Foster City Local Hazard Mitigation Plan & Safety Element

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1 EXECUTIVE SUMMARY

1.1 Overview

The Local Hazard Mitigation Plan/Safety Element focuses on the protection of the community from risks associated with hazards such as earthquakes, floods, fires, hazardous materials and other hazards. The Local Hazard Mitigation Plan/Safety Element analyzes these hazards and the risks they pose, and includes goals and mitigation strategies to establish what measures will be undertaken to reduce these risks to levels determined by the City to be reasonable. Foster City has chosen to prepare one document to meet the requirements of both the Safety Element of the General Plan and the Local Hazard Mitigation Plan in order to provide one point of reference for safety and hazard mitigation planning.

The Local Hazard Mitigation Plan/Safety Element supports Foster City's emphasis on hazard mitigation prior to disasters such as earthquakes, storms and fires, including maintenance of infrastructure, requirements for new construction beyond the uniform codes and education of residents and community groups. The City believes that this proactive emphasis on pre-disaster mitigation is a large part of the explanation of why the City has experienced minimal damage in the face of actual disasters. When major storms cause flooding on nearby highways, the City's Lagoon System works to collect storm water and prevent local flooding. In the 1989 Loma Prieta Earthquake, Foster City experienced some broken utility lines, minor local bridge damage (no local bridges were closed) and minor building damage (no buildings were declared uninhabitable). Although the underlying geology of the area results in mapping that shows a relatively high exposure to seismic hazards according to USGS maps, the review of individual geotechnical reports prepared for various projects indicates that the risk is minimal in some areas and in areas with higher risk can be mitigated with appropriate building design that has been incorporated into projects.

One of the key mitigation strategies contained in this Plan, the Levee Protection and Planning Improvements, is already well underway. This project will ensure that Foster City's levees continue to protect the City from the waters of San Francisco Bay, including sea level rise. The City has begun the design and review process for this project with a goal of completion by mid-2020.

The City/Estero Municipal Improvement District has used a long-term, 10-year funding strategy to ensure that funds are available to carry out a proactive capital improvement program to maintain the City/District's infrastructure. This includes proactive maintenance, recurring capital improvement projects and infrastructure replacement. This ensures that key systems are operating at peak levels and improves resiliency. The City has continued to adopt amendments to the uniform building codes with each code cycle to improve seismic safety and fire safety. The City provides extensive public education in emergency preparedness through a variety of means, including website, classes, community events and the Community Emergency Response Training (CERT) a program that trains individuals and groups in how to make their homes, businesses and neighborhoods more resilient as well as how to respond in a disaster.

1.2 Goals

The Local Hazard Mitigation Plan/Safety Element includes the following goals:

S-A. Strong infrastructure. Preserve the quality of life by ensuring the City's infrastructure and municipal services are capable of withstanding reasonably foreseeable risks and hazards.

S-B. Emergency Response. Maintain an effective emergency response program that anticipates the potential for disasters and ensures the ability to respond promptly, efficiently and effectively, to provide continuity of services during and after an emergency.

S-C. Long-term community resilience. Ensure the long-term community resilience of the community by improving the resiliency to hazards and planning for post-disaster recovery.

S-D. Empower residents and community groups. Provide on-going education/resources to empower residents and community groups to be better educated, prepared and self-reliant in order to protect themselves from unreasonable risk to life and property posed by the hazards specific to Foster City, including access to transparent, frequently updated hazard and emergency response information before, during and after any disaster event.

S-E. Build sense of community. Build a strong sense of community and allegiance among residents, employees and visitors to Foster City by building social connectedness and commitment to the community so that individuals and groups are more empowered to help one another before, during and after any disaster event.

1.3 Update Process

The update process followed the methodology prescribed by the Federal Emergency Management Agency (FEMA) for update of Local Hazard Mitigation Plans. The update process included:

- Reviewing existing plans, programs and capabilities
- Creating an outreach strategy
- Conducting a risk assessment
- Developing a mitigation strategy
- Assembling the updated plan

1.4 Summary of Mitigation and Adaptation Strategies

The Local Hazard Mitigation Plan/Safety Element includes strategies to mitigate potential losses related to significant hazards. The highest priority mitigation strategies include:

Table 1-1. High Priority Mitigation Strategies

Related Goal	Strategy	Hazard(s)	Timeline	Ranking
S-A Strong Infrastructure	Wastewater Treatment Plant Improvements	Earthquake Ground Shaking; Liquefaction; Flooding; Sea Level Rise	By 2025	1
S-A Strong Infrastructure	Levee Protection Planning and Improvements	Flooding; Levee Failure; Sea Level Rise	5 years	2
S-A Strong Infrastructure	Wastewater Lift Stations Rehabilitation	Earthquake Ground Shaking; Liquefaction	Ongoing in Tri-Annual Phases	3
S-A Strong Infrastructure	Evaluation/Replacement of Air Release Valves (ARVs) on the Wastewater Line between Lift Station #59 and the Wastewater Treatment Plant	Earthquake Ground Shaking; Liquefaction	5 years	4
S-A Strong Infrastructure	Water Booster Pump Station Seismic Retrofit	Earthquake Ground Shaking; Liquefaction; Fire	By 2018	5
S-A Strong Infrastructure	Potable Water Tank Seismic Evaluation Retrofit	Earthquake Ground Shaking; Liquefaction; Fire	By 2018	6
S-A Strong Infrastructure	Lagoon Pump Station Seismic Evaluation	Earthquake Ground Shaking; Liquefaction; Flood; Levee Failure; Sea Level Rise	By 2018	7
S-D Empower Residents and Community Groups	Emergency Preparedness Education and Outreach	All Hazards	Current and ongoing	8
S-A Strong Infrastructure	Water Transmission Main Evaluation	Earthquake Ground Shaking; Liquefaction; Fire	Current and ongoing	9
S-A Strong Infrastructure	Water System Pressure Reducing Station Evaluation	Earthquake Ground Shaking; Liquefaction; Fire	5 years	10
S-A Strong Infrastructure	Police Station Assessment.	Earthquake Ground Shaking; Liquefaction	Long Term	11
S-A Strong Infrastructure	Recreation Center	Earthquake Ground Shaking; Liquefaction	Long Term	12

2 INTRODUCTION

2.1 Background

Disasters can cause loss of life; damage buildings and infrastructure; and have devastating consequences for a community's economic, social, and environmental well-being. Hazard mitigation can reduce or eliminate these impacts. FEMA's definition of hazard mitigation is "Sustained actions taken to reduce or eliminate long-term risk to life and property from hazards."[1] For the purposes of the Foster City Local Hazard Mitigation Plan (LHMP)/Safety Element, hazard mitigation is slightly expanded as follows: Sustained actions taken to reduce or eliminate long-term risk to life, property and the environment from hazards.

The Local Hazard Mitigation Plan/Safety Element supports Foster City's emphasis on hazard mitigation prior to disasters, including:

- **Maintenance of infrastructure.** The City/Estero Municipal Improvement District has used a long-term, 10-year funding strategy to ensure that funds are available to carry out a proactive capital improvement program to maintain the City/District's infrastructure. This includes proactive maintenance, recurring capital improvement projects and infrastructure replacement. This ensures that key systems are operating at peak levels and improves resiliency.
- **Requirements for new construction beyond the uniform codes**. The City has continued to adopt amendments to the uniform building codes with each code cycle to improve seismic safety and fire safety.
- **Education of residents and community groups.** The City's provides extensive public education in emergency preparedness through a variety of means, including website, classes, community events and the Community Emergency Response Training (CERT) program that trains individuals and groups in how to make their homes, businesses and neighborhoods more resilient as well as how to respond in a disaster.

The LHMP/Safety Element focuses on the protection of the community from risks associated with natural hazards and some man-made hazards. Some level of risk associated with these hazards is unavoidable; the LHMP/Safety Element is the means by which the City defines what measures will be undertaken to reduce these risks to levels determined by the City to be reasonable. The City has chosen to combine the two required plans into one document in order to reduce redundancy and to ensure continued consistency in the City's approach to hazard mitigation.

The City of Foster City is located in San Mateo County, California. Foster City, incorporated in 1971, is situated on the San Francisco Peninsula midway between San Francisco and San Jose. Foster City is a "Planned Community" originally designed to be a full service city with a character defined by nine residential neighborhoods, supported by commercial centers throughout the City and light industrial land uses in the northern portion of the City. The municipality of Foster City covers 4 sq. miles (a map of the City's jurisdictional boundary is provided in Figure 2-2). The City has a population of 32,390 people, based on an estimate as of 1/1/2015 by the California Department of Finance[2]. The City staff also serves as staff to the Estero Municipal Improvement District, which provides water and sewer services to Foster City and the Mariner's Island portion of San Mateo. In FY 2015-16, the combined City/Estero Municipal Improvement District total budget was $77,671,740, including $11.4 million for

[1] Federal Emergency Management Agency (FEMA) (2013). Local Hazard Mitigation Planning Handbook, March 2013, p. 1-1.
[2] California Department of Finance (2015), Table E-5 Population and Housing Estimates for Cities, Counties and the State January 2011-2015. http://www.dof.ca.gov/research/demographic/reports/estimates/e-5/2011-20/view.php

capital expenditures. The City has a staff of 190 full-time employees and provides both Fire and Police services to its residents.

The small size, underlying geologic conditions, and history of development result in Foster City having nearly the same exposure to hazards throughout the City. Based on United States Geological Survey (USGS) mapping, Foster City is underlain by Quaternary Holocene-aged Bay Mud that is less than 9,600 years old and man-made artificial fills that have been placed in the areas that are developed. Foster City had its beginnings as reclaimed marshlands devoted to dairy farming and evaporation ponds known as Brewer Island. During the late 1950s, T. Jack Foster, in association with Bay Area developer Richard Grant, purchased an option to acquire Brewer Island for the development of a complete community. In 1960, the California Legislature created the Estero Municipal Improvement District (EMID) with most of the governing powers of an incorporated municipality. The County Board of Supervisors approved the Foster City Plan and ground breaking for the first reclamation and development projects took place in 1961. Due to the extensive fill, compaction and construction of infrastructure that had to precede any building construction, three years passed before the first homes were completed.

Similarly, the land areas of Foster City protected by the City's levees have the same exposure to flood hazards. The topography of Foster City is relatively flat with an existing ground surface elevation of between 5 and 7 feet above mean sea level. Flood protection is provided through a combination of the levees surrounding the City and the Foster City Lagoon. Storm water collected throughout Foster City flows primarily to the Foster City Lagoon system, which serves as a drainage detention basin for storm water runoff (a small area near Port Royal Avenue flows to the City of San Mateo's Marina Lagoon). The Foster City Lagoon system is designed and operated to store runoff from a 100-year storm event. Storm water from the Foster City Lagoon flows or is pumped into the San Francisco Bay.

The demographic information for Foster City indicates that the age, race, and economic characteristics are fairly evenly distributed throughout the City. Table 2-1 includes the citywide average for various demographic characteristics as well as the range among the census tracts. Other than the range given for owner occupied housing units, the ranges among the census tracts are narrow, further illustrating the even distribution of demographics throughout the City. One factor with more disparity is the rate of owner-occupied units, which is to be expected given that some neighborhoods include more apartment communities.

Table 2-1. Selected Demographic Characteristics of Foster City

	Citywide Average	Range Among Census Tracts
Median Age	39.3	36.6 to 44.6%
Race: White	45.5%	41.6 to 53.5%
Race: Asian	45%	39.6 to 49.1%
Race: Asian Indian	11.3%	5.3 to 15.6%
Hispanic	6.5%	5.0 to 7.0%
Owner Occupied Housing Units	57.9%	46.5 to 83.6%

Source: 2010 US Census

The City of Foster City currently owns and maintains City Hall, Council Chambers, Fire Station, Police Station, The Vibe Teen Center, Recreation Center/Senior Center, Community Center/Public Library and Corporation Yard.

Figure 2-1. Foster City Facilities (City Hall, Community Center/Library, The Vibe Teen Center)

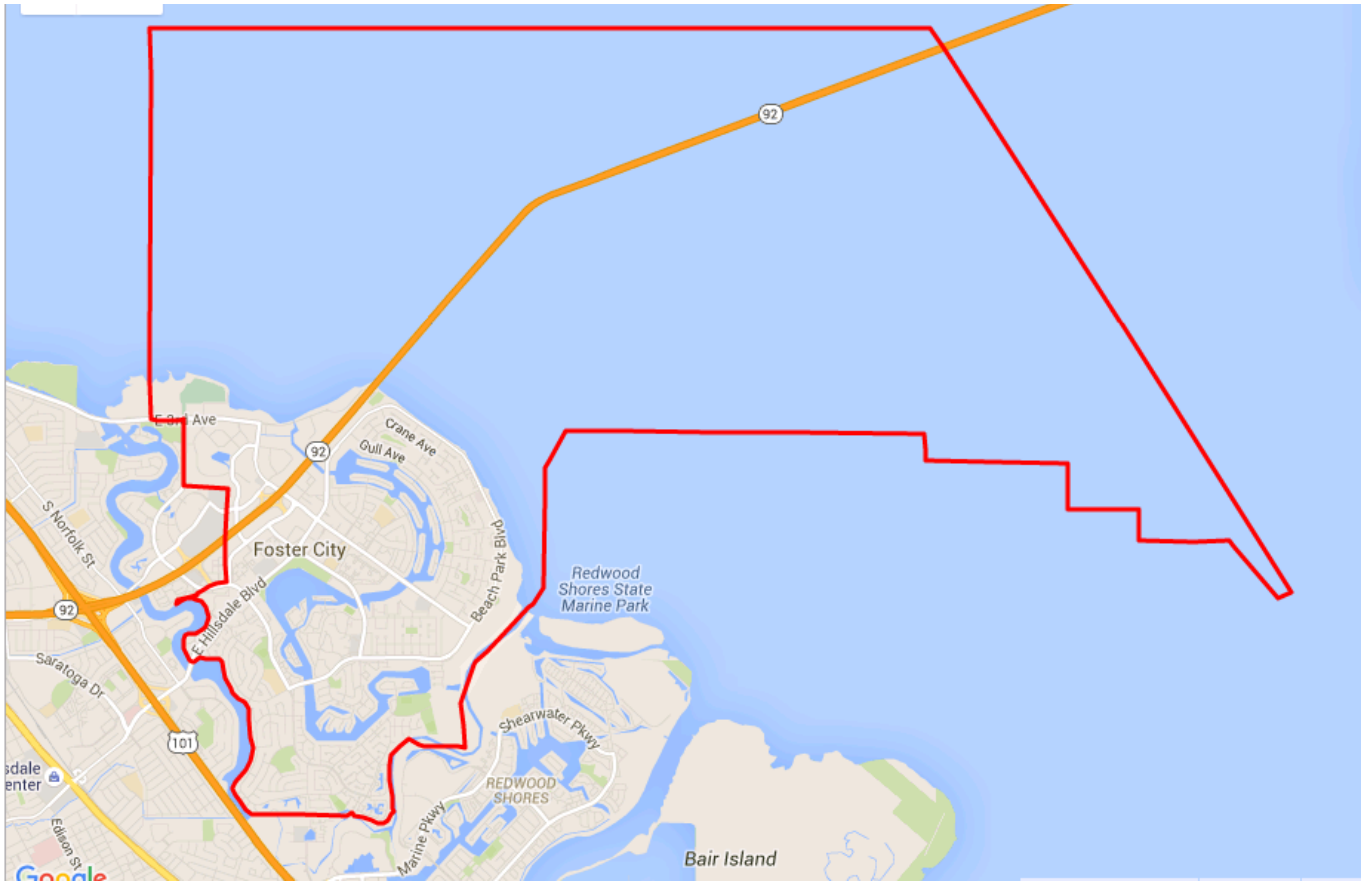


Figure 2-2. Jurisdictional Boundary Map

2.2 Disaster Mitigation Act of 2000 and AB 2140

Protecting the public health and welfare is a primary function of government. This has included preparing for and responding to disasters and natural hazards. This plan has been prepared to comply with the requirements of the Disaster Mitigation Act of 2000, as administered by the Federal Emergency Management Agency (FEMA). The Disaster Mitigation Act of 2000 (Public Law 106-390) amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act previously adopted in 1988. A significant amendment was the requirement for state and local governments to prepare and adopt hazard mitigation plans approved by FEMA under its implementing regulations as a condition of

eligibility for receiving hazard mitigation grants from FEMA. The plans are "to reduce the loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from natural disasters."

Federal regulations require an update of the LHMP every five years. The City's previous LHMP was adopted in 2011 as an annex to the 2010 Association of Bay Area Governments Local Hazard Mitigation Plan Taming Natural Disasters and included a commitment to update the plan at least once every five years.

AB 2140, passed by the California legislature in 2006, limits the State's share for any eligible project under the California Disaster Assistance Act to no more than 75% unless the local agency has adopted a local hazard mitigation plan in accordance with the Federal Disaster Mitigation Act of 2000.

2.3 Safety Element Requirements

The legal authority and requirements for Foster City to prepare the General Plan derive from state law (California Government Code, Section 65300 et. seq.). The Safety Element of the General Plan is required to address natural hazards such as seismic and other geologic hazards, as well as urban fires, safety issues related to evacuation routes, peakload water supply, minimum road widths and clearances around structures. The Safety Element is required to include mapping of known seismic and other geologic hazards.

The City's previous Safety Element, adopted in 1995, utilized the most accurate information available at the time. Substantial additional information regarding hazards has been developed in the twenty years since adoption of the Safety Element.

2.4 Purpose

The purpose of hazard mitigation and this plan is to reduce or eliminate risks to people, property and the environment from significant hazards in Foster City, California.

2.5 Scope/Plan Organization

This plan will replace the Safety Element of the General Plan adopted in 1995 and the Local Hazard Mitigation Plan (annex to the 2010 Association of Bay Area Governments Local Hazard Mitigation Plan Taming Natural Disasters) adopted in 2011. This plan is organized into the following sections:

1. Executive Summary
2. Introduction
3. Planning Process
4. Existing Plans and Programs
5. Community Profile
6. Hazard Analysis
7. Vulnerability Analysis/Risk Assessment
8. Capability Assessment
9. Mitigation and Adaptation Strategy
10. Plan Maintenance Procedures

2.6 What's New in the 2016 Update

The City of Foster City has made several changes to the format and content of the Local Hazard Mitigation Plan and Safety Element, including:

- The two plans were combined into one document
- The plan is a “stand-alone” plan instead of an “annex” to a regional or County plan
- Best available data sources, maps and analysis tools were utilized in the hazard and risk exposure assessment
- The plan addresses sea level rise and other potential hazards resulting from climate change
- A more robust public involvement process was used, including a survey and interactive public workshop

2.7 Authority

This plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth in Title 44 of the Code of Federal Regulations (44 CFR 201.6). Other Federal requirements are included in Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) as amended, and the National Flood Insurance Act of 1968 (NFIA), as amended.

This plan also meets the requirements for the Safety Element set forth in Section 65302(g) of the California Government Code. In addition, Section 65302.6 of the California Government Code, adopted with AB 2140, specifically allows the adoption of a local hazard mitigation plan with a safety element.

3 PLANNING PROCESS

3.1 Overview of Hazard Mitigation Planning

In 2005 and 2010, the Association of Bay Area Governments (ABAG) led the regional hazard mitigation planning effort and drafted the document, "Taming Natural Disasters," which included Foster City's Annex detailing its local hazard and risk assessment and mitigation activities.

In early 2015, it became known that ABAG would not be leading a regional hazard mitigation planning effort for the 2016 update, but would be providing resources and workshops to assist local jurisdictions in creating their own complete Local Hazard Mitigation Plans. Foster City staff members participated in three unique workshops provided by ABAG:

- Community Engagement on April 16, 2015,
- Hazard and Risk Assessment on July 23, 2015, and
- Mitigation and Adaptation Strategies on September 16, 2015.

Foster City followed the roadmap outlined by ABAG, which was based on the FEMA Local Mitigation Planning Handbook (March 2013). Additionally, Foster City staff participated in a hazard mitigation workshop offered by the California Governor's Office of Emergency Services Hazard Mitigation Planning Branch on July 14, 2015.

3.2 Preparing the 2016 Update

Representatives from multiple City departments as noted below comprised the planning team. Each department representative brought the perspectives of their individual departments along with infrastructure and budget priorities. All members of the planning team participated in every aspect of the planning process and plan development.

Table 3-1. LHMP/Safety Element Planning Team

Foster City Department	Name/Title
City Manager's Office	'Andra Lorenz, Management Analyst
City Manager's Office	Rob Lasky, Information Technology Manager
Communications/City Clerk	Doris Palmer, City Clerk
Community Development	Leslie Carmichael, Consultant Planner
Community Development	Martin Cooper, Chief Building Inspector
Finance	Karen Li, Accounting Specialist
Fire	Jenelle Masterson, Emergency Preparedness Coordinator
Police	Martin Ticas, Lieutenant
Parks and Recreation	Jennifer Liu, Director
Public Works	Norm Dorais, Maintenance Manager
Public Works	Allan Shu, Senior Civil Engineer and Floodplain Administrator
Public Works	Jennifer Phan, Office Assistant

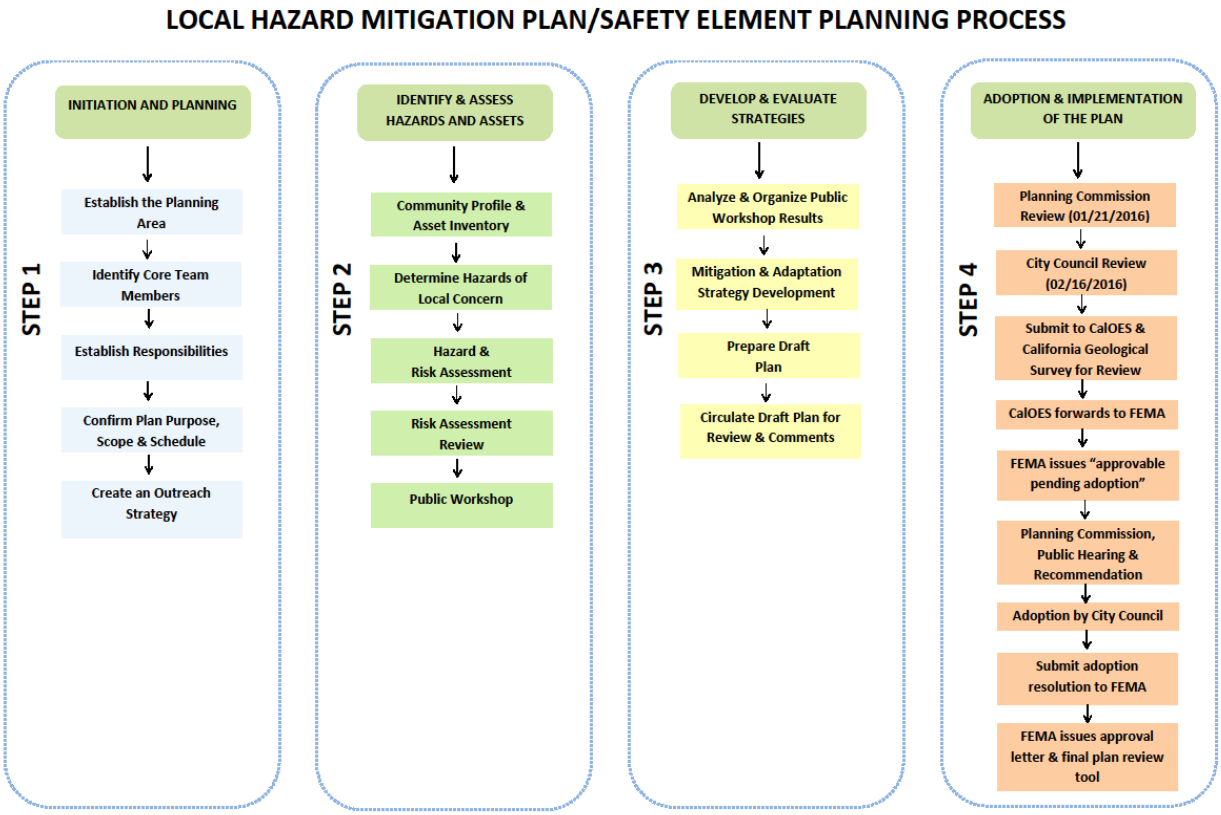


Figure 3-1. LHMP/Safety Element Planning Process

The planning team began the hazard mitigation planning process with Initiation and Planning. A project kick-off meeting was held on May 7, 2015. At this meeting, the planning team established that the planning area would be limited to Foster City, rather than participating in a multijurisdictional planning effort. This would enable Foster City to have a single plan that would also satisfy the requirements of a General Plan Safety Element, which would contain the background data, goals and strategies, rather than a county-wide plan with a city-specific "annex" that would not satisfy requirements of a General Plan Safety Element. With the core team members and responsibilities identified, leadership roles and ground rules were established during the kick-off meeting, and all planning team members agreed to meet at least monthly throughout the course of the planning process. The planning team met 14 times from May 2015 through February 2016. Meeting agendas, notes and attendance logs are available for review upon request.

Additionally, the planning team identified various stakeholders and agencies and invited the following organizations to provide input to the planning process via email, phone or face to face meetings including: San Mateo Union High School District, San Mateo-Foster City School District, City of San Mateo, City of Belmont, San Mateo County Health System, Pacific Gas & Electric (PG&E), Comcast Communications, San Mateo County Office of Emergency Services (OES), the Association of Bay Area Governments (ABAG) and the Foster City Chamber of Commerce. See Appendix A for a list of stakeholder organizations invited to participate.

During the Initiation and Planning stage, the planning team reviewed the 2010 Plan and confirmed the purpose, scope, schedule and goals for the 2016 plan update. Next, City staff also developed a public outreach strategy, which will be discussed in Section 3.3.

The next steps in the planning process included the identification and assessment of hazards and assets. The planning team participated in several meetings to research City records in order to provide new information on hazards and susceptibility within the City. This was done comprehensively as part of the City's review of the 2010 materials to reflect minor changes to City policies and programs that had occurred since 2010. The updates also incorporated the new ABAG data on hazard susceptibility. The City included any additional occurrences of natural hazards since the last plan and updated the risk assessment with new data from ABAG. This will be further discussed in Section 6.2.

Throughout the risk assessment process, the planning team used maps, rating tools, and assessment questions supplied by ABAG. Foster City used its own Geographic Information System to incorporate data sets from ABAG to allow for detailed analysis of community assets. The planning team used rating tools and assessment questions in group settings to ensure consistency for both qualitative and quantitative assessment of risk and vulnerability. This will be further discussed in Section 7.1.

At the close of the risk assessment process, the planning team organized a Public Workshop held on November 17, 2015, to present the goals of the hazard mitigation plan, maps and displays related to historical hazards and hazard risks, and the findings of the risk assessment to the community. The community provided feedback to the planning team in this venue, and applicable feedback was incorporated into the subsequent planning steps.

Next, the planning team identified mitigation strategies that would address the highest risk assets, and ranked those strategies based on feasibility, social and economic benefits, environmental improvements, and overall community objectives.

Finally, the plan was drafted to incorporate the findings from all of the above steps and the adoption and implementation steps were followed.

3.3 Community Engagement Process

Per 44 CFR, Section 201.6(b)(1), public participation in the planning process helps ensure that citizens understand risks and vulnerability and can work with the City to support policies, actions and tools that will lead to a reduction in future losses. It is for this reason that the public must have opportunities to comment on disaster mitigation plans during the drafting stages and prior to plan approval.

Foster City delivered a multipronged community engagement process, including the use of the City Website, social media platforms, paper and online surveys, a public workshop, appearances at public events, press releases, a Planning Commission Study session, and a City Council meeting, all completed prior to the plan's submission to California Governor's Office of Emergency Services for review. This strategy was designed to gauge the public's perception of risk and ideas for mitigation strategies by using multiple media avenues.

Website/Social Media
Foster City provided updates about the Local Hazard Mitigation process on its webpage, and advertised the survey and workshop through its social media channels. The Foster City Local Hazard Mitigation Plan Webpage can be found at http://www.fostercity.org/fire/communityoutreach/Local-Hazard-Mitigation-Plan.cfm, and an image of the page appears in Figure-3-2.

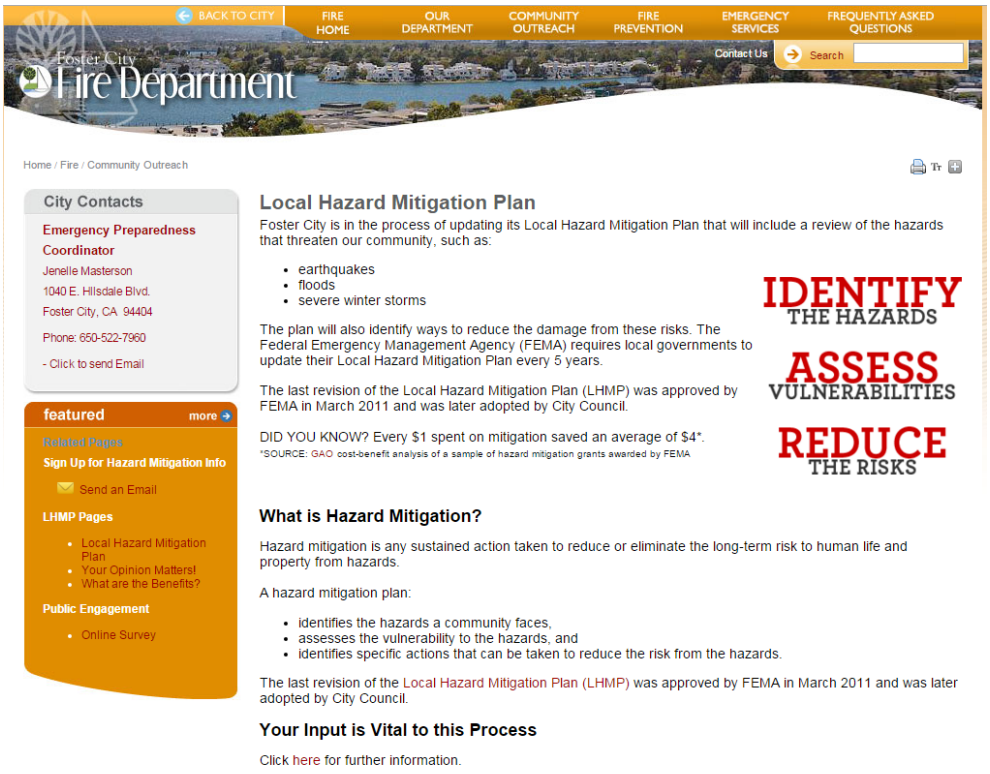
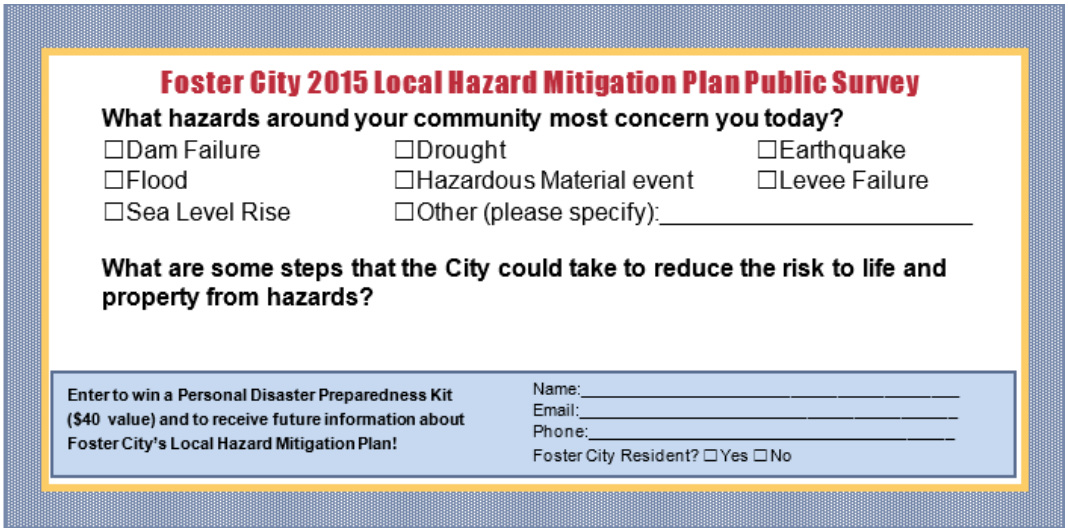


Figure 3-2. Foster City Local Hazard Mitigation Plan Website

Survey

A local hazard mitigation plan public survey (Figure 3-3) was developed by the planning team and was used to gauge the public's concern about hazards identified by the planning team. In addition to the hard copy of the survey and flyer (Figure 3-4), which was available at the City's public counters in City Hall, the Police Department, the Fire Department, and the Recreation Center, the Communications/City Clerk Department made the survey available online via the Foster City Forum. The Foster City Forum is an online forum for civic engagement that allows community members to comment on important Foster City topics, which are reviewed by City officials and incorporated into the decision-making process. From July 29, 2015 through November 13, 2015, a total of 448 hard copy and online surveys were completed by community members. The results of the survey were also posted on the Foster City Forum in an outcome statement (see Appendix B). All survey respondents were offered the opportunity to provide their name for entry into a drawing to receive a personal preparedness kit valued at over $40. The drawing was held and the winner was announced at the Public Workshop.

