure and Communities program (BRIC), and the Flood Mitigation Assistance (FMA) program. All requests for funding are evaluated individually according to eligibility and other program requirements. Approved hazard mitigation plans may also be eligible for points under the National Flood Insurance Program's Community Rating System (CRS).

FEMA's approval is for a period of five years, effective starting the date of this letter. Prior to **February 1, 2027**, the City of Norwalk must review, revise, and submit their plan to FEMA for approval to maintain eligibility for grant funding. The enclosed plan review tool provides additional recommendations to incorporate into future plan updates.

If you have any questions regarding the planning or review processes, please contact the FEMA Region 9 Hazard Mitigation Planning Team at fema-r9-mitigation-planning@fema.dhs.gov.

Sincerely,

KATHRYN J LIPIECKI
Digitally signed by KATHRYN J LIPIECKI
Date: 2022.02.01 08:37:57 -08'00'

Kathryn Lipiecki
Director, Mitigation Division
FEMA Region 9

Enclosure (1)
City of Norwalk Plan Review Tool, dated February 1, 2022

cc: Xing Liu, Senior Community Planner, FEMA Region 9
Jennifer Hogan, State Hazard Mitigation Officer, California Governor's Office of Emergency Services
Victoria LaMar-Haas, Hazard Mitigation Planning Chief, California Governor's Office of Emergency Services

Appendix E. Progress Report Template

E. PROGRESS REPORT TEMPLATE

2021 City of Norwalk Hazard Mitigation Plan
Annual Progress Report

Reporting Period: *(Insert reporting period)*

Background: The City of Norwalk developed a hazard mitigation plan to reduce risk from all hazards by identifying resources, information, and strategies for risk reduction. The federal Disaster Mitigation Act of 2000 requires state and local governments to develop hazard mitigation plans as a condition for federal disaster grant assistance. To prepare the plan, the City organized resources, assessed risks from natural hazards within the county, developed planning goals and objectives, reviewed mitigation alternatives, and developed an action plan to address probable impacts from natural hazards. By completing this process, these jurisdictions maintained compliance with the Disaster Mitigation Act, achieving eligibility for mitigation grant funding opportunities afforded under the Robert T. Stafford Act. The plan can be viewed on-line at:

> https://www.norwalk.org/city-hall/departments/public-safety/norwalk-emergency-management-office/local-hazard-mitigation-plan

Summary Overview of the Plan's Progress: The performance period for the *2021 City of Norwalk Hazard Mitigation Plan* became effective in Month Year with the final approval of the plan by FEMA. The initial performance period for this plan will be 5 years, with an anticipated update to the plan to occur before Month Year. As of this reporting period, the performance period for this plan is considered to be __% complete. The hazard mitigation plan has targeted 16 hazard mitigation actions to be pursued during the 5-year performance period. As of the reporting period, the following overall progress can be reported:

- __ out of 16 actions (__%) reported ongoing action toward completion.
- __ out of 16 actions (__%) were reported as being complete.
- __ out of 16 actions (___%) reported no action taken.

Purpose: The purpose of this report is to provide an annual update on the implementation of the action plan identified in the *2021 City of Norwalk Hazard Mitigation Plan*. The objective is to ensure that there is a continuing and responsive planning process that will keep the hazard mitigation plan dynamic and responsive to the needs and capabilities of the City. This report discusses the following:

- Natural hazard events that have occurred within the last year
- Changes in risk exposure within the planning area
- Mitigation success stories

- Review of the action plan
- Changes in capabilities that could impact plan implementation
- Recommendations for changes/enhancement.

The Multi-Hazard Mitigation Plan Steering Committee: The Hazard Mitigation Plan Steering Committee, made up of stakeholders within the planning area, reviewed and approved this progress report at its annual meeting held on _____, 201_. It was determined through the plan's development process that a steering committee would remain in service to oversee maintenance of the plan. At a minimum, the Steering Committee will provide technical review and oversight on the development of the annual progress report. It is anticipated that there will be turnover in the membership annually, which will be documented in the progress reports. For this reporting period, the Steering Committee membership is as indicated in Table 1.

Table 1. Steering Committee Members

Name	Title	Jurisdiction/Agency

Natural Hazard Events within the Planning Area: During the reporting period, there were __ natural hazard events in the planning area that had a measurable impact on people or property. A summary of these events is as follows:

- _____
- _____

Changes in Risk Exposure in the Planning Area: *(Insert brief overview of any natural hazard event in the planning area that changed the probability of occurrence or ranking of risk for the hazards addressed in the hazard mitigation plan)*

Mitigation Success Stories: *(Insert brief overview of mitigation accomplishments during the reporting period)*

Review of the Action Plan: Table 2 reviews the action plan, reporting the status of each action. Reviewers of this report should refer to the hazard mitigation plan for more detailed descriptions of each action and the prioritization process.

Address the following in the "status" column of the following table:

- *Was any element of the action carried out during the reporting period?*
- If no action was completed, why?
- Is the timeline for implementation for the action still appropriate?
- If the action was completed, does it need to be changed or removed from the action plan?

Table 2. Action Plan Matrix

Action Taken? (Yes or No)	Time Line	Priority	Status	Status (X, O,✓)
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				

Completion status legend:
✓= Project Completed
O = Action ongoing toward completion
X = No progress at this time

Changes That May Impact Implementation of the Plan: *(Insert brief overview of any significant changes in the planning area that would have a profound impact on the implementation of the plan. Specify any changes in technical, regulatory and financial capabilities identified during the plan's development)*

Recommendations for Changes or Enhancements: Based on the review of this report by the Hazard Mitigation Plan Steering Committee, the following recommendations will be noted for future updates or revisions to the plan:

- _____
- _____
- _____
- _____

Public review notice: *The contents of this report are considered to be public knowledge and have been prepared for total public disclosure. Copies of the report have been provided to the City Council and to local media outlets, and the report is posted on the City's website. Any questions or comments regarding the contents of this report should be directed to:*

Name
Title
12700 Norwalk Boulevard
Norwalk, California 90650
(562) 929-5700
Email: _____