Upon closure of the public survey period, the planning team reviewed the top hazards as perceived by the community, which were earthquakes, drought, sea level rise, flood and levee failure. The planning team ensured that all of the hazards identified by the community were included in the hazard analysis. The planning team also reviewed the recommended mitigation activities identified by the community and found that an overwhelming majority of the recommendations were related to levee improvements, flood control and other infrastructure. Other recommendations related to preparedness and response rather than to the mitigation planning process were recorded and shared with City staff responsible for coordinating those activities.



Foster City 2015 Local Hazard Mitigation Plan Public Survey

What hazards around your community most concern you today?

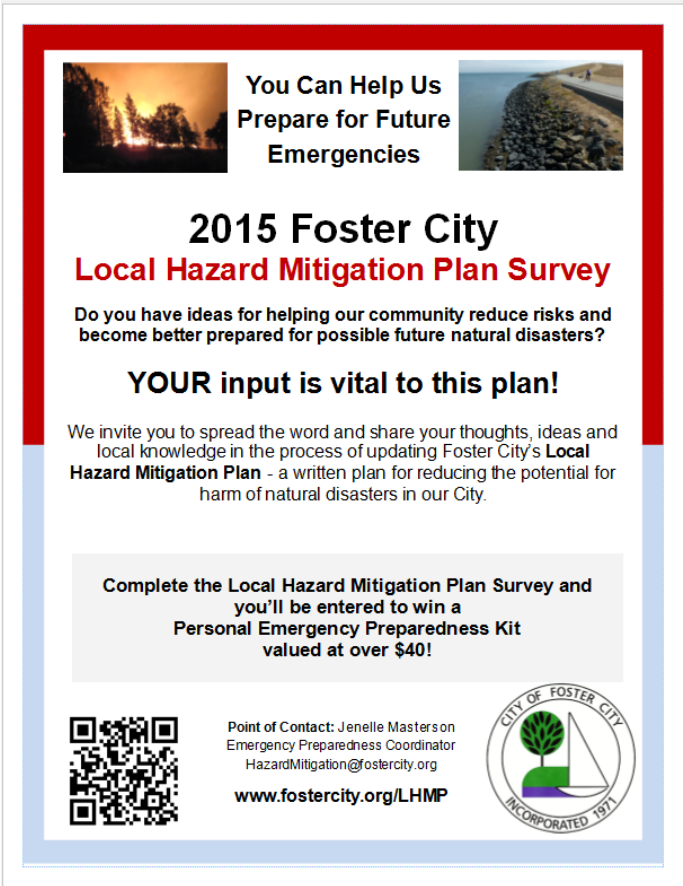
☐Dam Failure ☐Drought ☐Earthquake
☐Flood ☐Hazardous Material event ☐Levee Failure
☐Sea Level Rise ☐Other (please specify):_____

What are some steps that the City could take to reduce the risk to life and property from hazards?

Enter to win a Personal Disaster Preparedness Kit ($40 value) and to receive future information about Foster City's Local Hazard Mitigation Plan!

Name:_____
Email:_____
Phone:_____
Foster City Resident? ☐Yes ☐No

Figure 3-3. Foster City Local Hazard Mitigation Plan Public Survey



You Can Help Us Prepare for Future Emergencies

2015 Foster City

Local Hazard Mitigation Plan Survey

Do you have ideas for helping our community reduce risks and become better prepared for possible future natural disasters?

YOUR input is vital to this plan!

We invite you to spread the word and share your thoughts, ideas and local knowledge in the process of updating Foster City's **Local Hazard Mitigation Plan** - a written plan for reducing the potential for harm of natural disasters in our City.

Complete the Local Hazard Mitigation Plan Survey and you'll be entered to win a Personal Emergency Preparedness Kit valued at over $40!

Point of Contact: Jenelle Masterson
Emergency Preparedness Coordinator
HazardMitigation@fostercity.org

www.fostercity.org/LHMP

CITY OF FOSTER CITY INCORPORATED 1971

Figure 3-4. Foster City Local Hazard Mitigation Survey Flyer

Public Workshop

A public workshop was held on November 17, 2015 at the Foster City Vibe Teen Center and was attended by 27 members of the public. The meeting format included an introduction to hazard mitigation and a short presentation on personal emergency preparedness, followed by an hour of rotating among four stations. All stations allowed for direct conversations between the community with the planning team and other City staff with subject matter expertise. Community members were able to examine

maps depicting various hazards, to review the history of disaster events in Foster City and San Mateo County, to understand mitigation efforts that Foster City has already undertaken, and to hear about the hazard mitigation planning process steps and potential mitigation priorities. A YouTube video summarizing this event is available at: https://youtu.be/Cn5ym0jp0pY.

Figure 3-5. Foster City Community Members Learn about Hazards

This event was advertised through myriad channels, including through a press release to local newspapers (see Appendix C); on the Foster City Website and Event Calendar; through various City Listservs targeting businesses, homeowners associations, multifamily residential communities, volunteer communities, and the Community Emergency Response Team; on various City social media platforms, including Facebook, Twitter and Nextdoor; through flyers posted at various locations throughout the City (Figure 3-6); and through direct outreach to individuals who had completed the online and/or paper survey.

The planning team held a Public Workshop debriefing on November 24, 2015 and reviewed the summary of public comments recorded throughout the workshop. Team members again reviewed the top hazards and assets of concern mentioned by the community, and confirmed that the relevant hazards and assets were included in the hazard analysis. The planning team also reviewed the recommended mitigation activities identified by the community and found that many of the recommendations were related to preparedness and response rather than mitigation. These preparedness and response recommendations were recorded and shared with City staff responsible for coordinating those activities. All feedback received from the public during this workshop is summarized in Appendix D.

Figure 3-6. Foster City Public Workshop Flyer

Visa Preparedness Day

A member of the planning team staffed a public information booth at the Visa Corporate Preparedness Fair in Foster City on September 17, 2015. Community members had an opportunity to receive information about the Local Hazard Mitigation Planning process, to fill out paper surveys, to share ideas about hazards and assets of concern, and to offer ideas about mitigation strategies. This event was supported by FEMA Region IX and was attended by other government and non-government stakeholders.

Figure 3-7. Foster City Fire Department at Visa's Corporate Preparedness Fair

Community Events

City staff used other scheduled community events as an opportunity to provide information about the Local Hazard Mitigation Planning process and to distribute paper surveys. The City Paper Shred event was held at City Hall on July 29, 2015, and the City Open House was held at City Hall, the Fire Department and the Police Department on October 3, 2015. Community members shared ideas about assets of concern, hazards of concern, mitigation strategies, and asked questions about the planning process.

Planning Commission Review

As part of the General Plan Safety Element review process, the plan was provided to the Foster City Planning Commission for review during a study session on January 21, 2016. The draft plan was made available to the members of the Planning Commission and community at large for a 30 day review period beginning on January 14, 2016. Public comment received by Foster City staff during the January 14-21, 2016 timeframe was also provided in writing to the Planning Commission for consideration during the study session. The Planning Commission provided verbal and written feedback to the planning team regarding the draft plan, and applicable changes were incorporated into a revision which was reviewed by the City Council on March 7, 2016.

Draft Plan Public Comment Period

The planning team made the Draft Local Hazard Mitigation Plan-Safety Element available to the public beginning on January 14, 2016 as part of the materials associated with the Planning Commission Study Session in accordance with the Brown Act. Additionally, the Draft Local Hazard Mitigation Plan-Safety Element was available for review on the Foster City Forum as a discussion topic from January 25, 2016

through February 19, 2016. Notice of the availability of the Draft Local Hazard Mitigation Plan-Safety Element and Public Comment period was advertised through myriad channels, including through a Press Release to local newspapers; on the Foster City Website; through various City Listservs targeting businesses, homeowners associations, multifamily residential communities, volunteer communities, and the Community Emergency Response Team; on various City social media platforms, including Facebook, Twitter and Nextdoor; and through direct outreach to individuals who had completed the online and/or paper survey.

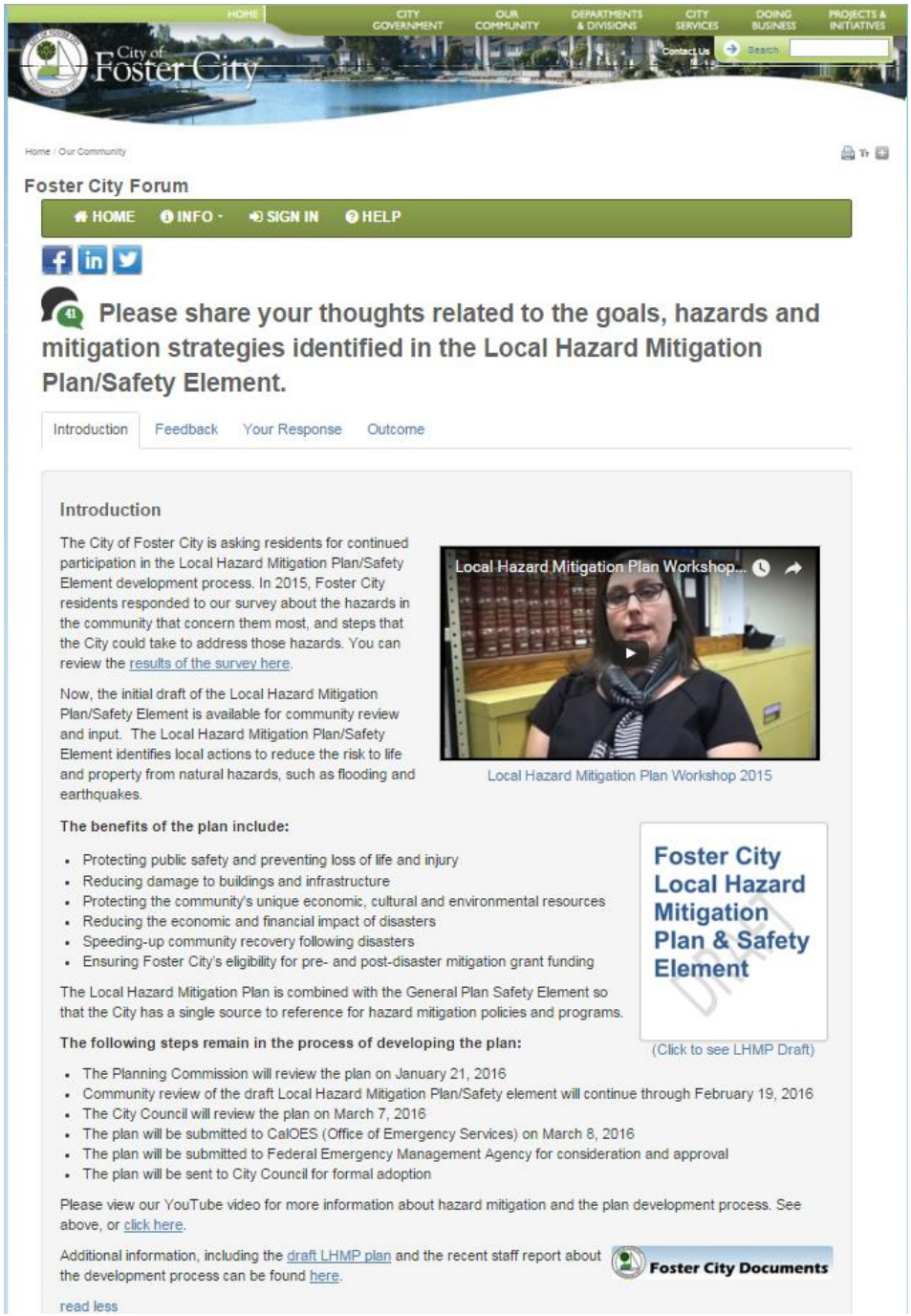


Figure 3-8. Foster City Forum Notice of Public Comment Period

Additionally, the planning team provided the draft plan to public agency stakeholders in the San Mateo County Operational Area and to technical experts at the Association of Bay Area Governments (ABAG) for review and comment.

The planning team reviewed all comments received during the public comment period and made the relevant updates to the draft plan. Comments and/or recommendations related to preparedness and response rather than mitigation were recorded and shared with City staff responsible for coordinating those activities.

City Council Review
The planning team provided a revised plan that incorporated feedback from the Planning Commission, recommendations of other Public Agencies and stakeholders, and relevant public comments to the Foster City City Council for review on March 7, 2016, prior to submission to California Governor's Office of Emergency Services (CalOES) and California Geological Survey (CGS). The discussion of this plan in the public forum provided an opportunity for revision prior to its entry into the formal review process as prescribed by FEMA. The City Council adopted Minute Order No. 1456 directing staff to submit the draft Local Hazard Mitigation Plan/Safety Element of the General Plan to the required reviewing agencies.

3.4 Approval Process

Following the City Council's review of the draft Local Hazard Mitigation Plan/Safety Element the following steps are required prior to final adoption:

- Draft Plan is submitted to California Governor's Office of Emergency Services (CalOES) for review (LHMP requirement) and at same time Draft Plan is submitted to California Geological Survey for review (Safety Element requirement)
- CalOES forwards the Plan to FEMA Regional Office for review and approval
- FEMA Regional Office conducts its review within 45 days and provides a completed Local Mitigation Plan Review Tool to the State
- FEMA issues "approvable pending adoption" letter
- Planning Commission Public Hearing and recommendation
- City Council Public Hearing and adoption

4 EXISTING PLANS AND PROGRAMS

4.1 Relevant Plans and Programs in Place

The following documents were reviewed and relevant information incorporated into this document:

Table 4-1. Existing Plans, Studies, Reports and Technical Information Used

Existing Plans, Studies, Reports and Technical Information	Method of Incorporation into the LHMP/Safety Element
ABAG Open Data (2015)	Hazards
ABAG Risk Landscape template document (2015)	Hazards, Risk Assessment/Vulnerabilities
Annex to 2010 Association of Bay Area Governments Local Hazard Mitigation Plan-Taming Natural Disasters (2011)	Risk Assessment, Mitigation Programs
Capital Improvement Program (CIP)	Risk Assessment, Capabilities, Mitigation Policies and Programs
Climate Action Plan (2016)	Mitigation Policies and Programs
County of San Mateo Emergency Operations Plan (2014)	Capabilities, Hazards, Risk Assessment/Vulnerabilities
County of San Mateo Hazard Vulnerability Assessment, Appendix to the Emergency Operations Plan (2014)	Hazards, Risk Assessment/Vulnerabilities
Emergency Operations Plan (2007)	Capabilities
Estero Municipal Improvement District Code	Mitigation Programs
Final Environmental Impact Report for the Foster City General Plan Update and Climate Action Plan (2015)	Hazards, Capabilities
Foster City Municipal Code, including but not limited to Chapter 15.36, Floodplain Management Regulations	Capabilities
FY 2015-16 Budget, including Capital Improvement Plan (2015)	Mitigation Programs
General Plan: • Housing Element (2015) • Land Use and Circulation Element (2016) • Safety Element (1995)	Community Profile, Capabilities, Mitigation Policies and Programs, Hazards
Lagoon Management Plan , 1992	Risk Assessment, Mitigation Programs
Levee Protection Planning Study, July 2015	Hazards, Risk Assessment/Vulnerabilities
State of California Multi-Hazard Mitigation Plan (2013)	Hazards, Risk Assessment/Vulnerabilities
Urban Water Management Plan : 2010-2015 (2010)	Capabilities

4.2 Previously Implemented Mitigation Strategies

The 2010 LHMP identified priorities for mitigation tasks, which have been implemented to various extents as indicated in Table 4-2. The 2010 LHMP identified four “priority” mitigation measures and also identified other on-going and unranked Mitigation Strategy Programs. These are listed together with

Implementation Programs from the 1995 Safety Element, with their status as of December 2015 in the table.

Table 4-2. Current Status of Mitigation Strategies from 2010 LHMP and 1995 Safety Element

OnGoing Mitigation Strategy Program Identified in 2010 LHMP	Safety Element Implementation Program	Status as of December 2015	Include in LHMP/Safety Element
Priority: Retrofit wastewater lift station with auxiliary pump to provide a third level of redundancy for pumping the raw wastewater from our main lift station (Lift Station #59) to the wastewater treatment plant in the event PG&E lost power and our emergency generator did not work.		In Five-Year CIP for installation in 2015-16 to install portable emergency power in addition to the existing diesel backup.	No: This project will be completed in 2015-16. A new high priority mitigation strategy is included to install air release valves (ARVs) in the line between Lift Station #59 and the treatment plant.
Priority: Wastewater system repairs on the gravity mains and manholes as part of a multi-phase program to rehabilitate the sewer system lift stations by performing preventative maintenance and upgrades to extend the useful life of the lift stations.		Ongoing. This is part of a multi-phase program started in 2000. Over a 25-year period, all 48 lift stations will be rehabilitated. Phase 4 was completed in 2012 and included improvements to 6 lift stations. Phase 5 will include various repairs at 10 lift stations. Phase 6 will begin in FY 2018-19.	Yes: This remains a high priority mitigation strategy in the LHMP/Safety Element.
Priority: Seismic engineering study of each 4-million gallon welded steel water storage reservoirs used to provide emergency supply storage, as well as storage for peak use period and firefighting needs.		Water tanks were studied and recommendations for seismic upgrades are included in the five year (2015-2020) CIP Plan.	Yes: This remains a high priority mitigation strategy in the LHMP/Safety Element.
Priority: Seismic assessment of the existing building that houses the six booster pumps for the distribution of water to the community (constructed over 60 years ago) to determine their compliance with current seismic standards.		Water pump station was studied and recommendations for seismic upgrades are included in the five year (2015-2020) CIP Plan.	Yes: This remains a high priority mitigation strategy in the LHMP/Safety Element.

OnGoing Mitigation Strategy Program Identified in 2010 LHMP	Safety Element Implementation Program	Status as of December 2015	Include in LHMP/Safety Element
Vulnerability assessments of City's facilities and infrastructure (GOVT-a-1)	S-f Protect City's Infrastructure and Facilities. The City will protect the City's infrastructure and facilities from damage due to seismic and geologic hazards through property design and retrofitting older facilities to current standards.	Ongoing Based on review of Caltrans' bi-annual inspection reports for the City owned bridges, CIP 762 provided for maintenance work and repair work. Design was completed and construction performed. CALTRANS conducts biannual inspections of City owned bridges (Bicentennial, Foster City Boulevard, Rainbow, and Shell Boulevard).	Yes
Non-structural mitigation for building contents (GOVT-a-4)	S-d Non-Structural Hazards Assessment. The City will include an assessment of non-structural seismic hazards as part of annual inspections of businesses as part of a public education program.	Ongoing	Yes
Coordination with the State Division of Safety of Dams to ensure that cities and counties are aware of the timeline for the maintenance and inspection of dams whose failure would impact their jurisdiction; (GOVT-a-8)		Ongoing	No: Foster City is aware of requirements for inspection and maintenance at Lower Crystal Springs Dam

OnGoing Mitigation Strategy Program Identified in 2010 LHMP	Safety Element Implementation Program	Status as of December 2015	Include in LHMP/Safety Element
Development of interoperable communications for first responders from cities, counties, special districts, state, and federal agencies. (GOVT-c-7)		Ongoing	No: This is managed through the San Mateo County Fire/EMS Joint Powers Agreement Fire Chiefs' Communications Committee
Maintain and update City of Foster City Standardized Emergency Management System Plan (GOVT-c-12)	S-p Emergency Response. The City will prepare to respond to emergencies through use of established procedures, programs of on-going training, periodic exercises of the City's Emergency Plan, and mutual aid agreements. S-q Emergency Plan. The City will maintain the City's Emergency Plan indicating responsibilities and procedures for responding to an emergency.	Ongoing. Extensive employee training was implemented, as required by FEMA.	Yes
Participation in general mutual-aid agreements and agreements with adjoining jurisdictions for cooperative response to fires, floods, earthquakes, and other disasters (GOVT-c-13)		Ongoing Foster City is a signatory for Automatic Aid with agencies in San Mateo County as well as part of California's Mutual Aid System.	Yes

OnGoing Mitigation Strategy Program Identified in 2010 LHMP	Safety Element Implementation Program	Status as of December 2015	Include in LHMP/Safety Element
Participation in FEMA's National Flood Insurance Program (GOVT-d-5)	S-g Maintain Levees and Lagoon for Flood Protection. The City will maintain the City's levees and lagoon for flood protection pursuant to the "Operation and Maintenance Manual, Foster City Levees and Pump Station" and the "Lagoon Management Plan."	Ongoing Quarterly inspections of the Levee condition are performed with video documentation. San Mateo's levee was certified in 2012 and the new flood maps were issued October 16, 2012. No change was made in the flood zone classification for Foster City. City's flood classification remained "flood insurance is not mandatory" for land areas. Based on FEMA coastal flood hazard study, levee system does not meet the new freeboard requirement. The Five-Year CIP includes a project to raise the levee to meet the new required elevation to retain accreditation.	Yes: Improvement of the City's levee system is now a high priority due to FEMA's determination that Foster City's existing levees will no longer be considered accredited.
Continue to support training of Community Emergency Response Teams (CERT) through partnerships with local businesses (GOVT-c-3, ECON-j-5, HWNG-k-6)	S-c Seismic Safety Education. The City will include seismic safety education in the Fire Department's public education programs, such as Neighborhood Emergency Response Team training and earthquake preparedness training.	Ongoing. Since 2010, 453 CERT members have been trained, including over 40 employees of Gilead Sciences.	Yes

OnGoing Mitigation Strategy Program Identified in 2010 LHMP	Safety Element Implementation Program	Status as of December 2015	Include in LHMP/Safety Element
Adopt the 2009 International Existing Building Code or the latest applicable standard for the design of voluntary or mandatory soft-story building retrofits for use in City/County building department regulations. In addition, allow use of changes to that standard recommended by SEAOC for the 2012 IEBC. (HSNG-c-2)	S-i Use of Uniform Codes. The City will adopt and enforce the most current uniform codes with additional local requirements as necessary tailored to Foster City.	Ongoing	Yes
Create a mechanism to require the bracing of water heaters and flexible couplings on gas appliances, and/or (as specified under "b. Single-family homes vulnerable to earthquakes" above) the bolting of homes to their foundations and strengthening of cripple walls to reduce fire ignitions due to earthquakes. (HSNG-g-18)		Required by code for all new water heaters/gas appliances	No: This is now required by the building code.
Incorporate FEMA guidelines and suggested activities into local government plans and procedures for managing flood hazards (LAND-c-2)	S-h Flood Plain Regulations. The City will evaluate any proposed development within special flood hazard areas for conformance with the City's flood plain regulations as contained in Chapter 15.36 of the Foster City Municipal Code.	Flood plain regulations were updated in 1995.	Yes

OnGoing Mitigation Strategy Program Identified in 2010 LHMP	Safety Element Implementation Program	Status as of December 2015	Include in LHMP/Safety Element
Develop a plan for speeding the repair and functional restoration of water and wastewater systems through stockpiling of shoring materials, temporary pumps, surface pipelines, portable hydrants, and other supplies, such as those available through the California Water /Wastewater Agency Response Network (CalWARN). Communicate that plan to local governments and critical facility operators. (INFR-a-6)		Priorities for water and wastewater systems are currently focused on the structures and connection nearby the structures. Distribution system upgrades will be reviewed in the upcoming five year CIP cycle. The City has subscribed to the CalWARN service that allows for resources should an emergency occur.	Yes
Pre-position emergency power generation capacity (or have rental/lease agreements for these generators) in critical buildings to maintain continuity of government and services. (INFR-a-8)		Ongoing	Yes
Ensure that critical intersection traffic lights function following loss of power by installing and maintaining battery back-ups and emergency generators. Proper functioning of these lights is essential for rapid evacuation, such as with hazmat releases resulting from natural disasters.(INFR-a-9)		All traffic signals have battery back-up capable of four hours of continuous operation. The batteries are routinely checked as part of the contractor's responsibilities.	Yes
As an infrastructure operator, designate a back-up Emergency Operations Center with redundant communications systems. (INFR-a-21)		Ongoing	Yes

OnGoing Mitigation Strategy Program Identified in 2010 LHMP	Safety Element Implementation Program	Status as of December 2015	Include in LHMP/Safety Element
Expedite the funding and retrofit of seismically-deficient City owned bridges and road structures by working with Caltrans and other appropriate governmental agencies. (INFR-b-1)		All bridges are up to current standards. The most recent seismic retrofits of the Shell and Foster City Blvd. bridges were completed in 2006.	No: This measure was combined with GOVT-a-1 from the 2010 LHMP.
Include "areas subject to high ground shaking, earthquake-induced ground failure, and surface fault rupture" in the list of criteria used for determining a replacement schedule for pipelines (along with importance, age, type of construction material, size, condition, and maintenance or repair history).(INFR-b-3)		All areas of the City are treated as areas subject to high ground shaking, etc.	No: All areas are treated the same.
Install specially-engineered pipelines in areas subject to faulting, liquefaction or other earthquake hazard. (INFR-b-4)		This has been done for the City water system. The next system to be examined is the wastewater system.	Yes

OnGoing Mitigation Strategy Program Identified in 2010 LHMP	Safety Element Implementation Program	Status as of December 2015	Include in LHMP/Safety Element
Install portable facilities (such as hoses, pumps, emergency generators, or other equipment) to allow pipelines to bypass failure zones such as fault rupture areas, areas of liquefaction, and other ground failure areas (using a priority scheme if funds are not available for installation at all needed locations). (INFR-b-6)	S-r Emergency Power. The City will provide emergency power at critical City facilities such as major sewer lift stations, lagoon pumps, and public safety buildings. S-s Monitoring of Water, Sewer and Lagoon Systems. The City will provide and maintain a consolidated remote monitoring capability for the water distribution system, the wastewater collection system and the lagoon system that can be monitored 24 hours a day by Public Works staff or Police Department staff.	Ongoing. All 49 lift stations have either permanent power or ability to use temporary power. Stand-by power was added at critical facilities. CIP 603 Completed March 2012 - CIP 603 included preventative maintenance and upgrades to 6 lift stations as well as replacement of 2 standby emergency generators, 1 portable emergency generator and 9 control cabinets. CIP 603 also included replacing the Supervisory Control and Data Acquisition (SCADA) communication system with all new radios operating on a licensed radio frequency. CIP 612 provided for an internal pipeline investigation of the 4 mile section of the 24-inch transmission main. 2013 Inspection ports were added to portions of the 24” transmission main.	Yes
Install earthquake-resistant connections when pipes enter and exit bridges and work with bridge owners to encourage retrofit of these structures. (INFR-b-7)		The City has done this for City pipes. A new program could be included to encourage homeowners’ associations to do this for their facilities.	Yes

OnGoing Mitigation Strategy Program Identified in 2010 LHMP	Safety Element Implementation Program	Status as of December 2015	Include in LHMP/Safety Element
Ensure a reliable source of water for fire suppression (meeting acceptable standards for minimum volume and duration of flow) for existing and new development. (INFR-c-1)	S-m Water Supply and Delivery. The City will maintain a water supply and delivery system that can meet potential fire fighting demands through annual exercising of fire hydrants. S-t Water Supply. The City will study the feasibility of adding water storage and/or supply facilities. S-u Water Delivery System. The City will ensure the adequacy of the water delivery system through periodic testing, flushing and replacement of parts as needed.	Ongoing. New water tank added in 2005. Ongoing	Yes
Continue to repair and make structural improvements to storm drains, pipelines, and/or channels to enable them to perform to their design capacity in handling water flows as part of regular maintenance activities (INFR—d-6, INFR-d-7)		This is included in the City's capital improvement program as needs arise.	Yes
Provide materials to the public related to coping with reductions in water supply or contamination of that supply BEYOND regulatory notification requirements. (INFR-g-3)		The Water Department maintains standard water supply notices should the need arise.	No: This level of detail is covered in the City's Urban Water Management Plan.

OnGoing Mitigation Strategy Program Identified in 2010 LHMP	Safety Element Implementation Program	Status as of December 2015	Include in LHMP/Safety Element
Facilitate and/or coordinate the distribution of emergency preparedness or mitigation materials that are prepared by others, such as by making the use of the internet or other electronic means, or placing materials on community access channels or in City or utility newsletters, as appropriate. (INFR-g-5)	S-k Fire Education/Prevention. The City will provide a fire education/prevention program to schools, businesses and the community through publications, training classes, and other means.	Held annual open house with a Fire Safety Trailer. Continued CERT program. Continued fire plan check and inspection program for new and existing occupancies construction projects. Continued offering Emergency Preparedness Classes and CPR. Provide materials through annual Silver Dragon Exercises and City's website.	Yes
Continue to require that all new housing be constructed in compliance with requirements of the most recently adopted version of the California Building Code. (HSNG-f-1)	S-j Development Review for Fire Safety. The City will review proposals for new and modified buildings to ensure that fire safety provisions are included as required by the most current uniform codes and local regulations.	Ongoing	Yes
Adopt and amend as needed updated versions of the California Building and Fire Codes so that optimal fire-protection standards are used in construction and renovation projects of private buildings. (HSNG-g-6)	S-i Use of Uniform Codes. The City will adopt and enforce the most current uniform codes with additional local requirements as necessary tailored to Foster City.	Adopted International Building Code 2012 Edition, with California amendment (California Building Code) with Foster City amendments.	Yes
Require fire sprinklers in all new or substantially remodeled multifamily housing, regardless of distance from a fire station. (HSNG-g-13)		Ongoing	Yes

OnGoing Mitigation Strategy Program Identified in 2010 LHMP	Safety Element Implementation Program	Status as of December 2015	Include in LHMP/Safety Element
Conduct periodic fire-safety inspections of all multi-family buildings, as required by State law. (HSNG-g-16)	S-I Annual Inspections for Fire Safety and Hazardous Materials. The City will conduct annual inspections of businesses and multi-family dwellings in order to ensure compliance with fire safety and hazardous materials requirements. The City will continue to provide inspections of residential care facilities at the request of the Department of Social Services.	Ongoing	Yes
Ensure that fire, police, and other emergency personnel have adequate radios, breathing apparatuses, protective gear, and other equipment to respond to a major disaster. (GOVT-c-6)		Ongoing	No: This is managed through Foster City's annual budgeting process and an in-house committee.
Participate in developing and maintaining a system of interoperable communications for first responders from cities, counties, special districts, state, and federal agencies. (GOVT-c-7)		Ongoing	No: This is managed through the San Mateo county Fire/EMS Joint Powers Agreement Fire Chiefs' Communications Committee
Purchase command vehicles for use as mobile command/emergency operations center (EOC) vehicles if current vehicles are unsuitable or inadequate. (GOVT-c-9)		Ongoing	No: This issue is subject to City Council review as part of the budgeting of vehicle replacements.
Maintain the local government's emergency operations center in a fully functional state of readiness. (GOVT-c-10)		Ongoing	Yes

OnGoing Mitigation Strategy Program Identified in 2010 LHMP	Safety Element Implementation Program	Status as of December 2015	Include in LHMP/Safety Element
Continue to participate not only in general mutual-aid agreements, but also in agreements with adjoining jurisdictions for cooperative response to fires, floods, earthquakes, and other disasters. (GOVT-c-13)		Ongoing	Yes
Promote transportation options such as bicycle trails, commute trip reduction programs, incentives for car pooling and public transit. (ENVI-b-4)		Complete Streets implementation promotes transportation options. Transportation Demand Management programs are required of new developments in order to promote these transportation options.	Yes
Increase recycling rates in local government operations and in the community. (ENVI-b- 11)		Recycling rates have been increased.	No: Programs to improve recycling rates are included in the Climate Action Plan.
Review new development proposals to ensure that they incorporate required and appropriate fire-mitigation measures, including adequate provisions for occupant evacuation and access by emergency response personnel and equipment. (LAND-b-1)		Ongoing with plan checks	Yes
	S-a Geotechnical and Engineering Reports. The City will require site specific geotechnical and engineering reports for new structures.	Ongoing with plan checks.	Yes
	S-b Geotechnical Reports Library. The City will establish a geotechnical report library at City Hall.	Completed. These reports are available in the Community Development Department.	Yes

OnGoing Mitigation Strategy Program Identified in 2010 LHMP	Safety Element Implementation Program	Status as of December 2015	Include in LHMP/Safety Element
	S-e Expand Seismic Hazards Identification Program. The City will consider expansion of the City's Seismic Hazard Identification Program to include additional potentially hazardous types of buildings and/or a lower number of occupants.	Chapter 15.32 contains the existing Seismic Hazards Identification Program, which requires the City to notify owners and owners to notify tenants.	No: The only structure type in Foster City that poses significant hazards are the pre- 1995 concrete tilt-up buildings, which are gradually being removed as properties redevelop.
	S-n Resale and Rental Housing Inspections. The City will consider expansion of the City's building code enforcement program to assure compliance with basic health and safety building and fire standards and appropriate permits, including: 1) resale inspections of single family homes; 2) rental housing inspections; and 3) public outreach and education.	No action	No: Given the relatively young age of Foster City's building stock and the existing program for annual fire inspections of commercial and multi-family buildings and public outreach, the intent of this effort is met through other mitigation strategies.
	S-o Electromagnetic Fields. The City will monitor available information regarding possible health hazards of electromagnetic fields.		No: The Centers for Disease Control, Occupational Safety and Hazard Administration, the Food and Drug Administration and the Federal Communications Commission monitor health hazards related to electromagnetic fields.

OnGoing Mitigation Strategy Program Identified in 2010 LHMP	Safety Element Implementation Program	Status as of December 2015	Include in LHMP/Safety Element
	S-v Police Services. The City will provide adequate personnel, training, and equipment to support the provision of police services.	Ongoing	Yes
	S-w Crime Prevention. The City will provide a variety of crime prevention programs to educate and involve the community, including but not limited to Neighborhood Watch, newsletters, security surveys, and programs with community groups and organizations.	Ongoing	Yes
	S-x Development Review for Crime Prevention. The City will review proposals for new and modified buildings for compliance with crime prevention requirements.	Ongoing	Yes

5 COMMUNITY PROFILE

5.1 Area at a Glance

- **Date of Incorporation:** 1971
- **Current Population:** 32,390 people, based on an estimate as of 1/1/2015 by the California Department of Finance.
- **Population Growth**: Foster City was virtually undeveloped in 1961, experienced significant population growth in the 1970s and 1980s, then grew at a much slower pace during the 1990s and to the present.
- **Location and Description:** Foster City is located midway between San Francisco and San Jose on the western shoreline of the San Francisco Bay, east of U.S. 101. The City is bisected by State Route 92 (the J. Arthur Younger Freeway), which runs between Half Moon Bay to the west and to Hayward and Highway 880 to the east via the San Mateo-Hayward Bridge. The City encompasses 12,345 acres, of which 8,726 acres are part of the San Francisco Bay and Belmont Slough, and 2,619 acres are reclaimed marshland. This equates to approximately 4 square miles of land area.

Figure 5-1. San Mateo-Hayward Bridge

- **Brief History:** Foster City had its beginnings as reclaimed marshlands devoted to dairy farming and evaporation ponds. At the turn of the century, the approximately 2,600 acres of tidal marshlands now occupied by Foster City were owned by Frank Brewer, and the land was called Brewer Island. During the late 1950s, T. Jack Foster, in association with Bay Area developer Richard Grant, purchased an option to acquire Brewer Island for the development of a complete community. In 1960 the California Legislature created the Estero Municipal Improvement District (EMID), the state's first such public agency. EMID was granted most of the government powers associated with an incorporated municipality, except the powers to zone and approve development and certain police powers. T. Jack Foster prepared a master plan for the development of Brewer Island (Foster City) and submitted it to the County in 1961. The plan envisioned a self-contained community with a variety of housing types, waterfront lots and parks, an internal lagoon for public recreation, marinas, offices, stores, industry and public services. The engineering firm of Wilsey Ham developed a plan to raise the surface level of the island four to five feet and to dig a central drainage basin area that would also serve as a runoff storage area. This drainage basin is the Foster City Lagoon. EMID issued bonds to finance the improvements, including the lagoon, water systems, sewer system, roads, bridges and other necessary improvements. Foster City was incorporated in April 1971, with the newly elected City Council assuming the powers of the EMID Board. Foster City's Master Plan was amended and adopted as the City's General Plan.

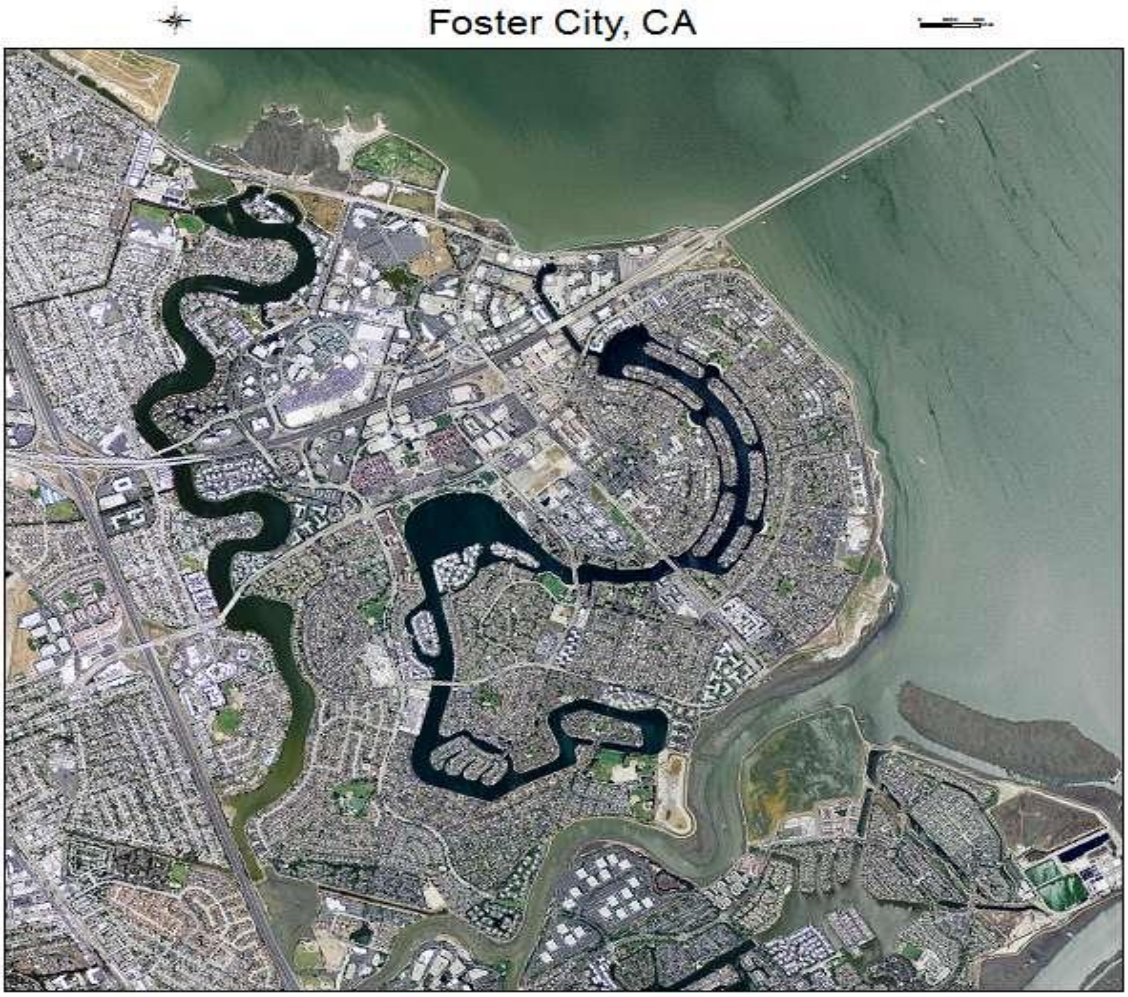


Figure 5-2. Foster City Satellite View

- **Climate:** Foster City enjoys a marine-like climate characterized by mild and moderately wet winters and dry, cool summers. The summer weather is dominated by a cool sea breeze. Low overcast often occurs for a few hours in the morning. Summer nights are comfortably cool, with minimum temperatures averaging in the fifties. The average minimum and maximum temperature range is 47.1°F to 71.1°F.

Figure 5-3. Foster City Park Spaces

- **Governing Body Format:** The City of Foster City and the Estero Municipal Improvement District provide governmental services to the citizens of Foster City. The members of the City Council serve as the policy-making body for both governmental agencies. City voters elect Council members to staggered terms of four years each. The City uses the Council-Manager form of government, with the City Manager appointed by and responsible to the five-member City Council.

5.2 Demographics

While Foster City population growth has been relatively minimal between 1990 and 2015, there have been changes to the ethnic composition of residents. The proportion of residents who are white or black has declined while the proportion that is Asian has increased. The Asian Indian population has been the fastest growing, increasing ten-fold from 1.0 percent to 10.5 percent from 1990-2014.

Table 5-1. Race and Ethnicity: 2000-2014

Race or Ethnicity	2000	2014
White	59.3%	45.4%
Black	2.1%	1.9%
Asian	32.5%	45.9%
Other	1.8%	1.4%
More than one race	4.1%	5.5%
Hispanic	5.3%	5.5%
Not Hispanic	94.7%	94.5%
Total population	28,803	31,809

Sources: 2000 US Census and 2010-2014 American Community Survey

The age composition of Foster City residents has shown an increase in the senior population since 2000, a decrease in the 20-59 year old segments and relatively constant proportion of children.[3] Foster City, like other cities in San Mateo County, can expect to see a dramatic increase in the number of seniors as the baby boomer generation ages.

Figure 5-4. Foster City Senior Center and Services

Table 5-2. Age of Residents: 2000-2014

Age	2000	2014
Under 5 years	6%	6.3%
5 to 19 years	17%	16.7%
20 to 34 years	21%	17.3%
35 to 44 years	18%	17.2%
45 to 59 years	23%	19.6%
60 to 74 years	11%	16.1%
75 years and over	4%	6.9%
Median age	38	40.7
Total population	28,803	31,809

Sources: 2000 US Census and 2010-2014 American Community Survey

[3] City of Foster City General Plan. Housing Needs Assessment (Appendix to Housing Element), 21 Elements, July 10, 2014, p. 8.

5.3 Trends

The following demographic and housing-related trends were noted in the 2015 Housing Element of the General Plan:

- **Rise of the Millennials.** The Millennial generation (ages 20-34) has a preference for dense, mixed-use, walk-able and bike-able communities. Many have speculated that Millennials may be a "generation of renters," but as the economy improves and as Millennials age, this conclusion may change.

- **Growing senior population.** Over the next decade and a half, the number of seniors (age 65+) in San Mateo County will increase by 76 percent. Foster City currently is home to approximately 2,400 seniors. Advanced planning will be necessary to ensure the opportunity for seniors to age safely in the communities where they reside.

- **Worsening workforce-housing shortage.** San Mateo County is projected to see notable job growth over the next decade, and about 40 percent of these jobs will pay lower income wages. San Mateo County already has a severe workforce housing shortage in general caused by years of rapid economic growth and slow housing growth. By 2025, the Department of Housing projects than the County's housing supply will only meet one third to one half of the demand. While Foster City is expected by the Association of Bay Area Governments (ABAG) to lose jobs between a high of 18,480 in 2000 and 16,190 in 2025, the City's Regional Housing Needs Assessment (RHNA) still requires accommodating the County's low-to-moderate income workers.

- **Increasing ethnic diversity.** According to 2010 U.S. Census data, San Mateo County is a "majority-minority" county — that is, no one racial group makes up over 50 percent of the population. The two racial groups growing the most rapidly in San Mateo County are Asians and Latinos. According to the regional Plan Bay Area, adopted by the Association of Bay Area Governments on July 18, 2013, Latinos will emerge as the largest ethnic group, increasing from 23 percent to 35 percent of the total population in the Bay Area by 2040.

- **Increase of people with developmental disabilities.** Aging baby boomers will be unable to care for their children with developmental disabilities. Almost three quarters of people with developmental disabilities live with a parent or caregiver and many of these caregivers are baby boomers. This trend is also going to be factor in the increased need for community-based independent living options.

In addition, recent trends related to housing and job growth include:

- **Housing growth "catch-up."** After eight years of no new housing construction in Foster City between 2005 and 2012, 307 new housing units at The Plaza were completed in 2013. As of January 2016, three housing developments including about 700 new units are under construction simultaneously. New development has utilized a "smart growth" concept including more urban, walkable, mixed-use developments close to transit, shopping and other amenities.

- **Post-recession job growth.** Foster City has seen dramatic job growth in the past five years and expects to see this continue for the next five years, based on development approvals. Commercial and industrial lands are nearly built out and, at the same time, some are undergoing redevelopment. In Vintage Park, Gilead Sciences has received approval to expand its existing campus by removing some buildings and adding larger buildings. Chess Drive Offices (recently purchased by Gilead Sciences) has been approved to include up to 800,000

sq. ft. of new office/research and development buildings. The Lincoln Centre area has been approved to include up to 595,000 sq. ft. for the bio-tech company, Illumina. This job growth is also resulting in the removal of many tilt-up concrete buildings constructed between 1965 and 1985 and replacing them with new commercial structures, which will improve the resilience of the City's building stock.

- **Post-recession traffic growth.** San Mateo County added 170,000 jobs between 2007 and 2015 and added 6,290 new housing units between 2007 and 2014, resulting in a dramatic increase in commuting from outside San Mateo County. The increased traffic congestion on Highways 101 and 92 has spilled onto City streets and created congestion at City intersections near the freeways.

5.4 Past Disasters

The City of Foster City has experienced a limited number of disasters since the City was incorporated in 1971. However, there is potential for earthquakes, floods, droughts, and severe storms. Regional disasters can affect the City even though they might not cause local damage. The Loma Prieta Earthquake of 1989 is an example of the kind of large scale disaster which can strike the Bay Area. It killed 63 people, injured 3,757, and displaced over 12,000 people. With over 20,000 homes and businesses damaged and over 1,100 destroyed, this quake caused approximately $6 billion of damage in the region. Although damage in **Foster City** was minimal, the City was impacted by the disruptions to the regional transportation system.

Locally significant incidents that have also impacted the City of Foster City in the past include:

- 2014-16 – Drought Emergency. In January 2014, the Governor proclaimed a State of Emergency and directed State officials to take all necessary actions to prepare for drought conditions.
- 2014 – Winter Storm damage resulted in San Mateo County's Proclamation of State of Emergency on December 19, 2014, and the Governor's Proclamation of a State of Emergency on December 22, 2014. Foster City personnel worked overtime and provided sandbags to City residents.
- 2013 – Asiana Airlines Flight 214 plane crash at San Francisco International Airport. Through automatic aid agreement, Foster City personnel provided coverage for neighboring communities that responded to the crash.
- 2010 – San Bruno gas line explosion. Numerous Foster City personnel worked at the event as part of initial response teams and during the aftermath.
- 2009 – Mehserle Shooting. Civil disturbance during which the City of Oakland activated their EOC. San Mateo County monitored this situation.
- 2002 – Santana Row Fire- Foster City Fire Department responded as part of a San Mateo County strike team deployment to the Santana Row Fire in San Jose.
- 2001 – Terrorists attacked The World Trade Center resulting in the closure of San Francisco International Airport and San Jose International Airport.
- 1995 – Tanker truck rolled over and caught fire on Highway 92. Foster City opened its EOC during this incident.
- 1989 – Loma Prieta Earthquake. Minor damage to City owned facilities.
- Seasonal Weather – Summer heat and winter cold. During weather extremes San Mateo County Office of Emergency Services monitors the situation with cities that are affected.

6 HAZARD ANALYSIS

6.1 Overview

This chapter defines and maps significant natural hazards that impact the people, built environment, economy and society of Foster City. Each section describes a different natural hazard, including how it has affected the Bay Area and Foster City in the past and how it is likely to impact Foster City in the future. Most of the information in this chapter is adapted from the "Risk Landscape" document prepared by ABAG to assist local governments in the preparation of their LHMPs.

In the Bay Area, earthquakes are the hazards that have the highest combined likelihood to cause extensive, multi-jurisdictional damage. All of the Bay Area is exposed to earthquake hazard, and impacts can cause region-wide disruptions. Disruptive earthquakes also have high likelihood of occurring at any given time. With the combined likelihood and extent of earthquakes, much of the focus of this chapter is on earthquake hazards.

Flooding is another major hazard that the Bay Area and Foster City are exposed to, although Foster City has been very successful in minimizing or eliminating flooding in the past through a combination of levee protection and use of the Foster City Lagoon for storm drainage. Globally, sea levels are rising due to thermal expansion caused by the ocean warming and the melting of land-based ice such as glaciers and polar ice caps. Regionally and locally, the rate of sea level rise is affected by other processes.

Other hazards beyond earthquakes and flooding/sea level rise may be less widespread or less frequent in the Bay Area and Foster City, but can still cause significant local impacts and have cascading effects on the region. Other hazards potentially affecting Foster City include dam failure of the Lower Crystal Springs Dam, drought, extreme heat, fire and hazardous materials.

Climate change has begun to increase the severity of some hazards. Changes in extreme weather events are the primary way that most people experience climate change. Human-induced climate change has already increased the number and strength of some of these extreme events. Over the last 50 years, much of the United States has seen an increase in prolonged periods of excessively high temperatures, more heavy downpours, and in some regions, more severe droughts.[4]

[4] U.S. Global Change Research Program (2014), Climate Change Impacts in the United States, p. 15. http://nca2014.globalchange.gov/

6.2 Hazard Identification and Screening

The Local Hazard Mitigation Planning Team considered the full range of potential hazards and their relevance to Foster City and determined which hazards warranted further discussion, as indicated in Table 6-1. For each hazard detailed in Table 6-1, the planning team identified the geographic areas, the extent, previous occurrences and probability of future events. While multiple hazards were identified, earthquakes (particularly shaking) and flooding were ranked as highest priorities based on past disasters and expected future impacts, as they pose the most significant risk for potential loss.

The planning team defined the probability of hazards as "highly likely" which is defined as occurring every 1-10 years, "likely" as occurring every 10-50 years, and "unlikely" as occurring at intervals greater than 50 years. For some hazards, due the wide variations of type and magnitude, there is no formal way to estimate the probability of these events, which will be noted throughout this section.

Table 6-1. Identification and Screening of Hazards

Hazard Type	Explanation
Dam Failure	Foster City lies within the inundation area mapped for the Lower Crystal Springs Reservoir.
Drought	Prolonged drought could limit water availability.
Earthquake -Shaking -Liquefaction -Tsunami	Foster City lies within areas mapped as potentially affected by earthquake shaking and liquefaction. Tsunami mapping shows areas affected outside the City's levees. Earthquake related landslides and surface fault rupture are not relevant to Foster City because there are no slopes susceptible to landslides and active earthquake faults are several miles away.
Extreme Heat	Climate change experts predict more extreme heat days in the future.
Fire (Urban)	Urban fires and fire following earthquake could potentially affect Foster City.
Flood	Foster City is potentially affected by flooding from San Francisco Bay.
Levee Failure	A failure of the City's levee would result in flooding from San Francisco Bay.
Sea Level Rise (see Flood)	Foster City is potentially affected by sea level rise.
Other: Hazardous Materials	Hazardous materials are transported on roadways in Foster City and are stored at some commercial facilities.
Other: Transportation Accidents	Foster City is in close proximity to main Highways 101 and 92 and the San Francisco Airport.
Other: Crime	Although crime in Foster City is low compared to other areas, crime prevention efforts can continue to reduce crime.

6.3 Earthquakes

Earthquakes occur when two tectonic plates slip past each other beneath the earth's surface, causing sudden and rapid shaking of the surrounding ground. Earthquakes originate on fault planes below the surface, where two or more plates meet. As the plates move past each other, they tend to not slide smoothly and become "locked," building up stress and strain along the fault. Eventually the stress causes a sudden release of the plates, and the stored energy is released as seismic waves, causing ground acceleration to radiate from the point of release, the "epicenter."

The Bay Area is in the heart of earthquake country. Major faults cross through all nine Bay Area counties. Every point within the Bay Area is within 30 miles of an active fault, and 97 of the 101 cities in the Bay Area are within ten miles of an active fault. Figure 6-1 shows the location of active faults that are mapped near Foster City under the Alquist-Priolo Act. There are no known active, potentially active, or inactive faults located within Foster City. The closest active faults are the San Andreas Fault, located approximately 5.7 miles southwest of Foster City, and the Hayward Fault, approximately 12.8 miles northwest of Foster City.

The total amount of energy released in an earthquake is described by the earthquake magnitude. The moment magnitude scale (abbreviated as M) is logarithmic; the energy released by an earthquake increases logarithmically with each step of magnitude.[5] For example, a M6.0 earthquake releases 33 times more energy than a M5.0, and a M7.0 earthquake releases 1,000 times more energy than a M5.0 event.

The quantified size or measurement of an earthquake is dependent on factors that include the length of the fault and the ease with which the plates slip past one another. In the Bay Area, technical specialists have observed varied fault behaviors, giving some sense of which faults may or may not produce a large, damaging earthquake. Earth scientists are most concerned about the San Andreas and Hayward faults, believed most likely to produce large, regionally damaging earthquakes. There are, however, many other Bay Area faults that can produce localized damage.

Additionally, earthquakes are often not isolated events, but are likely to trigger a series of smaller aftershocks along the fault plane, which can continue for months to years after a major earthquake, producing additional damage.

The energy released in earthquakes can produce five different types of hazards:

- Surface Fault rupture
- Ground shaking
- Liquefaction
- Earthquake-induced landslides
- Tsunamis and seiches

Each of these hazards will be discussed in greater detail later in Section 6.3.2.

[5] USGS (2014)

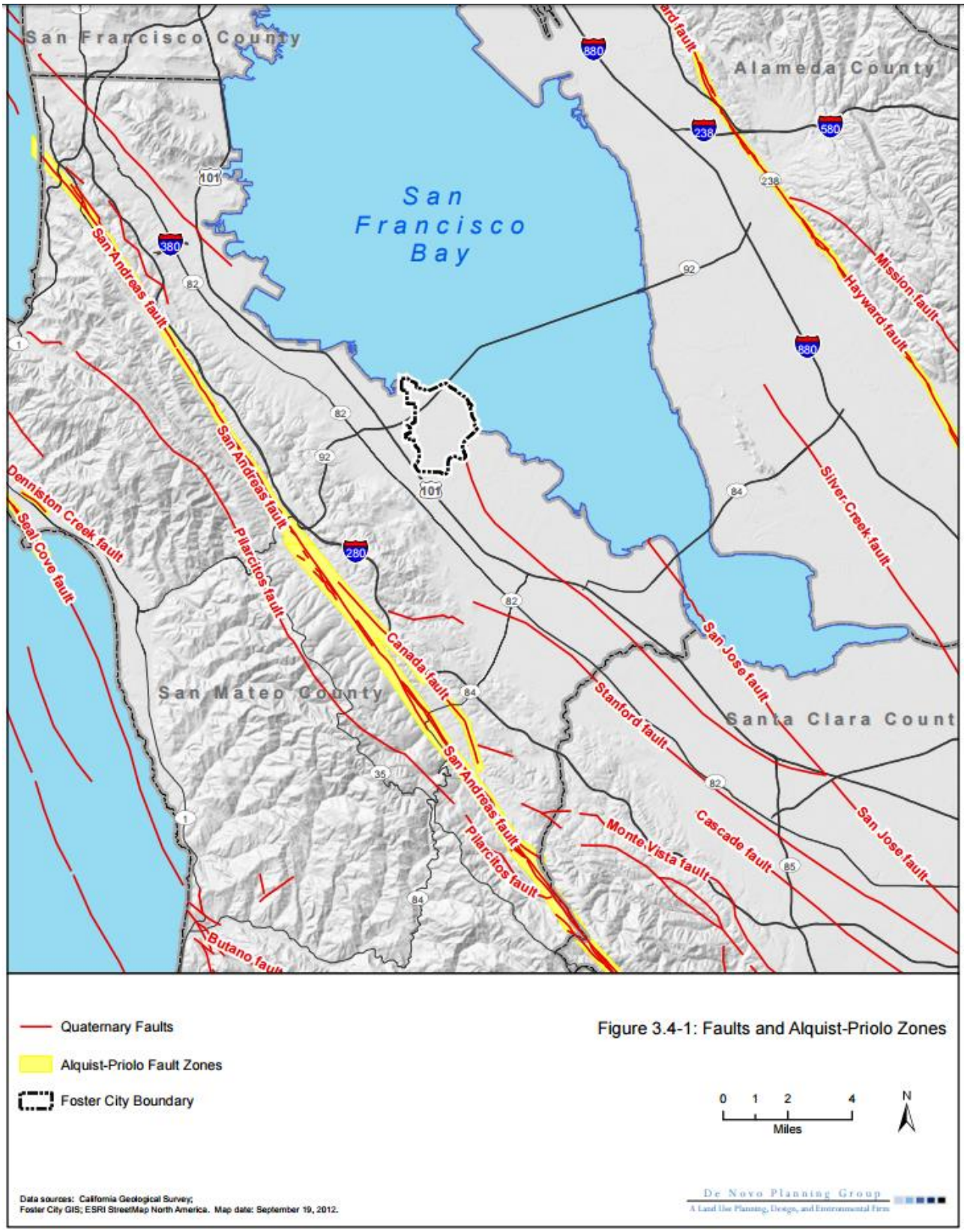


Figure 6-1. Faults and Alquist-Priolo Fault Zones

6.3.1 Historic Bay Area Earthquake Occurrences

The Bay Area has experienced significant, well-documented earthquakes. In 1868, a significant earthquake occurred on the Hayward fault with an estimated magnitude of 6.8-7.0. The fault ruptured the surface of the earth for more than 20 miles and significant damage was experienced in Hayward and throughout Alameda County, and as far away as San Francisco, Santa Rosa, and Santa Cruz. The M7.8 1906 earthquake on the San Andreas Fault, centered just off the coast of San Francisco, devastated San Francisco and caused extensive damage in Oakland, San Jose, and Santa Rosa. More recently, the M7.1 1989 Loma Prieta earthquake caused severe damage in Santa Cruz and the surrounding mountains, where it was centered, as well as fatal damage 50 miles away in Oakland and San Francisco. Moderate earthquakes are much more common in the Bay Area; twenty-two have occurred in the last 178 years, averaging every eight years.[6] The 2014 South Napa earthquake is a reminder of the strong shaking that even a moderate magnitude 6.0 earthquake can produce in a localized area.

Figure 6-2 illustrates Bay Area earthquakes over the past 165 years. Because the 1906 earthquake released so much energy and stress on regional faults when it ruptured, the last 100 years have been relatively seismically quiet. As faults restore their stress and energy builds again, the region may have a more seismically active future.

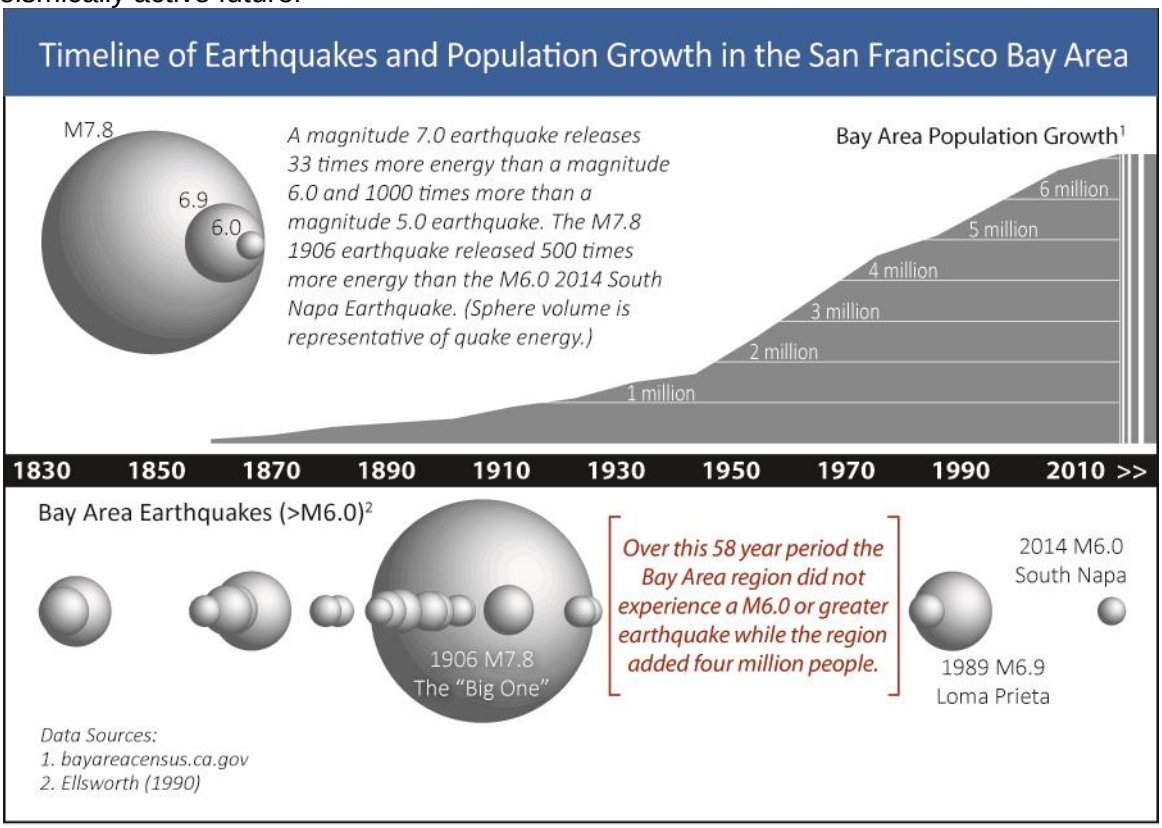


Figure 6-2. Timeline of Earthquake and Population Growth in the San Francisco Bay Area

[6] Ellsworth, W.L. (1990)

There have been six earthquake-related declared disasters in the Bay Area since 1950. Only the Loma Prieta Earthquake directly affected Foster City (highlighted below):[7]

Table 6-2. Earthquake Related Disasters in the Bay Area Since 1950

Disaster	Counties Declared	State Proclamation	Federal Declaration	Damage
M6.0 South Napa earthquake	Napa and Solano Counties	August 24, 2014	September 11, 2014	$362 million - $1 billion in damage
Tsunami resulting from M8.9 Honshu, Japan earthquake	Del Norte, Monterey, Santa Cruz	March 11, 2011	April 18, 2011	$39 million in damage
M5.2 Napa earthquake	Napa County	September 6, 2000	September 14, 2000	$15-70 million in estimated damage
M7.1 Loma Prieta earthquake	Alameda, Monterey, San Benito, San Mateo, Santa Clara, Santa Cruz, San Francisco, Contra Costa, Marin, Solano	October 18, 1989	October 18, 1989	$5.9 billion in damage, 23,408 homes damaged, 3,530 businesses damaged, 1,018 homes destroyed, 366 businesses destroyed
M6.2 Morgan Hill earthquake	Santa Clara County	None	April 25, 1984	$7.265 million in damage to public, business, and private sectors
Tsunami warning resulting from Good Friday earthquake in Alaska	Marin County	September 15, 1964	Not declared	No damage

6.3.2 Earthquake Hazards

Earthquakes can trigger multiple types of seismic hazards, causing varying severity of damage in different locations. The following sections describe each earthquake hazard in greater detail, including where and how it is likely to affect the Bay Area and more specifically, Foster City.

6.3.2.1 Surface Fault Rupture

A fault is a point of displacement along the fractures of the earth's crust caused by shifting tectonic plates. When an earthquake occurs, there is a rupture on a fault as built-up energy is suddenly released. Active faults are those that have ruptured in the past 11,000 years.[8] Often the rupture occurs deep within the earth, but it is possible for the rupture to extend to the surface and create visible above-ground displacement, called "surface rupture." The California Geological Survey (CGS) publishes maps of active Bay Area faults that could produce surface rupture, as required by the Alquist-Priolo

[7] State of California Multi-Hazard Mitigation Plan, Appendix M, California Governor's Office of Emergency Services
[8] Bryant, W.A., and Hart, E.W., (2007)

Earthquake Fault Zoning Act (1972).[9] These maps show the most comprehensive depiction of fault traces that can rupture the surface, and the zones directly above and surrounding the fault traces. Cities and counties require special geologic studies within these zones to prevent construction of human-occupied structures.

As previously indicated, there are no known active, potentially active, or inactive faults located within **Foster City**. The closest active faults are the San Andreas Fault, located approximately 5.7 miles southwest of Foster City, and the Hayward Fault, approximately 12.8 miles northwest of Foster City. Surface fault rupture is therefore not a potential hazard in **Foster City**.

6.3.2.2 Ground Shaking

When faults rupture, the slip generates vibrations or waves in the earth that are felt as ground shaking. Larger magnitude earthquakes generally cause a larger area of ground to shake, and to shake more intensely. As a result, one principal factor in determining anticipated levels of shaking hazard in any given location is the magnitude of expected earthquakes. The intensity of ground shaking felt in one area versus another, however, is based on the magnitude and other factors including distance to the fault; direction of rupture; and, the type of geologic materials at the site. For example, softer soils tend to amplify ground shaking, while more dense materials limit ground shaking impacts at the site surface. Ground shaking is commonly characterized using the Modified Mercalli Intensity (MMI) scale, which illustrates the intensity of ground shaking at a particular location by considering the effects on people, objects, and buildings. The MMI scale describes shaking intensity on a scale of 1-12. MMI values less than 5 don't typically cause significant damage; MMI values greater than 10 have not been recorded.

[9] California Public Resources Code, Division 2, Geology, Mines and Mining, Chapter 7.5, Earthquake Fault Zoning, sections 2621-2630

Table 6-3. MMI Intensity Table[10]

Intensity	Building Contents	Masonry Buildings	Multi-Family Wood-Frame Buildings	1&2 Story Wood-Frame Buildings
MMI 6	Some things thrown from shelves, pictures shifted, water thrown from pools.	Some walls and parapets of poorly constructed buildings crack.	Some drywall cracks.	Some chimneys are damaged, some drywall cracks. Some slab foundations, patios, and garage floors slightly crack.
MMI 7	Many things thrown from walls and shelves. Furniture is shifted.	Poorly constructed buildings are damaged and some well-constructed buildings crack. Cornices and unbraced parapets fall.	Plaster cracks, particularly at inside corners of buildings. Some soft-story buildings strain at the first floor level. Some partitions deform.	Many chimneys are broken and some collapse, damaging roofs, interiors, and porches. Weak foundations can be damaged.
MMI 8	Nearly everything thrown down from shelves, cabinets, and walls. Furniture overturned.	Poorly constructed buildings suffer partial or full collapse. Some well-constructed buildings are damaged. Unreinforced walls fall.	Soft-story buildings are displaced out of plumb and partially collapse. Loose partition walls are damaged and may fail. Some pipes break.	Houses shift if they are not bolted to the foundation, or are displaced and partially collapse if cripple walls are not braced. Structural elements such as beams, joists, and foundations are damaged. Some pipes break.
MMI 9	Only very well anchored contents remain in place.	Poorly constructed buildings collapse. Well-constructed buildings are heavily damaged. Retrofitted buildings damaged.	Soft-story buildings partially or completely collapse. Some well-constructed buildings are damaged.	Poorly constructed buildings are heavily damaged, some partially collapse. Some well-constructed buildings are damaged.
MMI 10	Only very well anchored contents remain in place.	Retrofitted buildings are heavily damaged, and some partially collapse.	Many well-constructed buildings are damaged.	Well-constructed buildings are damaged.

As described, there are a number of different faults that contribute to the seismic hazard in the Bay Area. The Association of Bay Area Governments (ABAG) and the United States Geological Survey (USGS) worked collaboratively to characterize which fault contributes most to an area's seismic hazard. Figure 6-3 maps which fault contributes most to an areas seismic risk, taking into account the locations proximity to various faults, and the likelihood and severity of each fault. The map characterizes the fault with the greatest hazard, but many locations in the region can be severely impacted by multiple faults.

[10] ABAG, (2013). Modified Mercalli Intensity Scale

Earthquake Shaking Scenarios

In addition to this effort, ABAG and USGS have developed several shaking scenario maps that depict shaking intensity for specific, plausible earthquake scenarios with a given magnitude on a fault. These maps show possible levels of ground shaking throughout the Bay Area in a single likely earthquake, taking into consideration the earthquake magnitude; rupture location and direction; and soil conditions throughout the region. The scenarios that are most likely to cause strong shaking in **Foster City** are shown in Figure 6-4. The map indicates that an earthquake on the San Andreas Fault has the greatest contribution to seismic hazard for **Foster City**.

Scenario maps are helpful to model the expected shaking of an individual event, but they do not depict the likelihood of the event occurring or whether it is the most significant event for a particular location. A Probabilistic Seismic Hazard Assessment (PSHA) Map incorporates the likelihood of ground shaking from all nearby fault sources, and accounts for the frequency of each event. The PSHA Map in Figure 6-5 illustrates the 10 percent or greater chance in a 50 year period that each location on the map will exceed the MMI shown at least once.

In terms of risk characterization, it is equivalent to a 500-year flood. A 10 percent in 50 years hazard level was chosen as it most closely aligns to the levels of shaking used in the current building code. Seismic hazard maps are not intended to be site-specific but depict the general risk within neighborhoods and the relative risk from community to community.

Events with strong shaking can still occur in areas with low probabilities shown in a PSHA map. The area damaged by the 2014 South Napa Earthquake is one example of a strong earthquake occurring in a location with lower risk probability than other areas within the region.

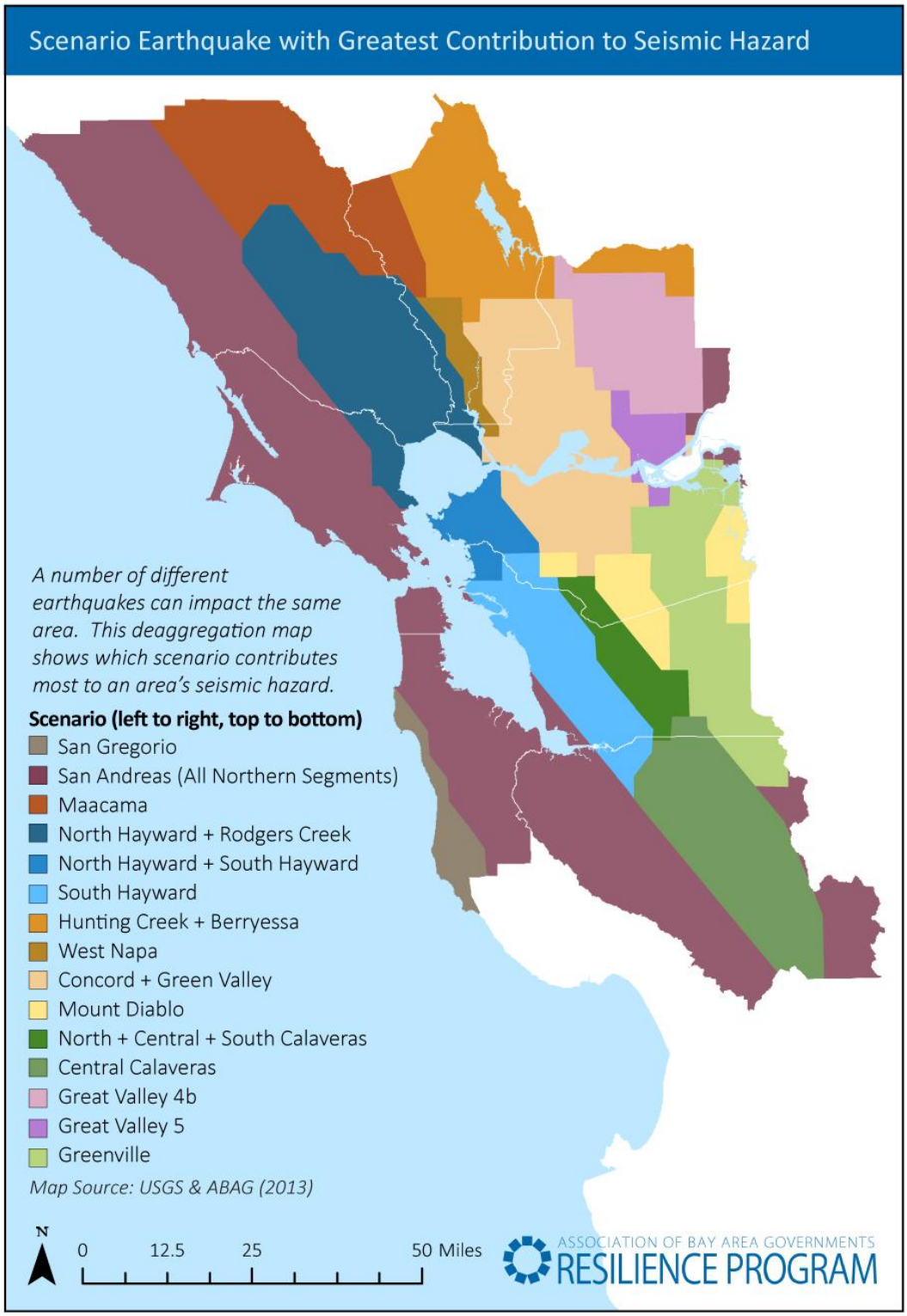
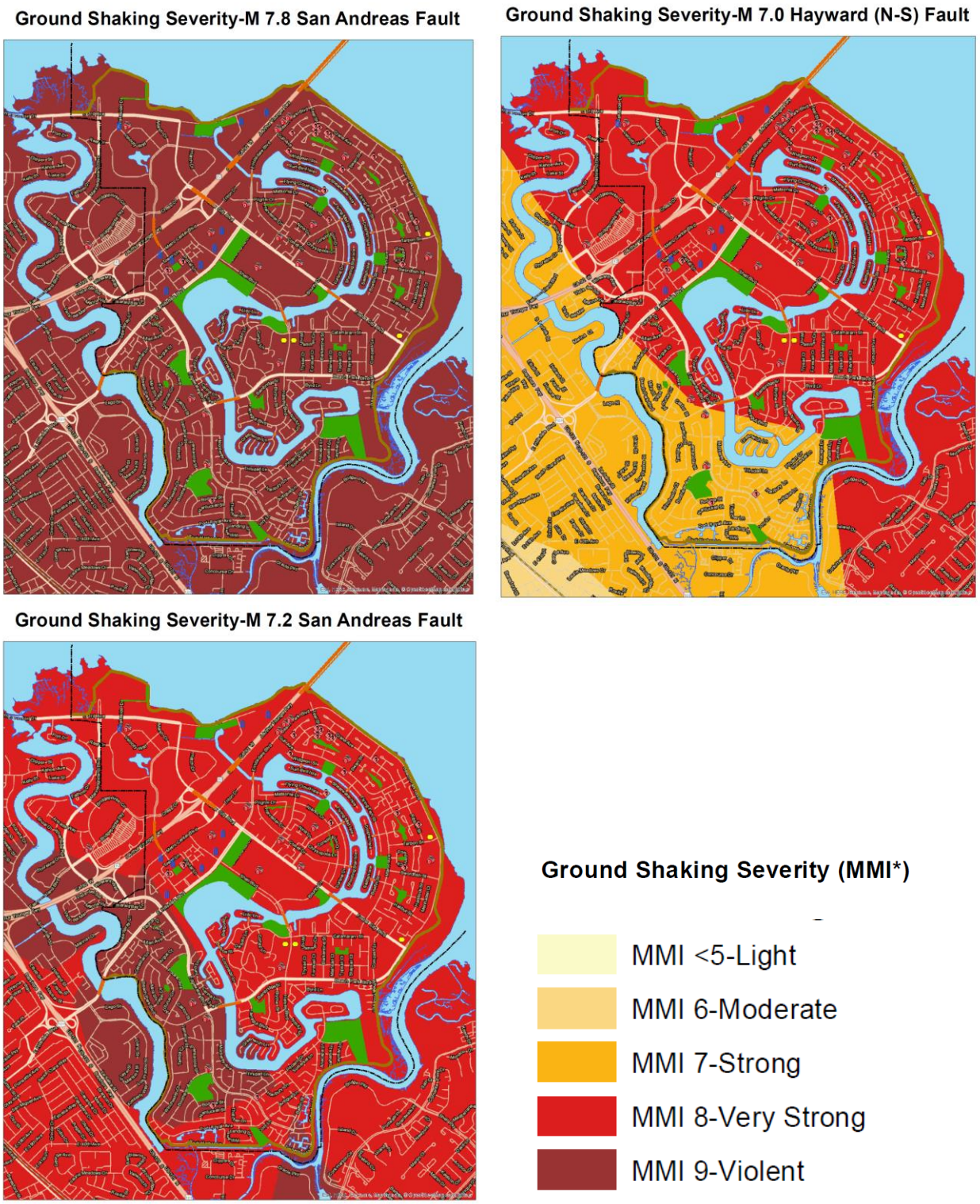


Figure 6-3. Scenario Earthquake with Greatest Contribution to Seismic Hazard



Source: ABAG Open Data; California Integrated Seismic Network (CISN, 2012)

Figure 6-4. Earthquake Ground Shaking Scenarios

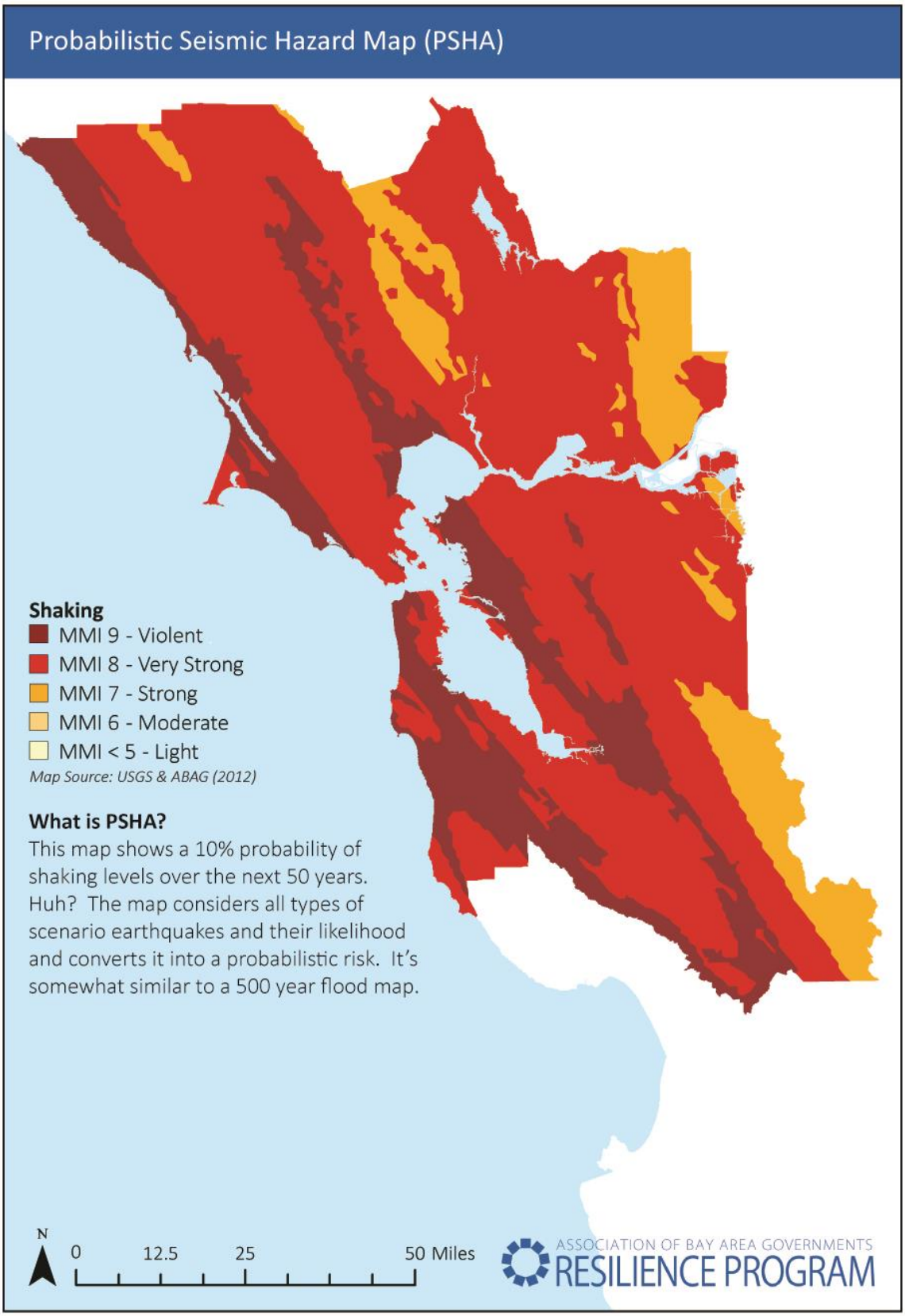


Figure 6-5. Probabilistic Seismic Hazard Map (PSHA)

6.3.2.3 Liquefaction

Soil that is loose, sandy, silty, or saturated with water can result in soil liquefaction if it is shaken intensely for an extended period. When ground liquefies in an earthquake, it behaves like a liquid and may sink, spread, or erupt in sand boils. This can cause pipes to break, roads and airport runways to buckle, and building foundations to be damaged. Liquefaction can only occur under certain circumstances:[11]

Loose Soils The soils must be loose, such as uncompacted or unconsolidated sand and silt without much clay. This happens most often in the Bay Area along the Bay shoreline, near creeks or other waterways, on dry creek beds, and in areas of man-made fill, such as the Marina District in San Francisco or parts of Alameda.

Soggy Soils The sand and silt must be soggy and saturated with water due to a high water table.

Ground Shaking The ground must be shaken long and hard enough by the earthquake to trigger liquefaction.

Liquefaction may not necessarily occur even if all three conditions are present. Additionally, if liquefaction does occur, the ground may not move enough to have significant impact on the built environment. As with ground shaking, several types of maps depict liquefaction potential. Liquefaction susceptibility maps show areas with soil types known to have the potential to liquefy with intense shaking.

Figure 6-6 illustrates liquefaction susceptibility for **Foster City** based on USGS soil type maps. However, site-specific investigations are required per Foster City regulations to confirm liquefaction susceptibility on any given site.

Unless areas of liquefaction susceptibility are subject to significant ground shaking, they are not likely to liquefy. Liquefaction hazard maps express where the ground is both susceptible to liquefaction, and where the ground is likely to be shaken long and intensely in an earthquake. In 2015, ABAG produced maps that combine liquefaction susceptibility with USGS-generated earthquake scenario maps to identify areas where there is a significant hazard of liquefaction. Figure 6-7 is a representative example which shows the liquefaction potential in a M7.8 San Andreas earthquake. The map combines the liquefaction susceptibility and San Andreas shaking information into a scenario-based liquefaction potential map.

Lateral Spreading/Lurching

Lateral spreading/Lurching is horizontal/lateral ground movement of relatively flat-lying soil deposits towards a free face such as an excavation, channel, or open body of water; typically lateral spreading is associated with liquefaction of one or more subsurface layers near the bottom of the exposed slope. As failure tends to propagate as block failures, it is difficult to analyze and estimate where the first tension crack will form. A review of soils reports for various projects in **Foster City** indicate that the potential for lateral spreading/lurching is low, and site-specific mitigation measures are incorporated to minimize the potential for this to occur.

[11] Perkins, J.B., (2001)

Cyclic Softening of Cohesive Soils

As noted on p. 11, Foster City is underlain by Quaternary Holocene-aged Bay Mud and man-made artificial fills. Bay mud consists primarily of clay and silt. As described in Boulanger and Idriss (2004)[12] "The term 'liquefaction' is used to describe the onset of high excess pore water pressures and large shear strains during undrained cyclic loading of sand-like soils, while the term 'cyclic failure' is used to describe the corresponding behavior of clay-like soils. The stress-strain behavior of a sand specimen that develops liquefaction can look quite similar, in some cases, to that of a soft clay specimen that develops cyclic failure."[13]

[12] Witter, R.C., Knudsen, K.L., Sowers, J.M, Wentworth, C.M., Koehler, R.D., and Randolph, C.E., 2006, *Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region*, California: U.S. Geological Survey Open-File Report 2006-1037, scale 1:24,000 (http://pubs.usgs.gov/of/2006/1037/of06-1037_3c.pdf)

[13] Boulanger, Ross W., and Izzat M. Idriss. *Evaluating the potential for liquefaction or cyclic failure of silts and clays*. Center for Geotechnical Modeling, 2004. (http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.132.3827&rep=rep1&type=pdf)

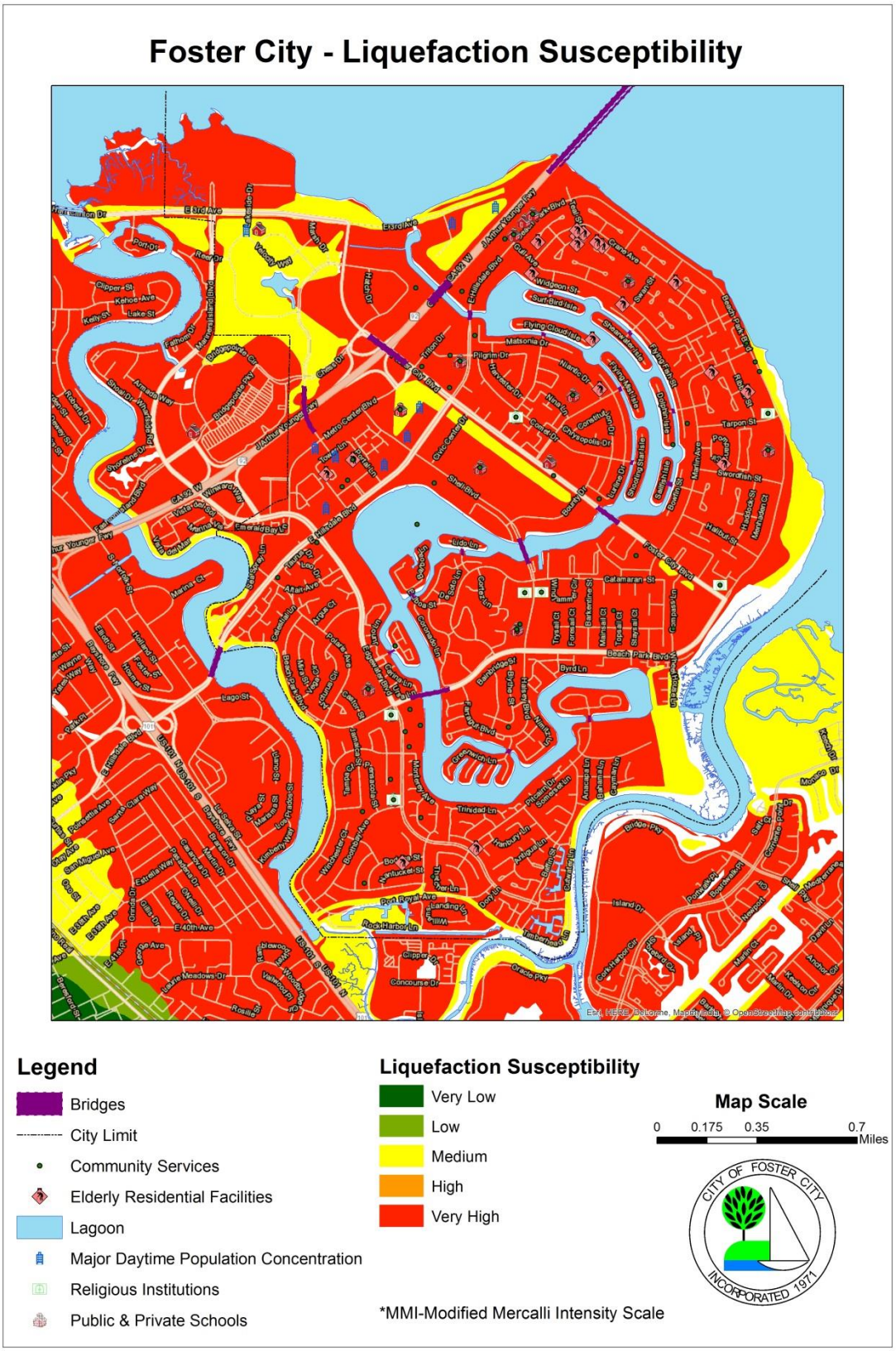


Figure 6-6. Earthquake Liquefaction Susceptibility

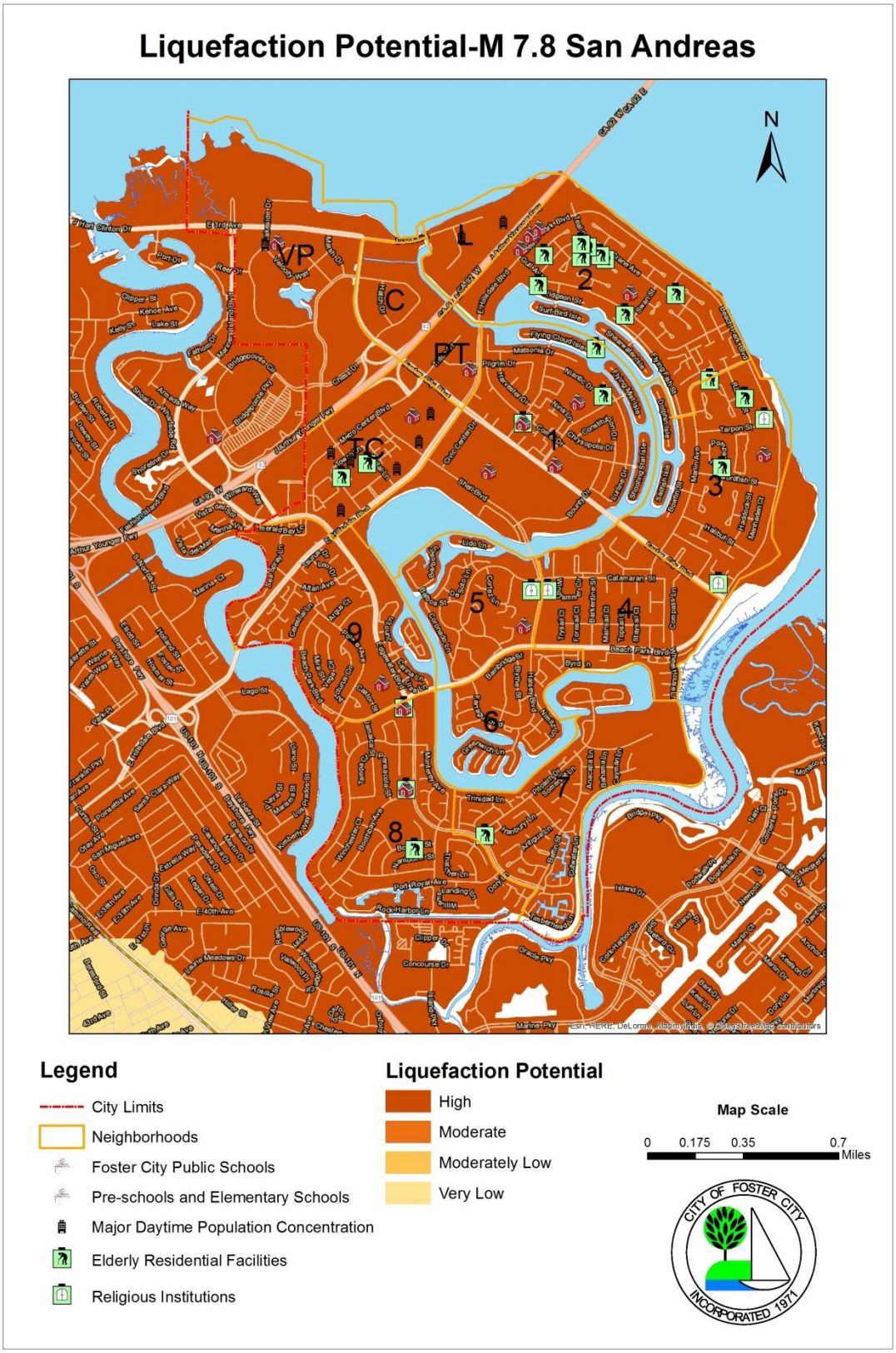


Figure 6-7. Scenario based Liquefaction Potential Map (M7.8 San Andreas)

6.3.2.4 Earthquake-Induced Landslides

Ground shaking can also lead to ground failure on slopes, triggering earthquake-induced landslides. Landslides tend to occur in weak soil and rock on sloping terrain. **Foster City** does not have sloping terrain and therefore has no potential for earthquake-induced landslides.

6.3.2.5 Tsunamis/Seiches

The terms tsunami or seiche are described as ocean waves or similar waves usually created by undersea fault movement or by a coastal or submerged landslide. Since tsunamis have high velocities, the damage from a particular level of inundation is far greater than in a normal flood event. A seiche occurs when resonant wave oscillations form in an enclosed or semi-enclosed body of water such as a lake or bay. Seiches may be triggered by moderate or larger local submarine earthquakes and sometimes by large distant earthquakes. The greatest hazard results from the inflow and outflow of water, where strong currents and forces can erode foundations and sweep away structures and equipment.

Tsunamis can result from off-shore earthquakes within the Bay Area or from distant events. It is most common for tsunamis to be generated by offshore subduction faults such as those in Washington, Alaska, Japan, and South America. Tsunami waves generated at those far-off sites can travel across the ocean and can reach the California coast with several hours of warning time. Local tsunamis can also be generated from offshore strike-slip faults. Because of their close proximity, the Bay Area would have little warning time. However, the Bay Area faults that pass through portions of the Pacific coastline or under portions of the Bay are not likely to produce significant tsunamis because they move side to side, rather than up and down, which is the displacement needed to create significant tsunamis. They may have slight vertical displacements, or could cause small underwater landslides, but overall there is a minimal risk of any significant tsunami occurring in the Bay Area from a local fault. The greatest risk to the Bay Area is from tsunamis generated by earthquakes elsewhere in the Pacific.

Though the Bay Area has experienced tsunamis, it has not experienced significant tsunami damage. In 1859, a tsunami generated by an earthquake in Northern California generated 4.6 meter wave heights near Half Moon Bay. The M6.8 1868 earthquake on the Hayward fault is reported to have created a local tsunami in the San Francisco Bay. In 1960, California experienced high water resulting from a magnitude 9.5 earthquake off the coast of Chile. The tsunami generated by the 1964 Alaskan earthquake caused wave heights of up to 1.1 meters along the coasts of San Francisco, Marin and Sonoma Counties. The 2011 tsunami created by the M9.0 Tohoku earthquake did not cause damage inside the Bay, but did cause damage to marinas and ports in both Santa Cruz and Crescent City. California has been fortunate in past distant-source tsunamis (1960, 1964, and 2011) that the events occurred during low tides.[14]

In 2013, the USGS, in partnership with the US Department of the Interior, published a tsunami scenario as part of the Science Application for Risk Reduction (SAFRR) series.[15] In the scenario, the multi-disciplinary team modeled a M9.1 offshore Alaskan earthquake to study impacts to California. Assuming that the tsunami reaches the central coast at high tide, the Bay Area can expect heights ranging from two to seven meters near the shore. The study suggests that this scenario inundation is only likely to occur once in a 100 year period.

[14] Ross, S.L., and Jones, L.M, eds., (2013)
[15] Ibid

In addition to the scenario inundation maps, CalOES developed tsunami evacuation maps indicating areas that should evacuate if a warning is given. The CalOES tsunami maps are not associated with a particular event but instead represent the worst-case scenario at any given location by combining a suite of extreme, but plausible, inundation scenarios. Additionally, the maps include no information about the probability of a tsunami affecting an area at any given time. Because of this, it is not intended to show locations of probable inundation but should be used for evacuation planning only. In general, the CalOES tsunami evacuation map is more conservative than the USGS SAFRR study; however, there are a few locations where the SAFRR study shows greater inundation.

For **Foster City**, the tsunami maps prepared by CalOES in Figure 6-8 indicate that only the areas outside of the City's levee system are at risk for tsunamis, including the adjacent marshlands, tidal flats and former bay margin lands that are now artificially filled but are still at or below sea level.

Although the potential size of seiches has been forecasted for other large bodies of water, such as Lake Tahoe[16] and the Great Lakes, Staff has not been able to find any data forecasting potential seiches on the San Francisco Bay. For the purposes of this plan, seiches are considered similar to tsunamis.

[16] Placer County Local Hazard Mitigation Plan Update (December 2015). p. 4-119. http://www.placer.ca.gov/departments/ceo/emergency/local-hazard-mitigation-plan

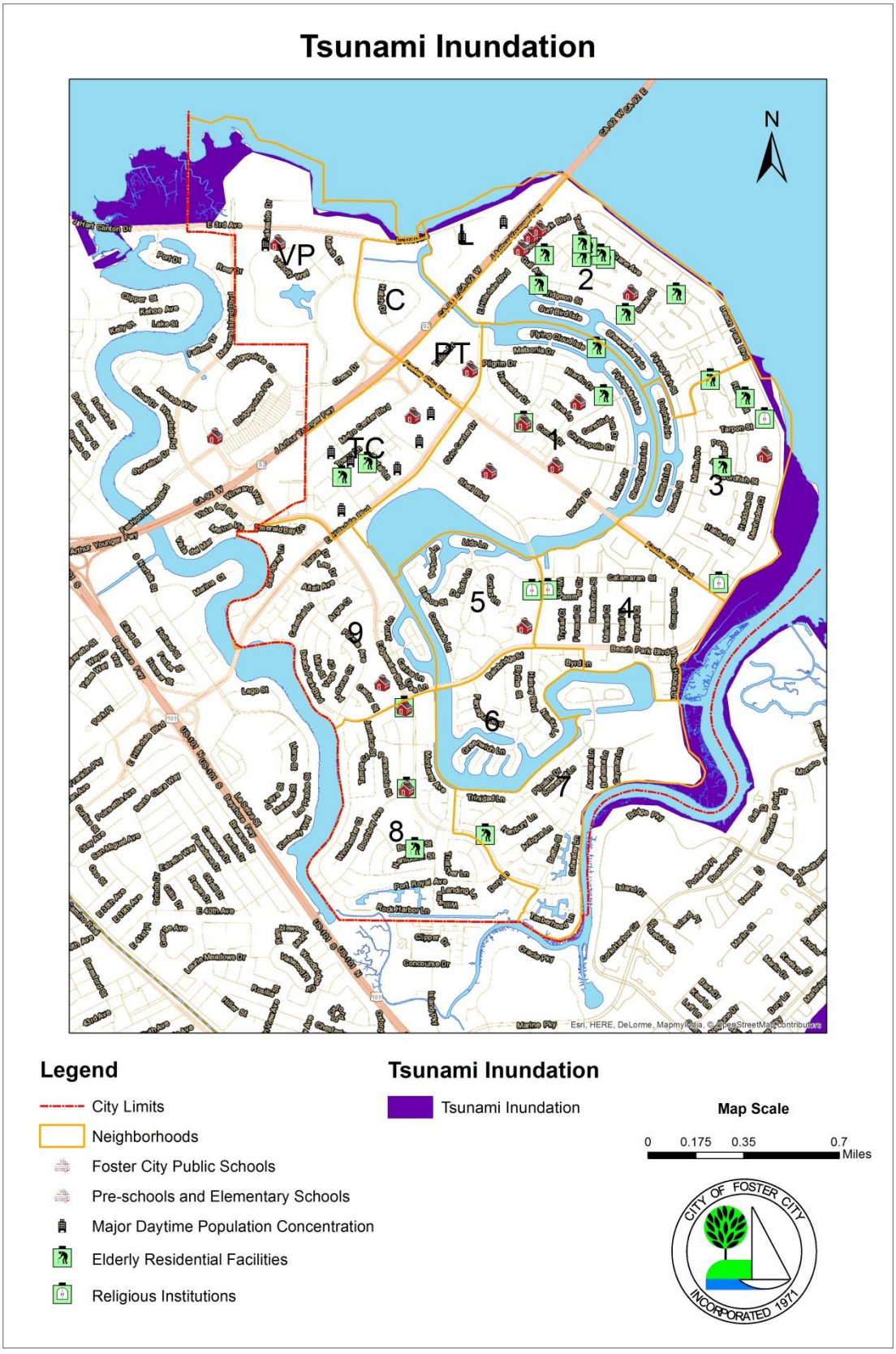


Figure 6-8. Tsunami Inundation Emergency Planning Map

6.3.2.6 Fire Following Earthquake

Earthquakes are often responsible for igniting fires which can contribute to a considerable share of the overall damage in a disaster. The fires can start from a variety of sources: appliances with natural gas pilot lights may tip, damaged electrical equipment may spark, and gas line connections may break. Recently in the South Napa Earthquake a number of mobile homes were destroyed and damaged when the gas connection to a home broke. In the Loma Prieta Earthquake, 36 fires broke out in San Francisco alone, but luckily were contained quickly in large part due to the abnormally calm wind that evening, and the fires' proximity to the bay which allowed a fire boat to pump water to the fire where the water lines had failed. In the 1906 earthquake over 3.5 square miles of San Francisco burned, representing 80% of San Francisco's property value at the time.

Fire following earthquake is especially sensitive because there are often multiple ignitions at once (overwhelming fire crews), typical water supply for fighting fire may be reduced or unavailable, and maneuvering fire crews to the ignition can be difficult if streets are blocked by road damage or by debris. Fire following earthquake is an issue that could impact any Bay Area community that experiences an earthquake – both urban and rural. The problem is heightened for urban environments, where many simultaneous ignitions can lead to a firestorm, and single fires can more quickly and easily move structure to structure.

A few characteristics can make a specific community more vulnerable to fire following earthquake. If there is a higher likelihood of building damage, there is also a higher likelihood that an ignition occurs. If a building collapses there is a high risk for gas or electrical lines to start "seed" fires that then impact undamaged neighboring structures. Areas of liquefaction are more vulnerable to fire because of the greater potential for underground gas mains to break due to the ground displacements, and because the water lines in the area may also be damaged – preventing the ability to fight a fire with regular water resources. Areas that are largely wood frame or shingle roof may be less prone to earthquake damage, but are a heightened risk for the spread of fires. There is added concern in areas with hazardous materials with the potential for explosion, or with the potential to produce toxic smoke. Industrial facilities and labs are a high concern because of the hazardous and flammable materials they store at their facilities.

In **Foster City**, the buildings with labs and the potential for more hazardous materials are generally located on the north side of SR 92. These types of uses are typically located in newer buildings or in buildings with newer tenant improvements that are therefore subject to the more recent building codes. The building codes have been strengthened over time to include additional safety features, such as flexible utility connections, leak detection systems, more advanced sprinkler systems, more stringent ventilation requirements and spill notification systems.

6.3.3 Probability of Future Earthquakes

A powerfully damaging earthquake similar to the 1906 earthquake or 1989 Loma Prieta earthquake is rare but likely to occur in the next 30 years. The United States Geological Survey (USGS) estimates there is a 72% chance of one or more magnitude 6.7 or larger earthquakes in the next 30 years on one of the Bay Area's faults.[17] Smaller magnitude earthquakes are more likely to occur, potentially producing significant local damage, as experienced in the 2014 South Napa earthquake.

[17] Field, E.H., et al, (2013)

Scientists continually study which Bay Area faults are more likely to produce large earthquakes, and how often. In March 2015, the USGS released an update to its 2008 earthquake probabilities for California faults. The Uniform California Earthquake Rupture Forecast 3 (UCERF3) provides detailed assessment on the likelihood of each fault segment producing M6.7, M7.0 and M8.0 and greater earthquakes. These probabilities are based on data such as fault length; how much energy the faults release annually through fault slip; and, known historical return periods for the fault. Table 6-4 summarizes the probabilities of future earthquakes in California.

Table 6-4. Likelihood of a M6.7 or greater earthquake over the next 30 years

Earthquake Fault	Probability[1]
San Andreas (Mendocino Coast to San Benito County)	33%
Hayward	28%
Calaveras	24%
Hunting Creek, Berryessa, Green Valley, Concord	24%
Maacama	23%
Rodgers Creek	15%
San Gregorio	5%
Greenville	6%
Mt. Diablo	3%
West Napa	2%

Source: Uniform Earthquake Rupture Forecast, Version 3 (2014)

6.4 Flooding & Sea Level Rise

Flooding is a temporary condition that causes the partial or complete inundation of land that is normally dry. Flooding occurs when streams, rivers, lakes, reservoirs, or coastal water bodies are abnormally high and overflow into adjacent low-lying areas.

The magnitude of flood used as the standard for floodplain management in the United States is a flood having a probability of occurrence of one percent in any given year, also known as the 100-year flood or base flood. The most readily available source of information regarding the 100-year flood is the system of Flood Insurance Rate Maps (FIRMs) prepared by FEMA. These maps are used to support the National Flood Insurance Program (NFIP) and show 100-year floodplain boundaries for identified flood hazards. These areas are also referred to as Special Flood Hazard Areas (SFHAs) and are the basis for flood insurance and floodplain management requirements under the NFIP. FIRMs also show floodplain boundaries for the 500-year flood, which is the flood having a 0.2 percent chance of occurrence in any given year, as shown in Figure 6-9.

The rivers and streams for which FEMA has prepared detailed engineering studies may also have designated floodways. The floodway is the channel of a watercourse and portion of the adjacent floodplain that is needed to convey the base or 100-year flood event without increasing flood levels by more than one foot and without significantly increasing flood velocities. The floodway must be kept free of development or other encroachments.

Existing coastal and riverine flood maps are available from FEMA, and include existing and preliminary map products for the San Francisco Bay and the Outer Coast of California.[18]

[18] http://www.r9map.org/Pages/California.aspx?choState=California

Sea level rise, one of the effects of global warming, will contribute to the potential for flooding. In the past century, average global temperature has increased by about 0.8°C (1.4°F), and average global sea level has increased by 7 to 8 in (17 to 21 cm).[19]

6.4.1 Types of Flooding

Coastal flooding is generally associated with Pacific Ocean storms from November through February when high tides coincide with strong winds both on the outer coast and within the Bay.

The following factors contribute to the frequency and severity of coastal flooding:

- Astronomical Tides
- Storm Surge
- Wind Waves
- El Nino Events
- Sea Level Rise

Riverine flooding, also known as overbank flooding, can occur if there is excessive rainfall especially in conjunction with high tides and strong winds. Riverine floodplains range from narrow, confined channels in the steep valleys of mountainous and hilly regions to wide, flat areas in plains and coastal regions. The potential for flooding of a floodplain is a function of the size and topography of the contributing watershed, the regional and local climate, and land use characteristics. Flooding in steep, mountainous areas is usually confined, occurs with less warning time, and has a short duration. Larger rivers typically have longer, more predictable flooding sequences and broad floodplains. The lower portions of coastal rivers are more likely to flood during high tides with backwater conditions that lead to overbank flooding.

The following factors contribute to the frequency and severity of riverine flooding:

- Rainfall intensity and duration
- Antecedent moisture conditions
- Watershed conditions, including steepness of terrain, soil types, amount, and type of vegetation, and density of development
- The existence of attenuating features in the watershed, including natural features such as swamps and lakes and human-built features such as dams
- The existence of flood control features, such as levees and flood control channels
- Velocity of flow
- Availability of sediment for transport, and the erodibility of the bed and banks of the watercourse

Localized, or nuisance, flooding can occur in areas that typically do not flood during locally heavy precipitation events, especially if ground water levels are high during extremely wet seasons or if storm water storage or conveyance facilities are inadequate. Localized flooding tends to occur in flat, urbanized areas that are highly impermeable and can result in inundation of basements, low lying roads, and parking lots from street drainage.

Flooding associated with severe storms has been among the most common disaster in the Bay Area during the period from 1950 to 2015, occurring on average 1.3 times a year over the past 60 years.

[19] International Panel on Climate Change (IPCC). 2013. Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change. [TF Stocker, D Qin, G Plattner, MMB Tignor, SK Allen, J Boschung, A Nauels, Y Xia, V Bex PM Midgeley (eds.)] Cambridge University Press: Cambridge, UK and New York, NY, USA. https://www.ipcc.ch/report/ar5/.

Often heavy rainfall brings many areas of localized flooding, especially in low lying areas of the region. Many other locally significant floods have occurred during this time period.

Extensive flooding in the Bay Area occurred in 1950, 1957, 1958, 1959, 1962, 1963, 1964, 1965, 1966, 1969, 1970, 1973, 1980, 1982, 1983, 1992, 1995, 1996, 1997, 1998, 2005, 2006, and 2008.

6.4.2 Potential Future Flooding

Globally, sea levels are rising due to thermal expansion caused by the ocean warming and the melting of land-based ice such as glaciers and polar ice caps. Regionally and locally, the rate of sea level rise is affected by other processes, including changes in land elevation (subsidence or uplift), coastal erosion, wind and ocean currents, ocean temperature and salinity, atmospheric pressure, and large-scale climate regimes.[20] Sea level at the San Francisco tide gauge has risen 8 in (20 cm) over the past century.[21]

The National Research Council (NRC) *Sea-Level Rise for the Coasts of California, Oregon, and Washington* study, released June 2012, provides regionally specific sea level rise projections for the Coasts of California, Oregon, and Washington. Because there is significant uncertainty in how much sea level will rise, the range in projected values increases over time.

Table 6-5. Regional Sea Level Rise Projections Relative to Year 2000 for the California Coast South of Cape Mendocino[22]

	Sea Level Rise (inches)		
Year	**NRC 2012 Projection** (mean ± the standard deviation for the A1B Scenario[23])	**Low** (mean of the B1 scenario)	**High** (mean of the A1F1 scenario)
2030	**5.6** (±1.9)	2	12
2050	**11.0** (±3.6)	5	24
2100	**36.1** (±10)	17	66

Sea level rise has the potential to influence the impact of coastal, riverine and localized nuisance flooding. In particular, without intervention rising sea levels may cause:

- **More frequent floods:** Rising sea levels can lead to more frequent flooding of existing flood-prone areas, including more frequent overtopping and overbank flooding of riverine systems that already flood when rainfall coincides with high tides due to the increased backwater effect. In addition, gravity drained and pumped systems that discharge storm water into flood control channels can have reduced performance, causing backups and flooding of streets and basements.

[20] Committee on Sea Level Rise in California, Oregon, and Washington, and Board on Earth Sciences and Resources and Ocean Studies Board, Division on Earth and Life Studies, (2012)
[21] California Coastal Commission. 2015. Sea Level Rise Policy Guidance. http://www.coastal.ca.gov/climate/SLRguidance.html
[22] Committee on Sea Level Rise in California, Oregon, and Washington, and Board on Earth Sciences and Resources and Ocean Studies Board, Division on Earth and Life Studies, (2012).
[23] The A1 scenario family assumes high economic growth, low population growth that peaks mid-century, and the rapid introduction of more efficient technologies (A1B is balanced and A1FI is fossil fuel intensive). The B1 scenario family assumes the same low population growth as the A1 scenarios, but a shift toward a lower-emission service and information economy and cleaner technologies.

- **More extensive, longer-duration flooding:** As sea levels rise there is the potential that storm events will flood larger areas for longer periods of time and that there will be new overtopping and overbank flooding of riverine systems that do not currently cause flooding.
- **Shoreline erosion and overtopping**: Sea level rise can cause shoreline protection, such as levees, berms and revetments, to be damaged or fail due to increased tidal and wave energy. There is also the potential that shoreline protection will be overtopped during storm events when there are extreme tide levels and wind-driven waves, flooding inland areas, including homes and community services that are currently protected.
- **Elevated groundwater and increased salinity intrusion:** As sea levels rise, groundwater and salinity levels are also predicted to rise. This will cause damage to below grade living spaces, finished basements, and electrical/mechanical equipment that is below or at-grade. In addition, increasing groundwater levels may increase liquefaction susceptibility, and require the use of pumping of storm water for flood management, which will increase both operations and maintenance costs.
- **Permanent inundation:** Sea level rise can cause areas that are not currently exposed to regular high tide inundation to be flooded, resulting in the need to either protect or move people and infrastructure, and the loss of trails, beaches, vistas, and other shoreline recreation areas. In addition, increased tidal scour due to increased tidal prism in riverine systems can trigger changes in channel geometry and sediment transport processes.

The **Foster City** Levee Protection Planning Study (see Appendix E) evaluated whether the Belmont Slough levee should be considered a coastal levee or a riverine levee. The cursory analysis contained in the Study concluded that the required coastal levee height is greater, indicating that the coastal process dominates within the Slough.[24]

[24] Schaaf & Wheeler, Foster City Levee Protection Planning Study, Updated July 2015, pp. 14-16.

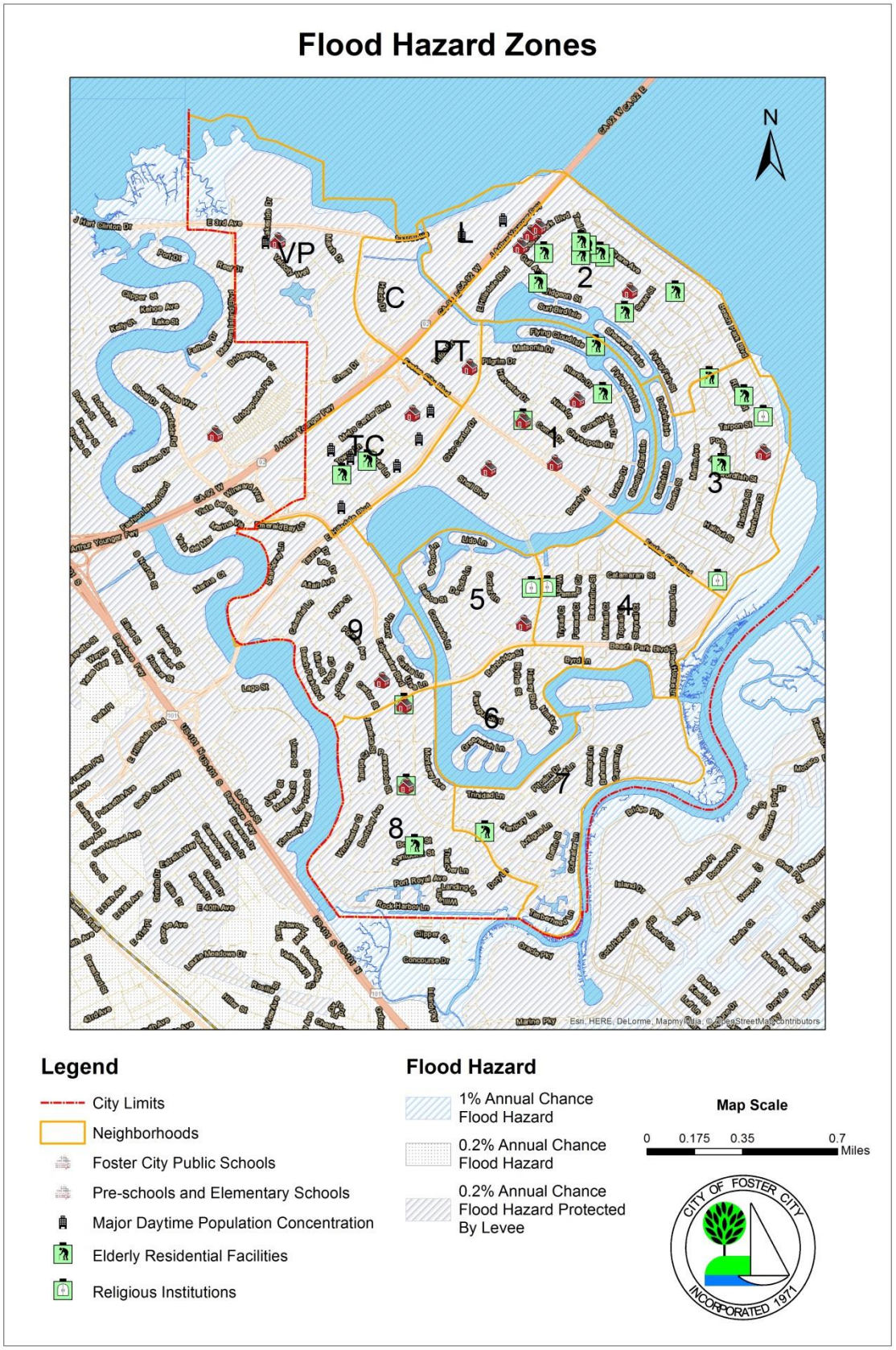


Figure 6-9. Flood Hazard Zones

In the Bay Area, the potential for new or prolonged flooding as sea level rises will not be confined to the shoreline. Sea level rise will increase the likelihood of major flood events around the Bay Area because higher water levels in tidal creeks and flood control channels will reduce capacity to discharge rainfall runoff. While some creeks already flood when rainstorms coincide with high tides, rising sea levels will cause flooding during smaller, more frequent rainfall events.

Sea level rise inundation maps help to visually assess under what conditions assets may be impacted by sea level rise and storm events and how far reaching the consequences may be if they are impacted. However, the City has found that the models currently available for estimating impacts of sea level rise do not accurately reflect the actual heights of the **Foster City** levee. For this reason, there are no maps of Sea Level Rise included within this document. Foster City is working with the FEMA Region IX Risk Management Division and the Mitigation Division to include more accurate topographic data regarding the Foster City levee in the available computer models. To understand these factors it is helpful to evaluate a range of possible future sea level rise scenarios. The "total water level" approach presented below simplifies this process.

A total water level of 36 inches above mean higher high water (MHHW)[25] can represent a new "daily" high tide with 36 inches of sea level rise. This amount of sea level rise, which is a likely projection for 2100, could result in regular, e.g., permanent, tidal inundation. This total water level can also represent today's 50-year extreme tide level, a one-year extreme tide level with 24 inches of sea level rise, or a five-year extreme tide level with 12 inches of sea level rise, which is a likely 2050 projection. Extreme tide events that are larger than daily high tide levels can result in episodic, short duration, or temporary, flooding.

The matrix of numbers presented in Table 6-6 can be used to understand a range of total water levels, from 0 to 95 inches above MHHW, represented both in terms of today's tides and future tides as sea level rises. Each total water level represents a combination of sea level rise (0 to 60") and tide levels (MHHW to a 100-year extreme event). As an example, the likely mid-century daily high tide is projected to be 12" above today's high tide, or 12"+MHHW. This total water level is approximately the level observed during King Tide, which is an astronomical tide that occurs approximately twice per year when the moon and the sun simultaneously exert their gravitational influence on the Earth.

Because of the uncertainties associated with modeling and mapping sea level rise, it is reasonable to allow for a +/- 3-inch range when interpreting the total waters in Table 6-6. As an example, the likely end-century high tide is projected to be 36 inches above today's high tide, or 36"+MHHW. Water levels ranging from 33 to 39 inches can be used to understand what other combination of tides and sea level rise that may result in the same amount of flooding or inundation as 36"+MHHW.

The values presented in Table 6-6 are generally applicable to central San Francisco Bay[26] and are therefore appropriate for local and regional scale climate adaptation planning, although it may not be as precise for some areas of North and South Bay. In addition, because tide levels do vary around the Bay, additional information about tide levels should be used for site-scale planning. Finally, the values in Table 6-6 are based on an analysis that does not include the effects of local wind waves and assumes that future storms will behave like past storms.

[25] Mean higher high water (MHHW) is calculated as the average of the higher of the two daily high tides over a 19-year tidal epoch.

[26] Existing condition water levels in the first row of Table 6-6. are based on FEMA model results for Central San Francisco Bay, http://www.r9map.org/Pages/San-Francisco-Coastal-Bay-Study.aspx, and are being used by Alameda and San Francisco Counties. Existing water level conditions for the other counties in the Bay Area will be available by the end of 2015.

Table 6-6. Matrix showing combinations of Sea Level Rise and Extreme Tide Level

Time Frame	Sea Level Rise	Total water level above today's daily high tide, MHHW (inches NAVD88), by tide recurrence interval							
		MHHW (≈ daily high tide)	1-yr (≈ King Tide)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr (1% annual chance)
Today		0	12	19	23	27	32	36	41
	+6	6	18	25	29	33	38	42	47
Likely Mid-Century	+12	12	24	31	35	39	44	48	53
	+18	18	30	37	41	45	50	54	59
	+24	24	36	43	47	51	56	60	65
	+30	30	42	49	53	57	62	66	71
Likely End-Century	+36	36	48	55	59	63	68	72	77
	+42	42	54	61	65	69	74	78	83
	+48	48	60	67	71	75	80	84	89

6.4.3 Probability of Future Flooding

The probability of future flooding is dependent on improvements made to the levee system. Using the results of the California Coastal Analysis and Mapping Project (CCAMP), as summarized in the "Central San Francisco Bay Coastal Flood Hazard Study" prepared in July 2014, FEMA has concluded that portions of the levee would need to be raised to restore FEMA's accreditation of the levee system that protects the City from a 100-year flood. The primary flood risk is wave overtopping during an extreme storm surge that could potentially compromise the levee system. Throughout Foster City's history, the lagoon system has functioned to prevent local flooding by receiving storm water which is then conveyed to San Francisco Bay, therefore, widespread flooding due to rainfall falling on the City is unlikely.

6.5 Levee Failure

Foster City is protected from the waters of San Francisco Bay by a levee system. The original perimeter levee system in Foster City was put in place in the early 1900s to reclaim tidal mud flats for agricultural use. The levees were formed with dredged bay mud deposited on the outboard side of a perimeter channel system formed by the dredging. The development of Foster City in the 1960s made use of the existing perimeter levee system to provide protection for the new development.[27]

The stability of levees is a function of several variables. Three main loading functions related to levee failure are water level changes, ground shaking and static loading.[28] Six main failure mechanisms are described in the State of California Multi-Hazard Mitigation Plan as a function of the three loading functions. Several of these potential failure mechanisms relate more to riverine levees like those in the California Delta than coastal levees, such as in **Foster City**. The failure mechanisms identified in the State's Multi-Hazard Mitigation Plan are as follows:[29]

[27] Schaaf & Wheeler, City of Foster City Levee Protection Planning Study, Updated July 2015. p. 5.
[28] Moss, R. E. S., and Eller, J. M. (2007). "Estimating the Probability of Failure and Associated Risk of the California Bay Delta Levee System." GeoDenver, ASCE conf. proc.
[29] California Office of Emergency Services, State of California Multi-Hazard Mitigation Plan, 2013. p. 287-288.

1. A bearing failure in levees is typically deep-seated and is most likely induced by seismic ground shaking. Failure is commonly triggered by a seismic event that either causes a loss of soil strength or produces destabilizing inertial loading conditions.
2. A sliding failure may occur if the foundation soil has a weak or brittle zone resulting in a preferred failure plane. Both seismic-induced inertial loading and high water levels can cause sliding failures.
3. Slumping and spreading can be generated by two loading conditions. Cyclic loading from earthquakes may generate increased pore pressures and reduced soil strength, leading to volumetric and/or deviatoric strains in the foundation. The same results can also occur due to increased pore pressures from high water levels and increased seepage.
4. Seepage is one of the most common failure mechanisms in levees. Levees are built in fluvial depositional environments, and it is common to find levees with an existing sandy layer beneath the foundation. The sandy layer can be a conduit for flow underneath the levee, resulting in critical conditions at the inboard (or landside) toe. This leads to erosion of the foundation during high water or a consistent weakening of the foundation over a long period of time, both eventually leading to failure. Biogenic agents can also lead to destabilizing seepage. This can include rodent holes, tree roots, or other biological activity that create conduits for seepage.
5. High velocity flows can erode material from the outboard or waterside of the levee, which may lead to instability and failure. Erosion can occur at once or over time as a function of the storm cycle and the scale of the peak storms.
6. The failure mechanism of overtopping occurs when high water exceeds the elevation of the levee crest. The water energy is then concentrated at the inboard toe of the levee, leading to soil erosion and decreased levee stability. Overtopping failure can be exacerbated by decreased levee crest height due to land subsidence.

Title 44 of the Code of Federal Regulations (44 CFR) Section 65.10 provides the minimum design, operation, and maintenance standards levee systems must meet and continue to meet in order to be recognized as providing protection from the base flood on a Flood Insurance Rate Map. For levees to be recognized by FEMA, evidence that adequate design and operation and maintenance systems are in place to provide reasonable assurance that protection from the base flood exists must be provided. These are discussed further in Section 8, Capability Assessment.

The **Foster City** Levee system provides protection for very short-duration, extreme high tides coupled with infrequent storm events. Unlike a riverine levee, which is required to retain flood water for many days, the upper elevations of the Foster City Levee would only retain flood water for a matter of hours.

6.5.1 Probability of Levee Failure

Despite the recent loss of levee certification and accreditation by FEMA, the probability of levee failure is low due to the robust armoring of those portions of the levee system exposed to wave hazards, which protects against erosion due to wave action. The City is actively pursuing a project to restore the required freeboard, verify the levee system's ability to resist the various loads placed on it, and meet all geotechnical performance standards to be in compliance with 44 CFR 65.10.[30]

[30] Schaaf & Wheeler, 2015. City of Foster City Levee Protection Planning Study, p. 6.

6.6 Fire

Fires are typically characterized into three categories: urban fires, wildland-urban interface fires, and wildland fires.

- Urban fires occur within a developed area and pose a direct risk to development.
- Wildland-urban interface (WUI) fires occur where the built environment and natural areas are intermixed (the fringe of urban areas).
- Wildland fires exist in wilderness land.

Fires in the urban environment and in the wildland-urban interface result in direct damage to the built environment and can injure or kill residents. Wildland fires can cause damage to linear infrastructure systems that serve the Bay Area, causing outages downstream of the failure; can impact the air quality in cities during the duration of the fire; and can impact water quality in watersheds impacted by a wildland fire. Wildland and wildland-urban interface fires can also damage natural environments, such as recreational areas, and can cause lasting impacts to slopes and soils.

In the Bay Area, fire areas generally fall into two categories – State Responsibility Areas, where the California Department of Forestry and Fire Protection (CALFIRE) is responsible for fire protection, and Local Responsibilities, where local fire departments and fire protection districts have responsibility. **Foster City** does not include any wildlands or State Responsibility Areas and therefore will address only urban fires subject to local responsibilities in the LHMP/Safety Element.

6.6.1 Urban Conflagration

While the primary fire threat in the Bay Area is from wildfire, urban conflagration, or a large disastrous fire in an urban area, is a major hazard that can occur due to many causes such as wildfires, earthquakes, gas leaks, chemical explosions, or arson. The urban fire conflagration that followed the 1906 San Francisco Earthquake did more damage than the earthquake itself. A source of danger to cities throughout human history, urban conflagration has been reduced as a general source of risk to life and property through improvements in community design, construction materials, and fire protection systems.

Fire hazards in industrial buildings are also mitigated by increasingly stringent requirements over time. These types of uses are typically located in newer buildings or in buildings with newer tenant improvements that are therefore subject to the more recent building codes. In **Foster** City, the building codes have been strengthened over time to include additional safety features, such as flexible utility connections, leak detection systems, more advanced sprinkler systems, more stringent ventilation requirements and spill notification systems. These changes in the codes have evolved based on problems experienced and lessons learned from fires resulting in losses of life and property.

6.6.2 Probability of Future Fire

Due to multiple variables including cause, weather, and location, there is no formal way to estimate the probability of fire within the scope of this document.

6.7 Drought

A drought is a gradual phenomenon that occurs over several dry years, depleting reservoirs and groundwater basins without the expected annual recharge from winter precipitation. While drought does

not have any primary impacts in the Bay Area, prolonged periods of drought can cause secondary impacts that can affect the region, including:

- Reduced water supply for crops and livestock feed, impacting the economy centered around the agriculture industry as well as impacts to the general economy related to cost of food
- Increased wildfire hazard, including more fire starts and more prolonged conflagrations fueled by excessively dry vegetation and reduced water supply for firefighting purposes
- Subsidence due to a lowering water table
- May be correlated to high heat conditions

Drought is not localized, but occurs simultaneously across the region, and may extend statewide or across a larger expanse of western states. This has been the case in California since 2013. While the drought exists in every county, the impacts of the drought are locally unique, based on local water supply systems, soil conditions, and the typical climate and vegetation land covering. The effects of drought are managed in the Bay Area through the importation of water and the storage of water in reservoirs.

6.7.1 Historic Bay Area Drought Occurrences

Major droughts occurred in California that affected the Bay Area in 1973, 1976-77, 1987-1991, and 2007-09. Drought conditions in 1973 led to a state-declared disaster in Glenn, San Benito, and Santa Clara counties, resulting in $8 million in agricultural loss. Between 1976 and 1977, California experienced one of its most severe droughts. 1977 was the state's driest year on record, and according to the California Department of Water Resources, and in the Bay Area, Contra Costa, Napa, San Mateo, and Marin counties were four of the several counties where a state disaster was declared. Statewide, $2.67 billion in damages occurred in the two-year period. Marin, Solano, and Sonoma counties were also affected in the 1987-1991 drought, which caused $1.7 billion in crop losses nationwide. The 2007-2009 drought did not directly affect Bay Area counties, but caused $300 million in crop loss statewide.[31]

In January 2014, the Governor declared a State of Emergency in California in response to current drought conditions, which began in 2012. As of June 2015, statewide reservoirs were at 18-67 percent of average and Sonoma County had declared a local Emergency Proclamation.[32]

6.7.2 Drought Hazard in the Bay Area

Drought can impact the entire Bay Area, not just one particular county or city. In addition, shortages in precipitation in the Sierra Nevada can have a more pronounced impact on water supply in the region than a drought in the Bay Area itself because of the reliance of the region on water from the Tuolumne, Mokelumne, Sacramento, and San Joaquin watersheds. Thus, drought is not a hazard that can be depicted by a Bay Area map; rather a map of Northern California is necessary to understand the impact of drought on Bay Area water supply.

Figure 6-10 illustrates where the largest water districts in the region collect water. Only a third of the water used in the Bay Area is from local rainfall collection and groundwater pumping; the remainder comes from runoff in the Sierra Nevada Mountains. Figure 6-11 highlights the severity of the current drought in watersheds Bay Area districts are dependent on for their water. In 2015, portions of the Bay Area were downgraded slightly because of average rainfall in micro climates of the region. Other

[31] State of California Multi-Hazard Mitigation Plan, California Governor's Office of Emergency Services
[32] California Governor's Office of Emergency Services (2015)

portions of the Bay Area, and most of the area the region relies on for its imported water, remain in exceptional drought, the highest drought designation.[33] See Section 8.1.5, Water Supply, for additional discussion specific to **Foster City** related to responding to drought-related limitations on water supply.

[33] National Drought Mitigation Center, (2015)

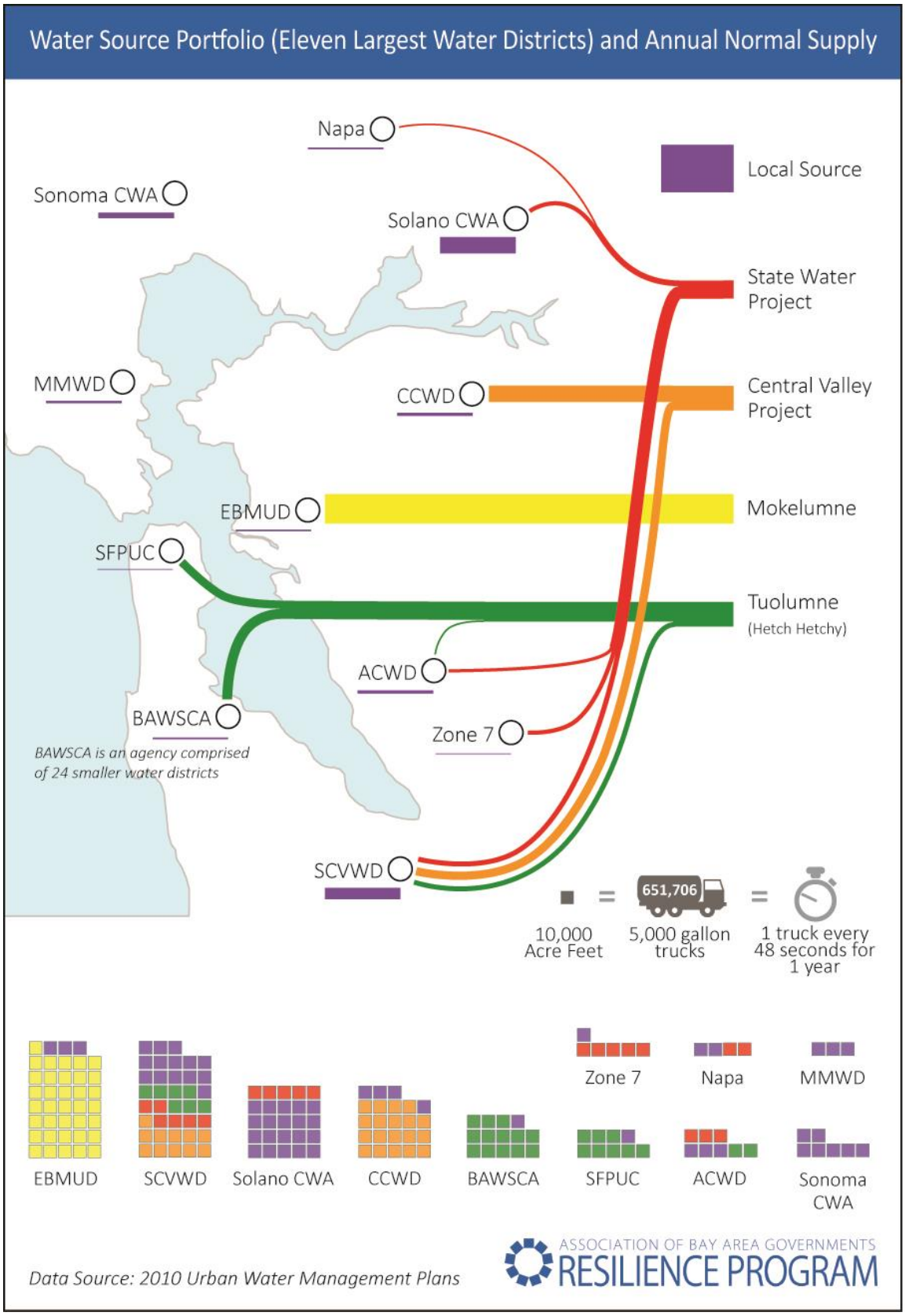


Figure 6-10. Water Source Portfolio and Annual Normal Supply

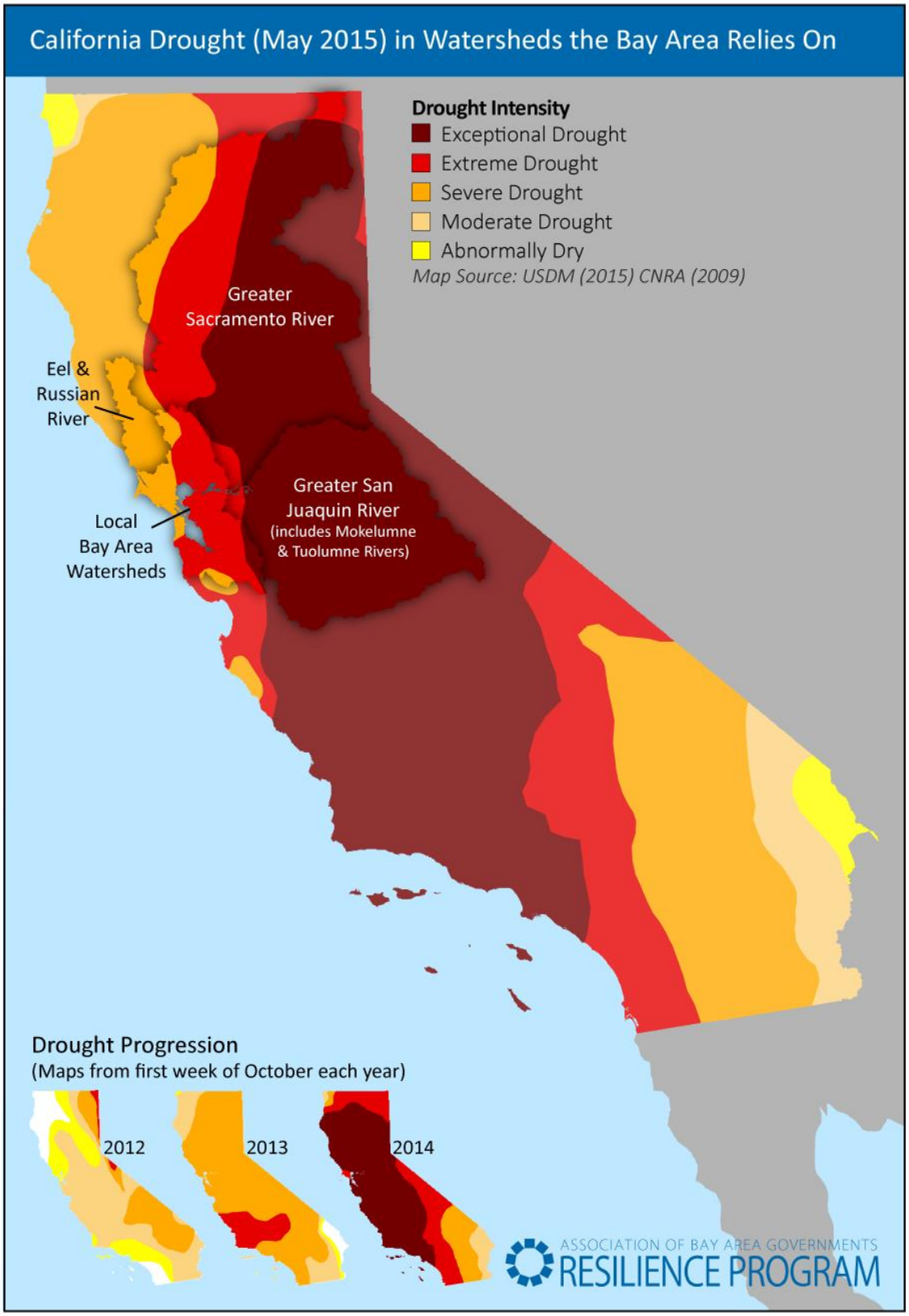


Figure 6-11. California Drought in Watersheds the Bay Area Relies On

6.7.3 Probability of Future Drought – Climate Influenced

Climate change is likely to increase the number and severity of future droughts. The cumulative impact of climate change impacts will result in drier conditions, and will alter the timing and efficiency of the Bay Area water supply. An increase in temperature and a reduction in snow pack are the two most direct effects of climate change that will result in a drier state with fewer natural water resources than historically have been available.

In the Bay Area temperatures are projected to increase between 3 degrees (low emission scenario) and 6 degrees Fahrenheit (high emission scenario).[34] In the eastern regions of the state, the increase is 4 to 9 degrees.

The reduction in snowpack does not have direct impacts in the Bay Area as the region does not accumulate meaningful levels of snow. The Bay Area is adversely impacted by the severe reduction in snow pack in the Sierras, the source of two-thirds of the region's water. By the end of the century the spring snow pack in the Sierra could be reduced by as much as 70 to 90 percent of the historic average.[35]

6.8 Extreme Heat

The Bay Area, especially away from the coast and bay, can experience extreme heat days, where the Heat Index, a function of heat and relative humidity, is high. Extreme heat days pose a public health threat, causing symptoms such as exhaustion, heat cramps, and sunstroke if the Heat Index is over 90°F. The National Weather Service has developed a Heat Index Program Alert which gets triggered when high temperatures are expected to exceed 105° to 110° for at least two consecutive days. Heat emergencies occur when residents are subject to heat exhaustion and heatstroke, and are more likely to occur in areas not adapted to heat and without air conditioning, cooling centers, or vegetation to mediate heat impacts in exposed areas. Certain populations are typically the most at risk during extreme heat emergencies, including people with disabilities, chronic diseases, the elderly, and children.[36]

Extreme heat emergencies typically build over time with cumulative effects. Because of this, and the fact that they do not cause substantial physical damage to the built environment, they do not elicit the same immediate response that other hazards do. However, they claim many lives in comparison to other disasters. The California Climate Adaptation Strategy, citing a California Energy Commission Study, states that heat waves have claimed more lives in California than all other disaster events combined.[37]

6.8.1 Historic Extreme Heat

No heat emergencies in California have been declared a disaster at the State or Federal level between 1960 and 2008.[38] The Spatial Hazard Events and Loss Data for the United States estimates approximately 47 heat events in California during this time. In 2006 a notable heat wave spread throughout most of the United States and Canada, causing 140 fatalities in California.[39]

[34] Cayan, D., et al. (2009)
[35] Scripps Institute of Oceanography (2012)
[36] State of California Multi-Hazard Mitigation Plan, California Governor's Office of Emergency Services
[37] Messner, S. et al. (2009)
[38] State of California Multi-Hazard Mitigation Plan, California Governor's Office of Emergency Services
[39] Ibid

6.8.2 Extreme Heat Hazard in the Bay Area

The Bay Area has historically experienced 4 extreme heat days a year.[40] Depending on low and high emission scenarios, and the location within the region, in the future a Bay Area city may experience an average of anywhere from 20 to 80 extreme heat days in a year. Cal-Adapt, California's database of climate data and visualization tools provides five different ways to define the extreme heat hazard: (1) number of extreme heat days by year, (2) number of warm nights by year, (3) number of heat waves by year (heat wave is defined as 5 consecutive extreme heat days), (4) timing of extreme heat days by year (i.e. which months do extreme heat hazards occur), and (5) the maximum duration of heat wave by year. These metrics are projecting both the intensity and the temporal nature of extreme heat.

6.8.2.1 Intensity

The intensity of extreme heat is defined differently for each location in the region. In San Francisco County an extreme heat day is defined as a day above 78°, while for inland portions of Solano County extreme heat is defined as a day above 100°. The threshold is the 98th percentile historic maximum temperature. The threshold is set locally to recognize services and buildings in cooler climates that may not be designed to handle moderate heat, while those areas where high heat has always been an occurrence, already have measures to address their historic temperatures.

In addition to the number of extreme heat days expected to rise in the Bay Area, the temperature is expected to increase well above thresholds over the next century. In San Francisco County by the end of the century there could be multiple days a year where temperatures reach 95°, while in Solano County there may be multiple days above 115° each year.

According to the National Oceanic and Atmospheric Administration's (NOAA) Climate Summary Report for the Redwood City Weather Station, maximum daily temperatures in excess of 90 degrees occurred 557 times between 1982 and 2012. Based on this data, **Foster City** can expect to experience temperatures in excess of 90 degrees approximately 19 days a year.[41]

6.8.2.2 Temporal

Extreme heat is made worse when it is experienced over a longer stretch of time. The number of heat waves (five or more consecutive days of extreme heat) will increase as will the length of heat waves.[42] By the end of the century most of the region will average six heat waves a year, with the average longest heat wave lasting ten days. In addition to the more frequent occurrence and duration of heat waves, they are expected to occur in months the region historically hasn't experienced extreme heat. Historically, extreme heat occurs between July and August, but in the future extreme heat will be an issue the region faces in both the spring and fall.[43]

Foster City's location on the San Francisco Bay will mitigate the impacts of extreme heat relative to more inland locations.

[40] Cayan, D., et al. (2009)
[41] County of San Mateo (2014), Hazard Vulnerability Assessment, Appendix to the Emergency Operations Plan, September 30, 2014, p. 23.
[42] Cayan, D., et al. (2009)
[43] California Climate Change Center (2006)

6.8.3 Probability of Future Extreme Heat

Climate change is expected to generate an increase in ambient average air temperature, particularly in the summer. The outer Bay Area will likely experience greater temperature increases than coastal or bayside jurisdictions, though likely not as great as in the eastern-most inland communities. The frequency, intensity, and duration of extreme heat events and heat waves are also expected as regional climate impacts.[44]

According to California Climate Change Center, by mid-century, extreme heat in urban centers could cause two to three times more heat-related deaths than occur today.[45] Statewide, temperatures could increase anywhere from 3 to 10.5° depending on CO2 emission levels, leading to more frequent, hotter days throughout the year.

6.9 Dam Failure

The dams built in the Bay Area over the last 150 years were built without seismic or government regulation. Dams can be damaged by large storms and the associated runoff, an earthquake, slope failures, or a terrorism event. While dam failure is rare, their failure can be catastrophic, destroying downstream structures and killing people, while reducing water supply to the Bay Area until the dam is rebuilt.

In 1972, California implemented Government Code § 8589.5 requiring dam owners to develop maps depicting inundation areas that might be affected by dam failure. The law required that each map be produced only once, without any requirements for updating. Further, the scenario used to create the maps restricted the results to a worst case situation that does not fit the historical evidence of dam failure.

The Lower Crystal Springs Dam is the only dam that could potentially affect **Foster City** and is the largest of the dams that affect San Mateo County. Constructed in 1888, as a part of the water system that brings water to the Peninsula from the Hetch Hetchy Reservoir in the Sierra Nevada Mountains, this gravity dam was built on the San Mateo Creek. The dam impounds water to form the Lower Crystal Springs Reservoir. The reservoir is a water supply for San Francisco and most cities within San Mateo County. Despite its location directly on the San Andreas Fault, the dam has survived both the 1906 San Francisco earthquake and the 1989 Loma Prieta earthquake.

The Division of Safety of Dams (DSOD) reviews and inspects the dams for potential failure due to a major seismic event. According to the most recent report, the DSOD indicates that the dam is structurally safe and will perform without failure. In 2010 the Lower Crystal Springs Dam was evaluated for the effects of an 8.3 magnitude earthquake (on the Richter scale). Based on this evaluation, it was determined the potential for dam failure would be low. If events caused a failure of the dam, the area of potential inundation is shown in Figure 6-12.

In 1983, the DSOD mandated the maximum allowable water surface elevation of the Lower Crystal Spring Dam reservoir be lowered by 8 feet until completion of hydraulic upgrades to the dam's spill capacity. This lower maximum operating elevation reduces the reservoir's storage capacity by 16%, a reduction of 2.6 billion gallons of water.

[44] Drechsler D. M., et al, (2006)
[45] California Climate Change Center (2006)

The San Francisco Public Utilities Commission (SFPUC), in conjunction with the County of San Mateo, completed these upgrades to Lower Crystal Springs Dam and the bridge that passes over the dam in May 2012.

The purpose of the Lower Crystal Springs Dam Improvements Project is to comply with these DSOD requirements including raising the existing parapet wall at the top of the dam, widening the dam's spillway and enlarge the stilling basin. These improvements will ensure that during an extremely large flood event, the reservoir's water is correctly directed through the dam's spillway and into San Mateo Creek.

As indicated in Figure 6-12, the inundation area resulting from a failure of the Lower Crystal Springs Dam would reach **Foster City**. The map does not take into consideration the ability of the cities of San Mateo and Foster City to lower the water levels in San Mateo's Marina Lagoon and the Foster City Lagoon by utilizing the pumps and tide gates.

6.9.1 Probability of Dam Failure

No quantitative probability information exists for the Bay Area dam failure hazard. When a dam is known to have a failure potential, the water level is reduced to allow for partial collapse without catastrophic loss of water, as required by the California Department of Water Resources, Division of Safety of Dams (DSOD). For example, in 2001 the DSOD restricted the Calaveras Reservoir to approximately 30% of its original capacity to avoid a catastrophic release of water until the deficiencies are corrected. This decrease in capacity reduced the probability of failure resulting in damage to near zero.[46]

[46] Association of Bay Area Governments, Multi-Jurisdictional Local Hazard Mitigation Plan for the Bay Area, Appendix C - Natural Hazard Risk Assessment, 2010

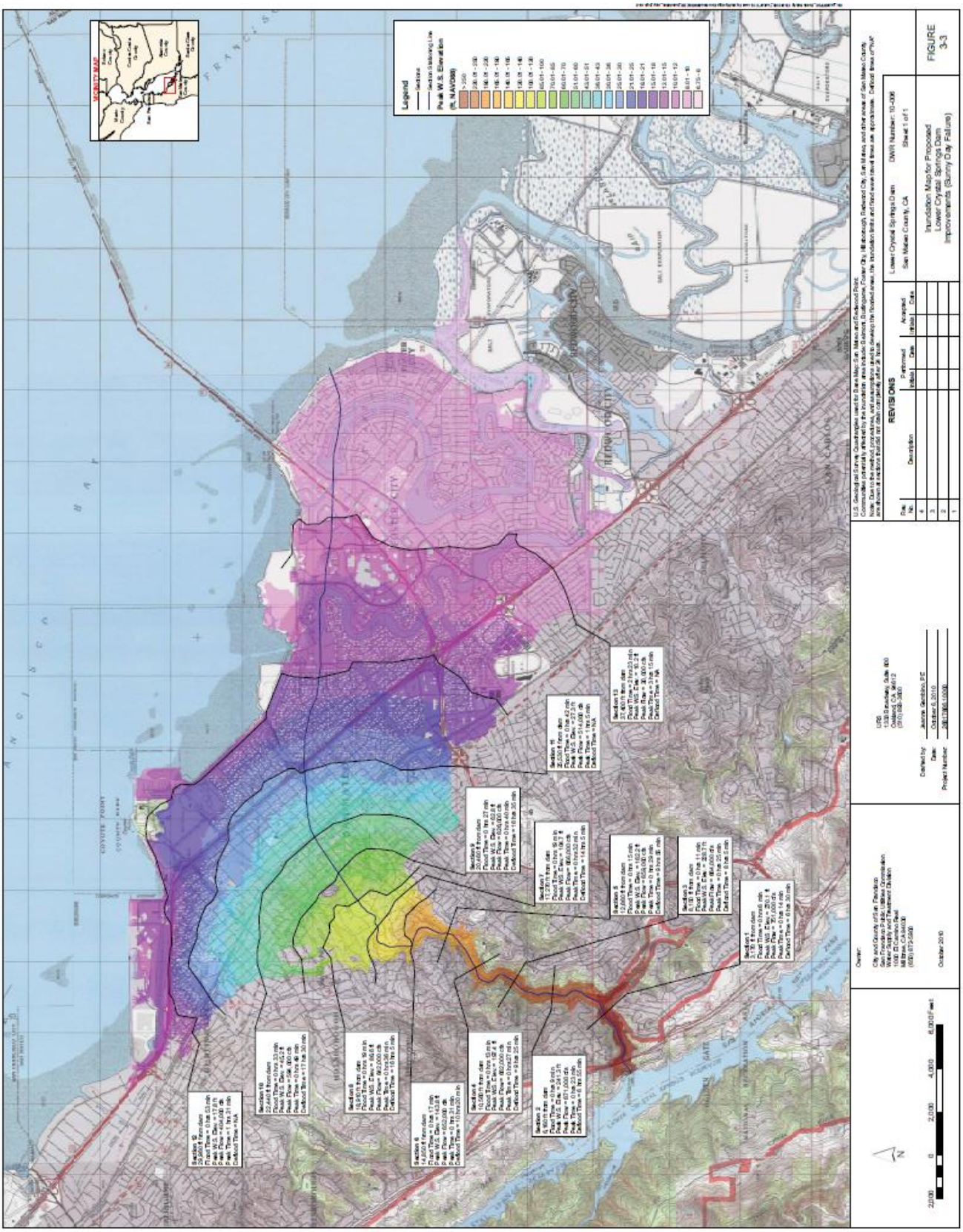


Figure 6-12. Inundation Area from Lower Crystal Springs Dam

6.10 Hazardous Materials

Releases of Extremely Hazardous Substances (EHS) can occur during transport and from fixed facilities. Transportation-related releases are generally more troublesome because they can occur anywhere, including close to human populations, critical facilities, or sensitive environmental areas. Transportation-related EHS releases are also more difficult to mitigate due to the variability of locations and distance from response resources.

In **Foster City**, a hazardous material incident is most likely to occur within the City's industrial areas, and along land and water transportation corridors. Trucks and vessels that use these transportation corridors commonly carry a variety of hazardous materials, including gasoline, other petroleum products, and other chemicals known to cause human health problems. Additionally, State Route 92 which bisects Foster City as it runs east-west is a major highway that carries large quantities of hazardous materials.

Foster City is home to a number of biotech companies, which increases the vulnerability for hazardous material incidents, and its proximity to residential areas would put a significant population at risk should a serious release occur.

6.10.1 Probability of Hazardous Materials Exposure

Due to the wide variations among the type and magnitude of hazardous materials accidents, there is no formal way to estimate the probability of these events within the scope of this document.

6.11 Transportation Accidents

Transportation accidents exemplify a hazard with a large number of low-impact events and a small number of high-impact events. Every year more than 40,000 people die in transportation accidents in the United States. The vast majority of these are the result of traffic accidents. Of the traffic deaths, most occur on highways and rural roads. While individual accidents are not large incidents, they have a large cumulative impact. Many programs and regulations have been established to improve safety. The means to handle the most frequent incidents fall well within the scope of daily operations of local government. Occasionally larger incidents occur that have a bigger, more lasting impact on the community and challenge the response capabilities of local government.

A plane or jet crash in **Foster City** could cause serious damage and life loss requiring an immediate and coordinated response by various law enforcement, fire, and emergency medical services. In the case of a downed aircraft, the size and speed of the airframe, and highly flammable fuel magnify the emergency response services required. The number of people killed and injured from an aircraft accident is dependent on the location of the crash and the way the plane impacts the ground. If the crash occurs in a populated area, the time of day affects the numbers of persons injured or killed on the ground.

Law enforcement efforts in a major crash would focus on cordoning off the impacted location, maintaining open traffic lanes for emergency vehicles, and keeping curious citizens at a safe distance from the incident. Firefighting resources would be charged with fire containment, search and rescue, patient triage and treatment. EMS would be responsible for additional patient triage, treatment and transportation to area hospitals. Depending on local arrangements, the local response agencies will affect a unified command organization. Mobile command and communication centers would be established as needed.

Foster City is located approximately 5 miles southeast of San Francisco International Airport (SFO), the seventh busiest international airport in the United States and twenty-second busiest in the world. SFO is owned by the City and County of San Francisco and operated in San Mateo County. Aircraft landing at SFO usually make their approaches to Runway 28 by flying west up the Bay, in close proximity to Foster City.

Due to the close proximity of dwelling units and high density of the urbanized area, a downed jet liner could cause a large number of fatalities and serious injuries. The immediate impact would be high and the risk of fire spreading to both homes and Foster City's economic centers would be significant.

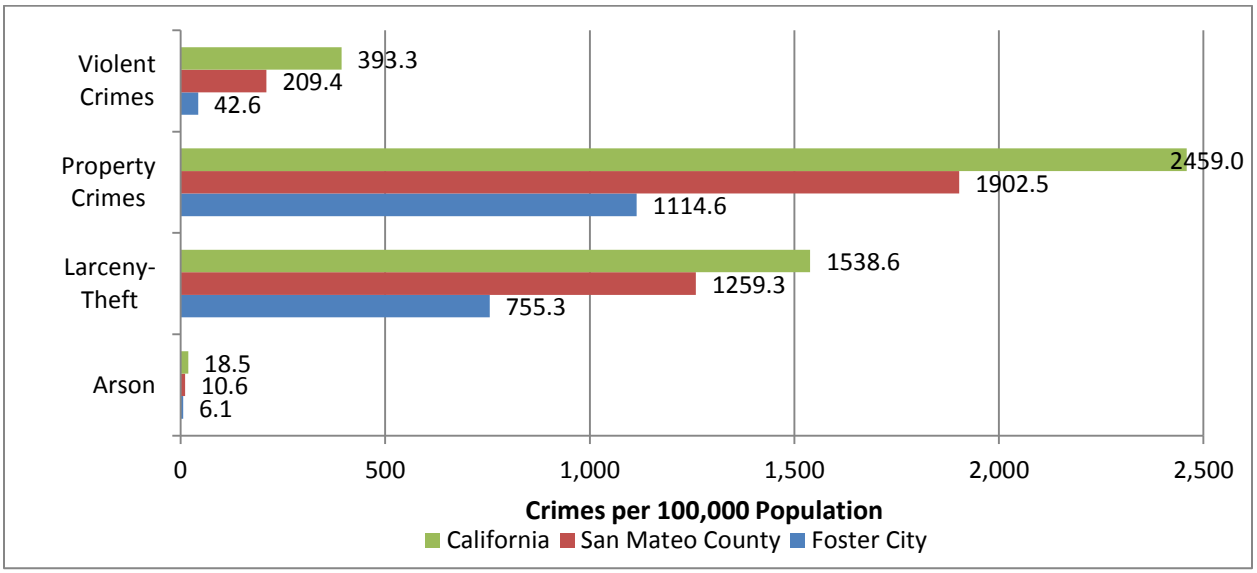
While the above scenario would dictate a quick and multi-jurisdictional response, the probability of such an event is low. According to national studies of airport accidents involving large aircraft, the vast majority of airliner accidents occur either immediately before landing or within 1,000 yards of take-off.

6.11.1 Probability of Transportation Accidents

Due to the wide variations among the type and magnitude of transportation accidents, there is no formal way to estimate the probability of these events within the scope of this document.

6.12 Crime

Foster City has a very low crime rate and year after year, is ranked one of the safest cities in California in which to live and work. According to the California Office of the Attorney General's crime statistics for 2014, Foster City had 14 violent crimes, which results in a crime rate of 42.6 crimes per 100,000 inhabitants compared to rates of 209.4 for San Mateo County and 393.3 for California.



Source: California Office of the Attorney General

Figure 6-13. Comparison of Crime Rates in California, San Mateo County and Foster City (2014)

Statistics on the number of crimes by category of crime in Foster City from 2008 through 2014, as reported by the California Department of Justice, are shown in Table 6-8. The majority of crimes committed in Foster City consist of non-violent property and non-violent larceny crimes.

Table 6-7. Foster City Crimes by Category 2008-2014

	2008	2009	2010	2011	2012	2013	2014
Violent Crimes	17	11	24	26	18	15	14
Homicide	0	0	0	1	0	0	0
Forcible Rape	1	2	1	1	0	2	3
Robbery	3	4	2	2	3	3	2
Aggravated Assault	13	5	21	22	15	10	9
Property Crimes	233	299	255	395	345	305	366
Burglary	62	129	103	107	83	69	81
Larceny-Theft	326	333	273	255	239	216	248
Vehicle Theft	27	33	40	33	23	20	37
Arson	4	6	1	8	1	4	2

6.12.1 Probability of Future Crime

Due to the wide variations among the type and magnitude of crime, there is no formal way to estimate the probability of these events within the scope of this document.

7 VULNERABILITY ANALYSIS/RISK ASSESSMENT

After a disaster, community vitality is dependent upon people, buildings, and utility and transportation infrastructure. Each of these assets contributes unique benefits to the community, and each has specific vulnerabilities to disasters. This chapter describes the role of these assets and how they are each uniquely vulnerable. Without an understanding of the asset's role, there is no basis to understand what damage means for the community.

People (7.2) experience hazards through damage to buildings and interruption of infrastructure services. While some people will be directly injured or killed by hazards, this is a small portion of the impacts on people. The vast majority of impacts will be felt through a person's ability to manage the secondary impacts from the hazard.

> *Social vulnerability* describes characteristics that make people less able to adequately withstand and adapt to a hazard, such as limited mobility, income, and educational attainment. Social vulnerabilities are largely independent of the hazard type and can be applied similarly to any type of disaster.

Buildings (7.3) & Utility and Transportation Infrastructure (7.4) support community vitality. Impacts to the built environment can have significant consequences to the people who live and work in the buildings and depend on the functions the buildings and infrastructure provide. The built environment is impacted by disasters primarily in two ways:

> *Physical vulnerability* describes how an asset can be physically damaged by a disaster. Because buildings and infrastructure are uniquely vulnerable to different hazards, they are described hazard by hazard.
>
> *Functional vulnerability* describes ways in which hazards can impact the ability of the asset to function as needed, either directly or indirectly, such as by limiting a sewer treatment plant's ability to operate if power is unavailable.

7.1 Methodology

The planning team conducted a risk assessment to determine the potential impacts of hazards to the people and built environments of Foster City. The approach used for the risk assessment was conducted using available data, technology and resources. Each of the hazards noted in Section 6 were reviewed based on disaster declaration history and other studies, reports and planning documents available, such as ABAG's Risk Landscape documents and open data sources, the location and extent of previous occurrences, and probability of future events.

Using a qualitative analysis method, the planning team conducted an exposure analysis to determine which assets will be exposed to a specific hazard and provided a basic understanding of the magnitude of possible damage or loss after a disaster. Examples of maps used in this analysis are shown in Figures 7-2, 7-4 and 7-5. Due to **Foster City's** small size and homogenous physical and environmental characteristics, the extent of the hazards was also homogenous within the areas protected by the levee. The planning team chose to use the Earthquake Ground shaking Scenario Map depicting a Magnitude 7.8 earthquake on the San Andreas Fault to illustrate vulnerability due to the likelihood of the scenario and impact on people, buildings and infrastructure.

The remainder of the qualitative analysis utilized a risk assessment questionnaire provided by ABAG to describe the physical, functional, and governance vulnerabilities of assets which were considered as individual assets, asset classes, or representative assets. This assessment considered the anticipated impact on society, the economy and the environment, and the planning team was able to prioritize assets based on this analysis.

For the purposes of this plan, the discussion of vulnerability of people and economic resources is included in Section 7.2, and the vulnerability of the built environment is included in Sections 7.3 (Buildings) and 7.4 (Infrastructure).

7.2 People

The character of Bay Area residents is responsible for the strong community vitality, distinctive culture, and its unique economy. The Bay Area is especially diverse, showcasing many different lifestyles, cultures, and languages that provide a wide variety of cultural experiences. Longtime residents of the region have special knowledge, social networks, and cultural memories that make them strong stewards for neighborhoods, parks, and trails. If a disaster forces Bay Area residents from their homes, social networks will be broken, and the diverse culture of the region will change.

The Bay Area's economy relies on service, labor, creative, and professional workers. The Bay Area economy is unique in that it is home to one of the fastest growing and most innovative economic sectors in the world. If a disaster impedes the ability of employees of any sector to stay in the region or get to work, the impact will cascade beyond individual businesses and be felt not just across the region, but globally. Employees from all sectors are needed to support one of the strongest and most specialized economies in the world.

People are a critical asset for the functioning of a community and the economy; without residents a jurisdiction loses its tax base and employers lose employees and customers. More importantly, jurisdictions lose the culture, vibrancy, and sense of cohesiveness that make them unique. Jurisdictions in the Bay Area should understand that people are the nexus of a resilient community, and many other assets are designed to serve and support people.

Figure 7-1. Foster City's Vibrant Community

7.2.1 Social Vulnerability

Unlike other asset classes like buildings and infrastructure, the vulnerability of people is not just due to physical characteristics but rather social characteristics that make them less able to adequately withstand and adapt to a hazard. People are also highly dependent upon the physical environment that they are surrounded by; community members are much more vulnerable if the buildings and infrastructure that they live in, work in, and rely upon fail.

In 2015, ABAG and the Bay Conservation and Development Commission (BCDC) published *Stronger Housing, Safer Communities*, a report that identified ten primary indicators that represent characteristics of individuals and households that affect their ability to prepare for, respond to, and recover from a disaster.[47] These indicators collectively present a picture of a community's vulnerability to stressors. Concentration of these indicators, or areas with multiple indicators, can inhibit the recovery of a community. Using Census data, ABAG and BCDC mapped community vulnerability in the region.

In **Foster City**, because the Census blocks used in the maps are very large, the mapping of the data is not useful. The concepts do, however, indicate possible vulnerabilities of some populations. Key themes that emerged included age-related vulnerabilities, language and ethnicity vulnerabilities, cost-burdened residents, housing tenure issues, and access to resources. Table 7-1 summarizes the key

[47] ABAG and BCDC, 2015

findings relating to social vulnerabilities and the presence of these indicators in Foster City and San Mateo County.

Table 7-1. Community Vulnerability Characteristics[48]

Indicator	Measure	Vulnerability	Foster City	San Mateo County
Housing cost burden	% household monthly housing >50% of gross monthly income	Less able to prepare; likely to struggle to find affordable replacement housing	13%	18.5%
Transportation cost burden	% household monthly transportation costs >5% of gross monthly income	Less able to prepare; likely to struggle to find affordable replacement housing	N/A	N/A
Home ownership	% not owner occupied housing	Renters are limited in ability to retrofit housing; not as likely to have insurance coverage	41.4%	40.7%
Household income	% households with income less than 50% area median income (AMI) (data shown is % people below poverty level)	Less able to prepare; likely to struggle to find affordable replacement housing	3.9%	7.6%
Education	% persons without a high school diploma >25 years	Less able to access information on preparedness or resources	6.1%	11.9%
Racial/Cultural Composition	% non-white	Can contribute to vulnerability if combined with other factors	54.6%	43.6%
Transit dependence	% households without a vehicle	Less able to evacuate; limits ability to find replacement housing	3.2%	5.7%
Non-English speakers	% households where no one ≥ 15 speaks English well (data shown is % people who speak English “less than well”)	Less able to access information on preparedness or resources	19%	18.2%
Age – Young children	% young children under 5 years	Dependent on others for basic needs	6.3%	6.2%
Age – Elderly	% elderly, over 75 years	More likely to be dependent on others for basic needs	6.9%	6.5%

[48] U.S. Census Bureau; American Community Survey, 2010 American Community Survey 5-Year Estimates, using American Factfinder; http://factfinder2.census.gov ; (March 2016)

As discussed in Section 5.3, several trends are expected to alter the demographics of Foster City in the coming years, but these are anticipated to affect all areas of the City fairly evenly:

- Rise of the Millennials.
- Growing senior population.
- Worsening workforce-housing shortage.
- Increasing ethnic diversity.
- Increase of people with developmental disabilities.

Figure 7-2 shows the distribution of vulnerable populations throughout Foster City in the context of the ground shaking hazard map. As discussed in Section 2.1, Foster City's community is largely homogenous with regard to distribution among neighborhoods and vulnerable populations are not concentrated in any one area of the City. One item of note is that apartment developments that contain units in the City's Affordable Housing Program in the very low-income category include households with less than 50% of the area median income. Also, the new Foster Square development (under construction in 2016) adjacent to City Hall with approximately 400 senior housing units will result in a greater concentration of seniors in this portion of the City.

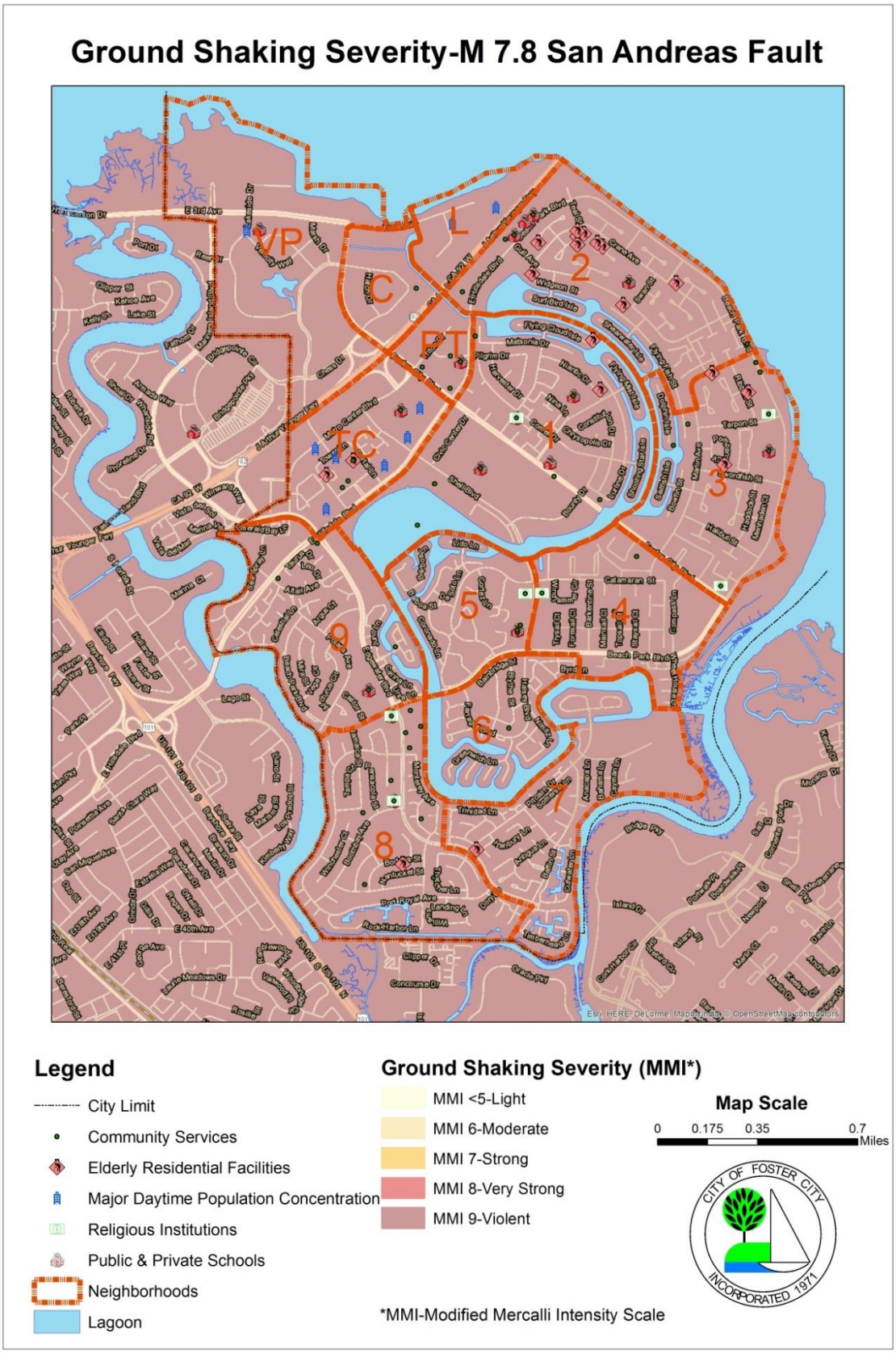


Figure 7-2. Vulnerability of People to Ground Shaking

7.3 Buildings/Structures

One of the most commonly reported disaster metrics is the number of damaged and destroyed buildings. The overall extent of damage is telling, but not every damaged building will have an equal impact on a community. Certain building uses, and the extent of damage to individual buildings, can have a great influence on the ability of a community to recover from a disaster. Understanding the function of the building stock and the potential for damage is central to understanding the impact that disasters have on people's lives and on the ability to recover.[49]

Housing, employment centers, and critical facilities are featured because of their important role in the fabric of a community and because they can significantly affect recovery. Each building use has unique functional vulnerabilities as the community relies on each building sector for different critical needs. However, the physical vulnerabilities of the buildings are the same across different building uses and instead vary by building construction type and by hazard. Different construction types may respond differently to a disaster, and buildings may also respond differently to different disasters. When assessing potential disaster impacts, it is important to consider both the physical vulnerability of the building that could lead to damage in a hazard event and the functional vulnerability of the building, including what services it provides and who it serves, that would be interrupted or displaced.

Beyond essential services, many communities' buildings also contribute greatly to the character and history of the community. In **Foster City**, the Recreation Center is identified as a key asset due to its significance as a community/cultural resource as well as a potential emergency shelter site.

7.3.1 Building Uses

7.3.1.1 Housing

Retaining housing is crucial to expediting and ensuring an effective disaster recovery. Limiting catastrophic housing damage and keeping residents in their homes not only helps people who may lack the resources to effectively recover from a disaster, but also keeps communities intact.[50] If residents are able to stay in their community, they can continue to assist recovery and rebuilding efforts, and support local businesses. Many community members, especially those who exhibit vulnerability characteristics described in Section 7.2.1, are highly dependent upon the housing they live in as a critical factor in their resilience to a major disaster.

Multiple studies have shown that population loss after a disaster significantly slows recovery time,[51,52,53] thus, keeping housing intact is fundamental to community stability. In the aftermath of natural disasters, the recovery of the region's economy is interdependent with the recovery of the region's housing. If residents can stay in their homes, they will be better able to participate in the rebuilding of their neighborhoods and cities, go to work and support local business, and improve the recovery trajectory of the entire region.

Beyond providing shelter, homes are also a financial asset for homeowners. For most owners, their home is their largest financial asset, and is something they leverage to finance other spending (cars, tuition, etc.). For many, especially in the Bay Area housing market, a home represents the single

[49] Comerio, M. C., (1998)
[50] ABAG (2015)
[51] Comerio, M. C., (1998)
[52] Mileti, D. S., (1999).
[53] Aldrich, D.P. (2012)

largest investment an owner will ever make.[54] The damage or loss of housing is a real threat to the investment that many homeowners have made, and many homeowners choose not to purchase earthquake insurance, since it tends to have high premiums and deductibles. However, even if a home is demolished, the homeowner is responsible for the remainder of the home loan. Following a major disaster, owners with severely damaged or destroyed homes may have to default on their loan and walk away from their property at a significant loss if they're unable to accumulate enough financial support to repair or rebuild.

While it is widely assumed that new housing is built to a standard that provides adequate protection for residents, current code is designed to protect from loss of life, not necessarily reducing damage to the building. Newly constructed homes may still experience significant damage, displacing and creating financial hardship for residents. This is especially true for homes in liquefaction and flooding areas. New housing and future growth should be given sufficient consideration for both current and future hazards.

In **Foster City**, given the relatively young age of housing, many of the most vulnerable types of housing structures are not part of the housing stock, such as unreinforced masonry, soft-story structures, cripple wall structures, etc. However, as noted above, even newly constructed housing may still experience significant damage.

7.3.1.2 Employment Centers

In a major natural disaster in the Bay Area, many businesses will close due to building damage, inventory loss, utility outages, supply chain disruptions, inability of employees get to work, or a loss of customer base. For businesses further removed from the hardest hit areas, disruption may last only a few days or weeks. For harder hit businesses, disruptions could be much longer, forcing them to close permanently or move elsewhere, either nearby or in an entirely different region.

Other factors likely to impact economic recovery include the dependency of businesses on our regional infrastructure systems; water, sewer, power, and access to broadband and communication; which are key to business operation and continuity. Ongoing infrastructure disruptions or unreliability will challenge businesses. Public transit, roads and highways are essential for the workforce to travel to work, particularly when more than half of Bay Area residents reside in a different county than where they work. The recovery of the education sector is also key; K-12 schools not only provide education to children, but provide the daycare that allows parents to return to work. Long school closures due to structural damage or prolonged shelter use will delay return of employees to work.

The Bay Area functions as a single economic unit, meaning that among the counties in the region there is a high degree of interconnectedness between where people work and live. Jobs as well as housing are distributed widely throughout the region, but only 53 percent of residents work in the county in which they live. All of the counties and sub-regions are highly dependent on one another for their economic functioning and on the region's transportation network. In addition, the Bay Area contains clusters of highly specialized and interdependent businesses, such as the tech sector in Silicon Valley. As these businesses are closely located, a disaster could have significant impact on an entire sector, affecting not just the Bay Area but state, national, and global economies.

Other potential barriers to economic recovery include the disruption of vendors and supply chains to and from the region and the repercussions for national and international markets. Business disruption has upstream and downstream impacts on supply chains that can exacerbate impacts on the economy.

[54]Comerio, M. C., (1998).

Just as different sectors are impacted differently, businesses of varying sizes can recover very differently. A large portion of the Bay Area's economic activity is based on small businesses. Small businesses are valuable contributors to the economic and cultural vitality of the region, but an estimated 25 percent of small businesses do not re-open following severe disruptions from a major disaster.[55] Many of these businesses provide the day-to-day necessities for residents such as groceries, shopping, doctors' offices, pharmacies, and restaurants. Essential services are mandatory for getting residents to remain or return. Until essential goods and services are available, people will stay away. Many operate out of a single facility, which if damaged or surrounded by damage, may be unable to recover. Because they often rely more on local consumers, small businesses can be particularly devastated by prolonged recovery. Small businesses with tight profit margins are also unlikely to have any level of business continuity insurance, making even moderate disruptions difficult to endure. Impacts to local small businesses can have a significant impact on the entire region's economy.

Large businesses have a different effect on the Bay Area economy. Large-scale enterprises can be major employers for a single city. These businesses are essential to many local economies. During a disaster, however, large national corporations, unlike small local businesses, have the capital necessary to temporarily or even permanently move their operations out of the region. In addition, the Bay Area regulatory environment, including zoning, permitting and environmental regulations may also inhibit businesses after a disaster, making it too difficult to stay or rebuild. Such an exodus can have disastrous consequences for local employment, as well as for a city's or county's tax base. Whether small or large, local or national, businesses are a large part of what keeps the Bay Area thriving.

In **Foster City**, the major employers, such as Gilead Sciences and Visa, occupy relatively new buildings that have been constructed under stringent building codes to be more resilient and to maximize life safety. These more stringent codes do not necessarily mean that there will be no building damage. Employment centers may still experience damage that results in loss of use of the buildings and potential negative economic impacts. The City routinely collaborates with major employers to improve emergency preparedness.

7.3.1.3 Critical Facilities

Some services such as healthcare, schools, and police and fire, are crucial for the functioning of communities, especially in the immediate post disaster environment. Other essential facilities for community functioning include public buildings that house community services such as libraries, or privately owned grocery stores, gas stations, banks, parks, places of worship, and many others. Understanding where these facilities are, and which communities they serve, is crucial to understanding the consequence if they are damaged.

[55] California Seismic Safety Commission (2012)

Figure 7-3. Foster City Community Center/Library and Corporation Yard

Public Facilities

Foster City identified several City-owned structures that are considered to be critical assets. The assets are listed in Table 7-2 along with the estimated total replacement costs.

Table 7-2. Foster City-Owned Critical Assets

Critical Asset	Facility Type	Structure Type	Total Estimated Replacement Cost
Recreation Center/Senior Center	Cultural Resource	Metal Frame	$17,897,085
Police Station	Public Safety	Metal Frame	$14,276,947
Library/Community Center	Cultural Resource	Concrete Structure	$20,337,950
Corporation Yard Administration/Gas Pumps	Utilities	Concrete Structure	$10,624,882
City Hall/Fire Station	Administration/ Public Safety	Metal Frame	$57,584,936
City Council Chambers	Administration	Metal Frame	$9,679,800
The Vibe Teen Center	Cultural Resource	Metal Frame	$15,948,992
Water Storage Tank #1	Utilities	Concrete Structure	$8,400,000
Water Storage Tank #2	Utilities	Steel Structure	$8,400,000
Water Storage Tank #3	Utilities	Steel Structure	$8,400,000
Water Storage Tank #4	Utilities	Steel Structure	$12,600,000
Waste Water Treatment Plant	Utilities	Concrete Structure	$875,000,000

Hospitals and Health Care Facilities

Hospitals and health care buildings are important for two reasons: they treat those injured during the hazard event, and they are housing or serving patients with specific medical needs. In **Foster City**, although there are no hospitals, there are a few health care offices. San Mateo County Health System manages the emergency preparedness concerns of the County-wide health system through its Medical/Health Operational Area Coordinator Program.

Schools

Schools are particularly important community assets, as residents highly value the safety and education of their children. Safe schools are important for the safety of children inside. A functional school following a disaster is also important to continue providing educational services during a community's

recovery. If they are not operational, families may choose to move in order to enroll their children in school. For families that stay, parents may be unable to return to work if schools are not in session.

The important role of a school expands beyond education. Schools can be the center of a community's social fabric. They are not just a space for youth, but a place for the community as a whole. Schools are often where community meetings, performances, and events are held. Following disasters, some schools can serve as temporary shelter sites, while others might house social services to support disaster stricken communities. In **Foster City** there are four public schools and several additional private schools and childcare centers.

7.3.2 Building Vulnerability

Some buildings are more susceptible to damage in hazard events than others. For example, a well designed building neighboring a poorly designed building can experience the same flood level or the same degree of shaking but have completely different outcomes.

Building use can be affected in a disaster by both direct damage as described in the sections above, or by the interruption of necessary services. Most buildings and the services they house are only functional if necessary infrastructure systems are also functional. If a restaurant requires electricity to cook and store food, their building may remain closed is power is out. If water and wastewater services are unavailable in a neighborhood for a length of time, people with undamaged homes may still be forced to leave until services are restored. Some critical facilities and well-prepared organizations have resources like storage or back-up generators to reduce these vulnerabilities to their building function.

7.3.2.1 Earthquake Ground Shaking

In general, ground shaking impacts buildings by exerting lateral forces on a building. Buildings are primarily structurally designed to withstand vertical force (gravity) but may not be able to withstand lateral forces as well. This is particularly true for older buildings that were built before building codes recognized the types of forces that ground shaking exerts on buildings. However, depending on the building construction type, the way that the building responds to lateral forces differs. In the Bay Area, there are several older building types that have been identified as particularly vulnerable to ground shaking.

Even if the structure performs adequately in an earthquake; it can still be unusable after an earthquake because of non-structural damage. Chimneys, cladding, and parapets can fall off the outside of a building. Windows may break and ceiling tiles and lights may fall. Heat and cooling systems and other interior utilities may break. Broken water pipes and fire sprinklers can cause significant water damage. Fallen shelves, file cabinets, pictures, and the contents of cupboards and cabinets can create a significant mess. If these components are not properly anchored or braced, they can fall and injure people, or can be damaged, limiting the utility of the overall facility. All buildings rely on interior services that must be properly anchored and protected from other falling non-structural elements.

Given the relatively young age of **Foster City** buildings, the City does not have buildings of the most hazardous types, specifically cripple wall buildings, pre-WWII homes not bolted to the foundation, multi-story buildings with large openings on the first floor built before 1978, non-ductile concrete buildings built before 1980 and unreinforced masonry buildings.

A relatively cheap and fast way to build a warehouse structure is to build concrete walls horizontally first, and then tilt them vertically. Footings and the roof are the main structural elements that then keep

the walls standing. These buildings are called tilt-ups, and are common as warehouses, strip malls, and light industrial facilities. Many tilt-up warehouses have also been repurposed as offices, recreational facilities, and even schools or assembly buildings. Most tilt-up concrete buildings built prior to 1995 lack adequate connection between the roof and the walls. In an earthquake, the connection between the roof and the walls can fail, resulting in walls falling outward, and the roof collapsing into the building. In 1989, the City Council adopted a Seismic Hazards identification Program as part of an amendment to Title 15, Building and Construction. The program calls for the Building Inspection Division to identify buildings that meet any of the following criteria:

- Buildings constructed of unreinforced masonry.
- Buildings constructed prior to January 1, 1935 containing more than 99 occupants.
- Buildings constructed prior to August 1, 1976 containing 300 or more occupants.

This survey was completed in 1995 and found that no buildings in Foster City met the criteria. **Foster City** does include some concrete tilt-up buildings, primarily in the Chess-Hatch area.

Although some tilt-up concrete buildings remain, many are being replaced as part of redevelopment of the City's older industrial areas. Additionally, in **Foster City**, site-specific geotechnical analysis is required for all new construction to ensure that the most appropriate foundation design is utilized in order to minimize impacts from geologic hazards, including ground shaking. Buildings are constructed under stringent building codes to be more resilient and to maximize life safety. These more stringent codes do not necessarily mean that there will be no building damage. Buildings may still experience damage that results in loss of use of the facility and potential negative economic impacts.

Figure 7-4 shows the distribution of the City's building stock including critical facilities, schools, religious institutions and economic centers throughout Foster City in the context of the ground shaking hazard map. Schools and religious institutions are spread throughout the City's neighborhoods, while critical facilities and most commercial buildings comprising the City's economic base are primarily located within the northern half of the City.

The local hazard mitigation planning team noted the exposure of the various buildings but determined that the buildings' use was the most important factor in prioritization of the assets and creation of mitigation strategies.

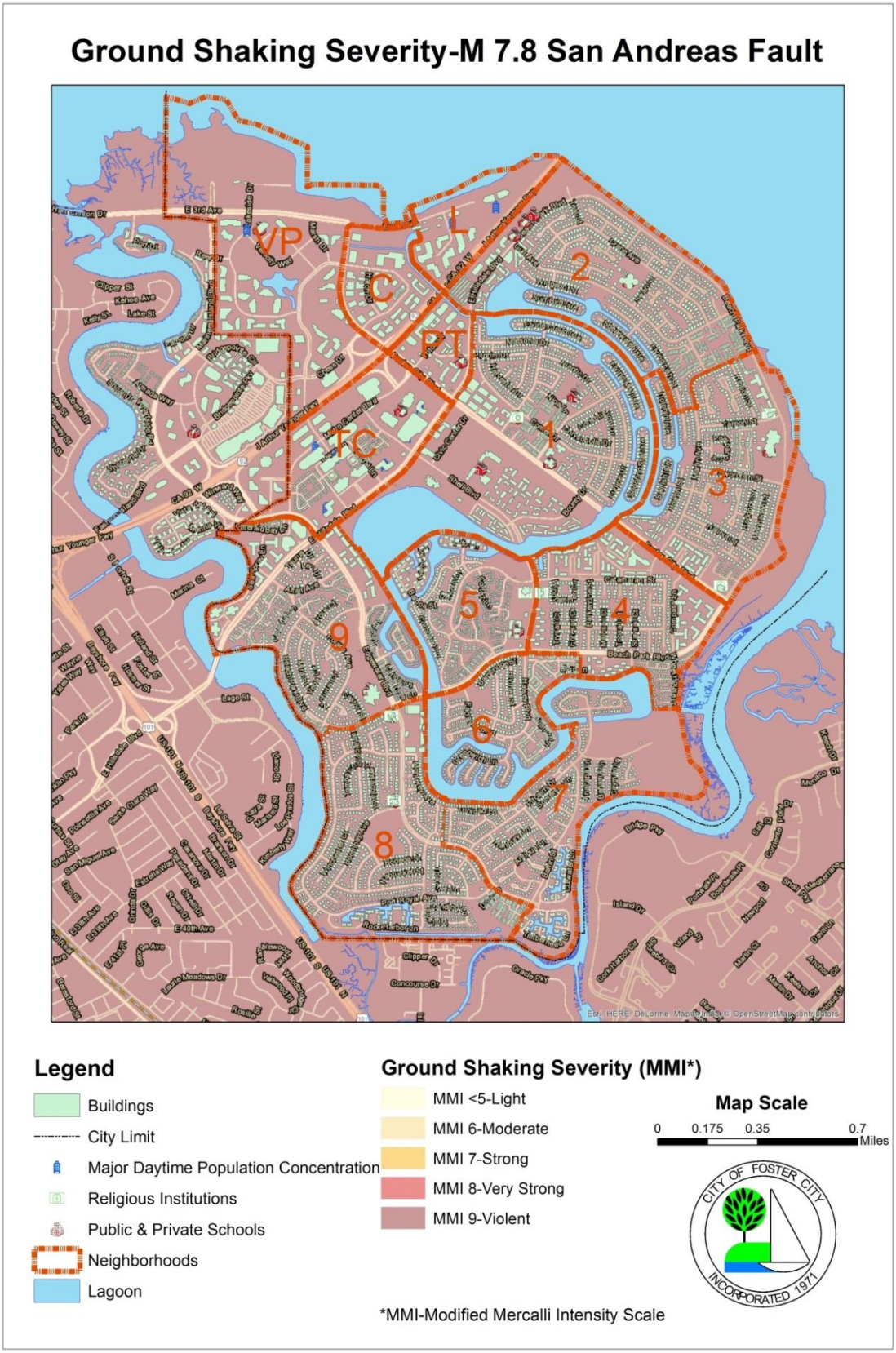


Figure 7-4. Vulnerability of Structures to Ground Shaking

7.3.2.2 Earthquake Liquefaction

Any structure in liquefaction prone areas may be susceptible to damage if the soil beneath liquefies. When soils liquefy, buildings can settle unevenly, damaging the structure and requiring extensive foundation work if the building is deemed salvageable, even if the building structure itself has been able to withstand ground shaking. In many cases of severe liquefaction, buildings with damaged foundations may require demolition and rebuilding. Single-family homes, commercial buildings under ten stories, and industrial and commercial buildings are typically built with foundations that are more vulnerable to liquefaction. However, even buildings with mat or pile foundations designed for liquefaction hazards are at risk of settlement damage. Additionally, utility connections to the building can also be damaged by liquefaction, causing the building to be unusable even if it remains intact.

Damage can be more severe if the liquefaction occurs on ground that also has a slope, as the building can also slide on the slope, which was the case in San Francisco's Marina District in the 1989 Loma Prieta earthquake. Even with the only slight gradient in the Marina District, portions of the liquefaction zone moved up to two feet,[56] which was enough to damage buildings and break utility connections.

In **Foster City**, site-specific geotechnical analysis is required for all new construction to ensure that the most appropriate foundation design is utilized in order to minimize impacts from geologic hazards, including liquefaction and settlement. Buildings more than four stories in height are typically supported on piles that would minimize impacts from liquefaction and ground shaking. Although ABAG and USGS maps indicate that the City is in a high to very high potential for liquefaction area, specific soil studies done in various areas indicate a moderate to high potential for liquefaction. The Foster City Public Works Department reviewed several soil studies conducted in various areas of the City and for some studies, after additional analysis, noted that the settlement due to liquefaction is negligible in some areas to up to 1" of settlement anticipated. In some cases, the design of the foundations address measures to minimize the potential for liquefaction. In addition, for slab on-grade homes, designs of foundations are designed to minimize the impacts that could be caused by said settlement.

7.3.2.3 Tsunami/Seiche

Nearly all structures in California that are exposed to tsunamis will be damaged if the tsunami is large enough. In areas with a greater threat of large tsunamis such as Japan, some structures have been specifically designed to withstand tsunami forces. This level of design is not common in California; therefore if a building is exposed to a tsunami, the design of the structure is not likely to influence its performance. Protective measures (seawalls or bay levees) can try to reduce the exposure of the tsunami, but building design in the Bay Area does not play a significant role. The tsunami inundation projections in the **Foster City** area are that only the area outside the levees would be affected. There are no structures in this area.

7.3.2.4 Flooding

Wood frame buildings are likely to receive significant damage as they are unable to withstand hydrostatic pressure from flooding and wood is vulnerable to water damage. Structures with habitable space below grade are vulnerable to sea level rise, storm events, and elevated groundwater. Essential mechanical and electrical equipment in buildings are highly water and salt sensitive, and are often located below-grade or on the ground floor.

[56] USGS (1992)

Most residences, employment sites, and community facilities are highly susceptible to damage from sea level rise because of their construction methods or materials. When flooding damages these structures, the release of hazardous materials including paints, cleaners, oils, batteries, pesticides, asbestos, and medical waste can occur.

Climate change is forecast to produce more flooding hazards in addition to sea level rise, due to more intense storms.[57]

In **Foster City**, the City's levees and lagoon system protect the City from flooding. The lagoon system serves as the City's storm water detention area, with the water level managed through the use of tide gates and pumps. The City is in the process of designing levee improvements to protect the City from flooding and future sea level rise.

7.3.2.5 Fire

Buildings in the urban environment are more prone to fires that start in the inside, or that grow from a fire in a neighboring structure. There are many designs that have been implemented to reduce urban fires, including fire sprinklers, which can extinguish small fires and reduce the speed at which large fires spread.

One unique fire risk is the potential for fire following an earthquake. Natural gas pipelines that connect at the street may break, or gas appliances in the house that shift or fall may also break gas lines. Gas fires, or those caused by electric failures, may produce more ignitions than fire fighters have resources to respond with. Some jurisdictions have required automatic gas shut off valves be placed on the street to reduce this risk, and improvements to the building code to reduce regular urban fire risk (i.e. sprinklers) have the potential to reduce the impact of a fire following an earthquake.

Foster City adopted stringent fire safety regulations for high rise buildings (75 feet) and in mid-rise buildings four or more stories in height (but below 75 feet) before they were required by later codes. The Fire Department conducts fire inspections annually on high rise buildings, in addition to company level fire inspection programs, ongoing district familiarization and the identification of target hazards. The use of residential sprinklers has improved the fire safety in buildings constructed since they were required in 1982 under National Fire Protection Association (NFPA) 13D standards.

7.3.2.6 Drought

Buildings are not directly damaged by drought, but their design can contribute to the hazard. In the case of drought, buildings without low flow features and/or with water intensive landscaping will require more water to function. Buildings and landscapes with water conservation designs improve the ability of a community to withstand the water supply problem presented by droughts.

In **Foster City,** water conserving fixtures and landscapes are required in all permitted new construction and/or encouraged through the water rate structure.

[57] U.S. Global Change Research Program (2014), Climate Change Impacts in the United States, p. 15. http://nca2014.globalchange.gov/.

7.4 Utility and Transportation Infrastructure/Facilities & Systems

Disruptions to communications, water, and transportation networks can cause emergencies to cascade into disasters. In day-to-day lives, Bay Area communities are heavily reliant on local, regional, state, and interstate utility and transportation systems. For homes and businesses to remain functional, their buildings must not only have minimal damage, but must also be connected to operating water, power, and sewer systems.

Annual outages caused by winter storms are reminders of personal and business reliance on critical infrastructure. In small emergencies, systems are disrupted for limited periods of time, or disruption is isolated to a single system, making the outage manageable for most. In large disasters, outages can last days, weeks, and months, and occur across multiple infrastructure systems at once. Because of our reliance on expansive linear systems, a single failure can impact the entire system. This type of failure can ripple and impact many more people that the hazard itself. For example, many portions of a community may not experience damage from flooding, but if flooding damages a key transportation corridor, a power substation, or sewage treatment plant, those outside of the flood zone will still be severely impacted by loss of services.

Natural hazards can cause direct damage to infrastructure components. Because most infrastructure systems are organized as a system, a single failure can result in a system outage (i.e. if a single portion of pipeline breaks, the remainder of the system may be unusable). Additionally, the failure of one system can also impact other systems all together (i.e. if an electrical outage causes water pumps to fail). Regardless of the hazard type, linear components of different asset classes often perform similarly (i.e. in an area with liquefaction or landslides; roads, rail, pipelines, and cables may all be severed by the hazard). In some cases, linear components have undergone unique improvements (i.e. waterproofing, increased flexibility at fault crossings, etc.) that make them less susceptible than the average infrastructure component. Different fixed asset components, such as substations, generation facilities, treatment plants, transit stations, or pumping stations, can also have similar challenges. For example, most have fragile mechanical or electrical equipment below grade, or have above ground structures with similar vulnerabilities as those mentioned in the buildings section.

Interdependence is often the term used to describe functional vulnerabilities between systems. Infrastructure interdependence is the interaction of one system on another and is used to describe a number of different interactions. The interaction between systems can result in cascading outages or failures, where the outage of one system results in loss of service for another (i.e. a cell tower that is not damaged cannot provide service because it lost electricity, and remains out of service until electricity is brought back online.) The failure of one system can also result in damage to another because of collocation (i.e. a water main break causes damage to a nearby sewer line, gas line, and the roadway above), or by an inability of systems to safely shut down in an outage (i.e. a failure caused by a hazard at one electric substation creates a surge elsewhere in the system, damaging components at a substation not exposed to the hazard). The failure of systems can also make the restoration of other systems more difficult. If roads are damaged by a landslide, it may be difficult for repair crews to get to the site of other damaged infrastructure, delaying the system restoration.

7.4.1 Utility and Transportation Infrastructure Assets

7.4.1.1 Transportation

The Bay Area is reliant on roads, rail, and ports to connect homes, businesses, people, and goods. Roads provide routes for personal vehicles, buses, bikes, and pedestrians. Both passenger and cargo rail move passengers and freight throughout the Bay Area. Ports and airports are used for domestic and international passenger and cargo movement. Each mode of transportation is required for a functional region, and is critical during and after an event, to move people away from, and resources to, a hazard. When they are severely damaged, the inability to move people and goods will impact response to a disaster and greatly slow the recovery of the region.

At a regional level, there are multiple routes and modes that individuals can choose to get around the region. The failure of any one component within the network will have cascading impacts across other corridors and transportation modes. Corridors with no damage may become gridlocked when transportation is rerouted around a damaged area. This was seen after the Bay Bridge deck failure in the 1989 Loma Prieta Earthquake. In the weeks following the earthquake, the Golden Gate Bridge experienced a record number of trips, and Bay Area Rapid Transit (BART) set ridership records. While this example highlights the partially redundant nature of some of the region's transportation corridors, some jurisdictions are reliant on a single mode or a single corridor that, if disrupted, will reduce the ability of residents and goods to move throughout the region.

In **Foster City**, local transportation is primarily on the City's streets and bridges and to a lesser extent on pathways such as the levee pedway. These assets are vulnerable to impacts from earthquakes and flooding from sea level rise. The Foster City Lagoon is primarily used for recreation but has limited potential to be used for transportation. Foster City is reliant on the adjacent regional highways, bridges and transit for access into and out of Foster City. These assets are also vulnerable to impacts from earthquakes and flooding.

Figure 7-5. Foster City Bridge and Shell Boulevard Bridge

7.4.1.2 Fuel

Refined fuel products are used for a number of processes, with the majority going towards powering motorized vehicles (cars, trucks, buses, trains, planes, boats). Some vehicle fleets have a growing number of electric or natural gas powered vehicles; however the vast majority of vehicles are reliant on refined petroleum fuel. The interruption of the fuel sector could be brief, caused by the inability to pump gas at gas stations in the days after an event while electric pumps are down, or could be a prolonged issue if the Bay Area fuel system is damaged in the event.

7.4.1.3 Natural Gas

Natural gas is used for heating and cooking in many homes and businesses, and is also supplied in large quantities for many industrial processes. Natural gas also fuels two-thirds of regionally generated electricity.[58] An interruption of the natural gas system could directly impact the heating of homes and businesses, and shut down dependent business sectors (restaurants and industrial facilities). Natural gas systems, as with many other utilities, are also important because they themselves can be a hazard if they are damaged. In the case of natural gas, the major fear is that a damaged pipeline leaking gas may ignite, which can spread to nearby homes and businesses. The San Bruno gas pipeline explosion is an example, where a 30-inch gas pipeline explosion killed 8 people, injured another 66 and destroyed 38 homes. These assets are vulnerable to earthquakes.

While natural gas pipelines also run north – south along the eastern bay shore in San Mateo County, an assessment of the information available has indicated that **Foster City's** risk of exposure is low.

7.4.1.4 Electricity

Nearly all water, wastewater and communications utilities, transportation systems, homes, and businesses rely on electricity to function. Many critical facilities have backup electric generators to provide power in the case of electrical outages, as do a growing number of businesses and homes. These backup generators are reliant on access to fuel, should the electrical outage last longer than the stored fuel supply. Some of these fuel supplies can be located at some distance, and may not be accessible when needed. Homes and businesses without backup power will remain in the dark and all electronics (refrigerators, electric heating and cooling systems, computers, etc.) will remain off.

High voltage lines owned by PG&E bisect **Foster City**. They are located within easements that preclude permanent structures within them. Parking, landscaping and recreation areas are commonly located within the easements. PG&E is responsible for hazard mitigation related to these facilities. The City maintains a working relationship with PG&E regarding activities potentially affecting the power lines.

7.4.1.5 Water

Water is critical for basic survival and sanitation. It is also needed for agriculture, and many industrial processes. Emergency supplies, stored by both individuals and emergency management agencies, will likely only be enough for drinking needs for a limited time. Sanitation, agricultural, and industrial uses of water will require the functioning of the water system. The availability of water resources is vulnerable to droughts. In **Foster City**, the assets related to transport and storage of water are vulnerable to earthquakes.

[58] Association of Bay Area Governments (2014). Cascading Failures: Earthquake Threats to Transportation Utilities. http://resilience.abag.ca.gov/projects/transportation_utilities_2014/

7.4.1.6 Wastewater

Wastewater services are typically provided at the sub-regional and local level in the Bay Area. Most of the wastewater treatment facilities are located along the Bay shoreline, because the majority of the systems are gravity fed, and all of them discharge to the Bay. Depending on where the system is disrupted there could be either a complete loss of service, a partial loss of service, or a spill or discharge of untreated or partially treated wastewater. This can become a public health issue, requiring special actions be taken to contain and then clean up the discharge.

Foster City's wastewater transport system is dependent on lift stations to move the wastewater through the City and to the Wastewater Treatment Plant located in San Mateo. The wastewater transport system is vulnerable to earthquakes and power outages. The Wastewater Treatment Plant is vulnerable to earthquakes and flooding from sea level rise. See Section 8.1.6, Wastewater, for more information.

Figure 7-6. Foster Station Lift Station #59

7.4.1.7 Solid Waste

After a disaster, damage to buildings and utilities will result in a huge amount of waste material that must be sorted and recycled or disposed of. Individual homes and businesses are likely to have additional waste removal needs, as will jurisdictions struggling to clear debris. Debris removal will be needed to make roads passable, and to allow for more rapid repairs and reconstruction in areas with damaged and destroyed properties and infrastructure.

7.4.2 Utility and Transportation Vulnerability

7.4.2.1 Earthquake Ground Shaking

Ground shaking is typically less damaging to linear infrastructure pipelines, cables, and at-grade roadways than other earthquake hazards such as liquefaction. It is the nodes of infrastructure systems that are often damaged by earthquake shaking. Just as with buildings, above ground facilities (refineries, water treatment stations, pumping stations, power plants, train stations) can all be damaged by the strong accelerations experienced in earthquakes. These facilities can also be damaged by liquefaction or fault rupture.

Figure 7-7 shows the distribution of the City's infrastructure in the context of the Ground Shaking Hazard Map. Transportation, storm water, wastewater and water infrastructure and facilities are spread fairly evenly throughout the City. Some critical facilities are primarily located within the northern half of the City such as the levee, lagoon pump station and major wastewater lift stations. The local hazard mitigation planning team noted the exposure of the various infrastructure assets and determined that the assets' use was the most important factor in prioritization and creation of mitigation strategies.

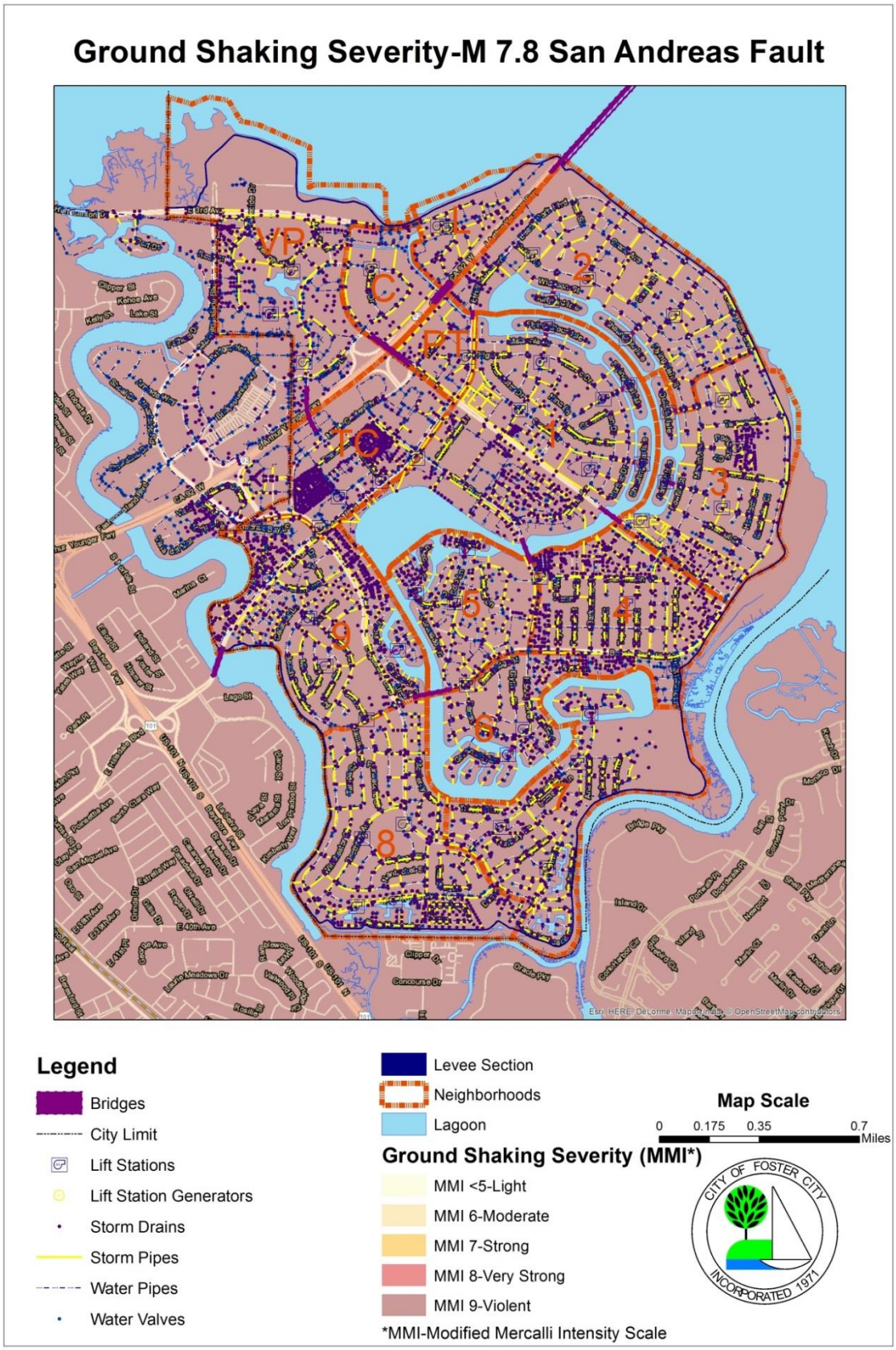


Figure 7-7. Vulnerability of Infrastructure to Ground Shaking

7.4.2.2 Earthquake Liquefaction

Earthquakes are particularly damaging to infrastructure systems, especially when surface fault rupture and liquefaction occur. Underground pipelines, cables, and other linear elements can be broken by the ground displacement caused by liquefaction. This is especially pronounced in the transition area between zones that liquefied and those that did not, resulting in differential movement, as well as in locations of lateral spreading where pipes and other underground elements can be pulled apart by the ground settling or sliding down a slope. Areas where pipelines cross river channels are vulnerable because these areas are often the most prone to liquefaction, and also due to a slope along the river bed.

Pipelines that are more buoyant than the soil can also rise out of the ground as a result of liquefaction. In past earthquakes, sewer pipelines can raise multiple feet while the soil liquefies, resulting in severe damage to the pipe, as well as to the roadway above where manholes stick up feet above the roadbed.

Infrastructure elements like roadways, rail, cables, and pipelines that are at the surface are also vulnerable to the displacement that can occur from liquefaction. For above-ground components, breaks are easier to find, and are often an easier fix. Above-ground lines routed along poles can be damaged if the poles fall over; however, this is rare except in severe cases of liquefaction or fault rupture.

7.4.2.3 Tsunami

In many ways, tsunami impacts to infrastructure are similar to those due to flood, only the impact may include greater current forces as the water inundates and then recedes rapidly. These forces are especially strong along stream channels and in marinas with small inlets. Historically, tsunamis have been particularly damaging to ports because they often create strong current flows in marinas, which can cause boats to be thrown about, which may then damage the marina infrastructure as well.

7.4.2.4 Current and Future Flooding

Flooding can impact infrastructure in a number of ways, including getting non-waterproof elements wet, exposing corrodible elements to salt water, filling elements with water, and causing scour and erosion. Although some below-ground, and even at-grade, infrastructure is designed to be wet, most elements cannot be submerged in water and many cannot get wet at all. Underground infrastructure, and particularly pipelines, can float if flooded when more buoyant than water. If floodwaters are saline, such as with inundation from the Bay, infrastructure elements that are not corrosion-resistant can be damaged beyond repair. In addition, the energy of strong water flows can scour and erode, damaging and destroying infrastructure elements. Bridge abutments in particular can be damaged if water, wind, wave, or tidal energy erodes the soil surrounding the structure. Other infrastructural elements that become exposed as soil erodes around them may be damaged by moving floodwaters.

Sea level rise will increase the likelihood that infrastructure elements are exposed to the impacts of flooding during storm events. In addition, sea level rise will begin to cause “sunny day flooding” in particular, affecting infrastructure that relies on below ground systems that are often gravity drained or have limited pumping capacity, such as storm water and wastewater systems. For example, most wastewater facilities in the Bay Area are built along the Bay shoreline as they discharge treated wastewater to a deep Bay location. As sea level rises, wastewater treatment plants will have shorter windows of opportunity to discharge into the Bay, and will be required to increase either flow storage or pumping capacity. Storm water collection and conveyance facilities will lose capacity both as the Bay and groundwater levels rise, and backups at higher than current high tides will cause street, basement, and parking lot flooding.

7.4.2.5 Fire

Fire can impact any infrastructure element. Depending on the intensity of the fire, underground components may be more protected than those on the surface or attached to poles. For above ground facilities, vulnerability is very similar to buildings, with the added damage potential that smoke can affect sensitive electrical equipment used to operate infrastructure systems. Fuel and natural gas infrastructure systems are especially important to consider because of their own flammability that could contribute to the fire hazard, and the ability of fire crews to extinguish the fires.

7.4.2.6 Drought

Drought has a direct impact on the amount of available water in the region. It indirectly influences the portfolio of energy generation available to the state, as many reservoirs are also hydroelectric facilities that produce a share of the region's power. With less water passing through these facilities, there is less electricity generated from these facilities.

7.5 Summary Tables of Exposures

The following table provides a summary of the exposure of Foster City's urban land, infrastructure, locally owned buildings, bridges and interchanges, and schools to hazards. The local hazard mitigation planning team reviewed maps and determined that the data below represents the best assessment available. Calculation of sea level rise, flood and tsunami exposures were based on the acreage of the low lying land areas outside the area protected by the City's levee system. Additionally, as discussed in Sections 7.3 and 7.4, buildings and infrastructure are not directly exposed to drought.

Although the ABAG and USGS maps designate Foster City as having high or very high liquefaction susceptibility areas, site-specific studies and historical evidence indicate that the risk may be overly stated in the ABAG and USGS maps.

Table 7-3. Summary of Hazard Exposure

Hazard	Urban Land (Acres)	Roadway (Miles)	Water Lines (Miles)	Sewer Lines (Miles)	Schools (Number)	Locally owned facilities (Number)	Locally owned bridges and interchanges (Number)
Total Assets	2,245	98	69.3	40.2	13	18	6
Earthquake Faulting Exposure	0	0	0	0	0	0	0
Earthquake Shaking (within highest two shaking categories) Exposure	2,245	98	69.3	40.2	13	18	6
Liquefaction (within moderate, high, or very high liquefaction susceptibility) Exposure	2,245	98	69.3	40.2	13	18	6
Flooding (within 100 year floodplain) Exposure (with levee improvements)	150	0	0	0	0	0	0
Flooding (within 100 year floodplain) Exposure (without levee improvements)	2,245	98	69.3	40.2	13	18	6
Flooding (within 500 year floodplain) Exposure	2,245	98	69.3	40.2	13	18	6
Dam Inundation (within inundation zone) Exposure	2,245	98	69.3	40.2	13	18	6
Sea Level Rise Exposure (2050 with levee improvements)	150	0	0	0	0	0	0
Sea Level Rise Exposure (2050 without levee improvements)	2,245	98	69.3	40.2	13	18	6
Tsunamis (within inundation area) Exposure	150	0	0	0	0	0	0
Drought Exposure	2,245	Not Applicable (N/A)	N/A	N/A	N/A	N/A	N/A

8 CAPABILITY ASSESSMENT

8.1 Plans and Programs in Place

Based on the guidance found in FEMA's Local Mitigation Planning Handbook, the local hazard mitigation planning team reviewed the Capability Assessment Worksheet. Local mitigation capabilities are existing authorities, policies, programs, and resources that reduce hazard impacts or that could be used to implement hazard mitigation activities. In addition to the capabilities described in detail later in this section, other capabilities in the form of Planning and Regulatory, Administrative and Technical, Financial, and Education and Outreach have been referenced throughout this document and are summarized at a high level in Table 8-1.

Table 8-1. Capabilities to implement Hazard Mitigation Strategies

Planning and Regulatory	Administrative and Technical	Financial	Education and Outreach
• General Plan • Capital Improvement Plan • Emergency Operations Plan • Climate Action Plan • Urban Water Management Plan • Lagoon Management Plan • Estero Municipal Improvement District Code • Building Codes • Fire Department ISO rating • Site plan review requirements • Foster City Municipal Code • Flood insurance rate maps	• Planning Commission • Maintenance Programs • Mutual aid agreements • Staff (Chief Building Official, Floodplain Administrator, Emergency Manager, Community Planner, Civil Engineer, GIS Coordinator) • Warning systems/ services • Hazard data and information • Grant writing	• Capital improvements project funding • Authority to levy taxes for specific purposes • Fees for water and sewer services • Impact fees for new development • Other state and federal funding programs	• Local citizen groups and non-profit organizations • Ongoing public education and information program • Public-private partnership initiatives addressing disaster related issues

8.1.1 Seismic Safety

The high potential for seismic related events in the region poses a variety of geologic hazards to structures and people. Ground shaking from earthquakes can cause significant structural damage of buildings. Severe structural damage to buildings can lead to structure failure, which places people at a significant risk to injury or death. As future development and infrastructure projects are considered by the City, each project will be evaluated for conformance with the seismic design standards contained within the California Building Code, Foster City's General Plan, Zoning Ordinance, other applicable regulations and the City's Standard Conditions of Approval (SCOAs). Compliance with all applicable regulations and seismic design standards, which are required for all construction projects in California, and the City's SCOAs, would ensure that future projects are not unduly susceptible to the effects of seismic ground shaking.

In the 1989 Loma Prieta Earthquake, **Foster City** experienced some broken utility lines, minor local bridge damage (no local bridges were closed) and minor building damage (no buildings were declared uninhabitable). Although the underlying geology of the area results in mapping that shows a relatively high exposure to seismic hazards such as ground shaking and liquefaction according to USGS maps, the review of individual geotechnical reports prepared for various projects indicates that the risk for liquefaction is minimal in some areas and in areas with higher risk can be mitigated with appropriate building design that has been incorporated into projects.

The Safety Element of the existing General Plan establishes policies and programs that are designed to protect structures, improvements, and people, from geologic hazards, including seismic related hazards. Policy S-1 requires the use of the most current uniform codes to review permits for new and modified structures. Policy S-2 requires the City to educate the public about seismic hazards in Foster City. Policy S-3 requires the City to take measures to prevent damage to the City's infrastructure and emergency facilities resulting from seismic and geologic hazards. Program S-a requires site specific geotechnical and engineering reports for new structures. Program S-c requires the City to include seismic safety education in the Fire Department's public education programs. Program S-d requires the City to include an assessment of non-structural seismic hazards as part of annual inspections of businesses as part of a public education program. Additionally, the City's adopted Standard Conditions of Approval are designed to protect structures, improvements, and people, from geologic hazards including seismic related hazards. Specifically, SCOA 2.2 requires a site-specific, design level, fault zone geotechnical report with recommendations to minimize seismic damage prior to the issuance of a building permit.

8.1.2 Flood Protection

Foster City is protected from flooding hazards by approximately 43,000 linear feet (8 miles) of levees that surround the perimeter of the City. Foster City has recently prepared a *Levee Protection Planning Study*[59] of flood hazards, the levee system, sea level rise and potential levee improvement alternatives. The information in this section is taken from that study. The Levee Protection Planning Study concluded that the levee surrounding Foster City will have to be raised by approximately 2.5 to 5.5 feet, depending on the location, to meet FEMA accreditation requirements. There are opportunities to conduct levee improvements to meet Sea Level Rise freeboard projections (11 inches by 2050, 3 feet by 2100), accommodate future settlement, and provide a margin of safety regarding future FEMA restudies. The Council will provide policy direction whether or not to address Sea Level Rise and to what extent.

[59] Schaaf & Wheeler (2015). City of Foster City Levee Protection Planning Study, Updated July 2015.

Flood Hazard Mitigation in Foster City

Approximately 9,000 properties in Foster City are protected from the one-percent annual chance of flooding by the City's levee system. An additional 8,000 properties in the City of San Mateo are also protected by the Foster City levee system. Conversely, the approximately 9,000 properties in Foster City are protected from the one-percent flood by San Mateo's levee and floodwall systems south of San Mateo Creek.

The City's lagoon system also minimizes the potential for flooding due to storm water flows. Storm water in Foster City flows to the Foster City Lagoon (except for a small area that flows to San Mateo's Marina Lagoon), where the water level is managed with tide gates and pumps. As a result, Foster City has not experienced flooding during flood events that have impacted other areas of San Mateo County. Foster City does not have any "repetitive loss" properties. A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A RL property may or may not be currently insured by the NFIP.

Foster City participates in FEMA's National Flood Insurance Program through the adoption of Chapter 15.36, Floodplain Management Regulations, of the Foster City Municipal Code. These regulations apply to properties located within a special flood hazard area as designated on the Flood Insurance Rate Map (FIRM) prepared by FEMA. In Foster City the only properties that are in a special flood hazard area are outside the levee system.

History of Levee System

The original perimeter levee system in Foster City was put in place in the early 1900s to reclaim tidal mud flats for agricultural use. The development of Foster City in the 1960s made use of the existing perimeter levee system to provide protection for the new development.

In 1984 FEMA issued a new Flood Insurance Rate Map (FIRM) for the City which significantly altered the presumed level of flood protection provided by the levee system. The City appealed the new maps and hired Robert H. Born Consulting Engineers, Inc. to prepare an analysis of the levee system. Foster City raised the levee system by about 18 inches in 1995 in response to the recommendations made in the Born Report.

Figure 8-1. Foster City Levee

Levee Accreditation

Title 44 of the Code of Federal Regulations (44 CFR) Section 65.10 provides the minimum design, operation, and maintenance standards levee systems must meet and continue to meet in order to be recognized as providing protection from the base flood on a FIRM. These include requirements related to:

- Freeboard (different requirements for riverine levees vs. coastal levees to include wave runup)
- Geotechnical standards
    - Embankment protection
    - Embankment and foundation stability
    - Settlement
- Closures
- Interior drainage

The U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA) certified Foster City's levee in 2007 as providing protection from the one-percent annual chance (base) flood. This flood is often called the "100-year flood," but should not be confused with an event that is expected to occur only once every 100 years. It is the event that has the one-percent chance of occurring every year.

Currently, land within the Foster City limits and "behind" the levee system is classified as Shaded Zone X, where mandatory flood insurance is not required. In 2011 the City of San Mateo improved its levee system south of San Mateo Creek and received FEMA accreditation in March 2012. This accreditation is still recognized.

The FIRM for San Mateo County that became effective October 16, 2012 shows all of Foster City outside of the Central Lagoon and "behind" the levee system classified as Shaded Zone X. This designation shows the area protected from one-percent flooding by an accredited levee system.

FEMA recently updated its analysis of the flood hazards posed by San Francisco Bay through the California Coastal Analysis and Mapping Program (CCAMP). Details of this study are provided in the Foster City Levee Protection Planning Study. FEMA has indicated that once new maps become effective (anticipated in 2016), Foster City's levees will no longer be considered accredited against coastal flood hazards. When the new maps become effective in 2016, Foster City will be designated as a high-risk Special Flood Hazard area. However, provided progress is made to the satisfaction of FEMA through the Seclusion Mapping Process to improve the levees, property owners will not be required to purchase flood insurance. The purpose of seclusion mapping is to recognize that the Foster City levees are no longer accredited by FEMA and while there are no immediate changes to the mapped flood hazards and no change in the need for mandatory flood insurance, FEMA reserves the right to remap the area bound by the seclusion in the future as additional study warrants. Seclusion mapping allows the properties in Foster City to remain outside of the flood zone provided that sufficient progress is being made to correct inadequacies of the levee system. The City is currently working on a project to raise the levee to meet FEMA requirements. The City has awarded contracts for preliminary design, consulting services related to funding options and environmental impact report. The City's timeline for completion of the improvements is mid-2020.

Evaluation of Existing Levees

The Levee Protection Planning Study evaluated the entire Foster City levee system using the stated requirements from 44 CFR 65.10 to analyze the freeboard based on the 100-year stillwater and maximum wave runup elevations determined by FEMA through CCAMP. Based on this analysis, it was found that 36,000 feet or roughly 85 percent of the levee system does not meet FEMA's freeboard requirements. Furthermore, 2,000 feet of the levee system would be overtopped by the one-percent Stillwater elevation. The average height increase required is about two feet and the maximum height increase is four feet. These values do not consider sea level rise or settlement, which could amount to an additional 1.5 feet.

Protection Against Levee Failure

The City is proactively maintaining the Levee system to minimize the potential for levee failure. Failure of the levee would result in flooding for Foster City. The City performs quarterly inspections of the levee as called for in the City's Levee Operation and Maintenance Manual as revised in 1994 and using inspection protocols and forms updated in 2010.[60] The quarterly inspections review overall operations regarding:

[60] ENGEO Incorporated, Levee Survey and Inspections Report, November 11, 2010.

- Project Operations and Maintenance Manual
- Emergency Supplies and Equipment
- Flood Preparedness and Training

The quarterly inspections review each segment of the levee system for:

- Unwanted vegetation growth
- Depression and rutting
- Erosion/bank caving
- Slope stability
- Cracks
- Animal control
- Encroachments
- Riprap and revetments and banks
- Concrete surfaces
- Flap gates
- Settlement

Evaluation of Future Sea Level Rise

The Levee Protection Planning Study examines the resiliency and adaptability of the Foster City levees to provide flood protection against coastal hazards from San Francisco Bay when considering future sea level rise that may result from global climate change. Resiliency refers to the robustness of a flood protection solution should San Francisco Bay water levels increase over time in response to certain sea level rise scenarios. Adaptability refers to how easily the protective elements could be altered to accommodate those sea level rise scenarios.

In March 2013, the State of California adopted the 2012 National Research Council Report, *Sea Level Rise for the Coasts of California, Oregon, and Washington: Past Present and Future* (NRC Report) as the best available science on sea level rise for the State and published guidance on incorporating sea level rise into State planning. The California Coastal Commission (CCC) also supported the use of the NRC Report as the best available current science. Low and high range projections are used to reflect the uncertainty bounds inherent in developing the projections and applying them to a single location. Table 8-2 provides a summary of the range of Sea Level Rise (SLR) projections contained in the 2012 NRC document.

Table 8-2. Summary of NRC Sea Level Rise Scenarios

Time Period	Low Range SLR (inches)	High Range SLR (inches)
2000 – 2030	2	12
2000 – 2050	5	24
2000 – 2100	17	66

Based on the best information available, the Levee Protection Study recommends the SLR planning scenarios for Foster City as shown in Table 8-3.

Table 8-3. Recommended Sea Level Rise Planning Scenarios for Foster City

Time Period	SLR (feet)
2000 – 2030	0.5
2000 – 2050	1.0
2000 – 2100	3.0

Corrective action taken to restore FEMA accreditation should include an extra one foot of freeboard with levee or floodwall foundations built to accommodate an extra two feet of freeboard in the future. This is based on the understanding that the levee improvements will be built to last at least until 2050 and likely longer. So the inclusion of an extra one foot of freeboard should prolong future improvements to incorporate SLR.

Levee Improvement Alternatives

The Levee Protection Planning Study concluded that the levee surrounding Foster City will have to be raised by approximately 2.5 to 5.5 feet, depending on the location, to meet FEMA accreditation requirements. There are opportunities to conduct levee improvements to meet Sea Level Rise freeboard projections (11 inches by 2050, 3 feet by 2100), accommodate future settlement, and provide a margin of safety regarding future FEMA restudies. The Council will provide policy direction whether or not to address Sea Level Rise and to what extent. The following three alternatives for improving the levee were presented:

1. Raise the levee using imported soil ($50-$75 million)
2. Construct a flood wall and earthen backfill ($40-$65 million)
3. Construct sheet piles and earthen backfill – Hybrid Design ($35-65 million)

In September 2015, the City Council awarded contracts to begin design of the levee improvements and evaluation of financing options. In October 2015, the City Council approved an agreement for preparation of the environmental impact report (EIR) on the levee improvement project. The proposed timeline includes design and permitting in 2016-2017 and construction in 2018-2020. The City's standard conditions of approval will require a site-specific geotechnical analysis for the levee improvements in order to minimize potential impacts from geologic hazards. The site-specific geotechnical analysis will address such hazards as settlement, liquefaction, and cyclic softening of clays.

8.1.3 Fire Services

Figure 8-2. Foster City Fire Department

The Foster City Fire Department (FCFD) protects lives, property and the environment from fire and exposure to hazardous materials, manages the City's Emergency Operations Center (EOC), provides emergency medical care, provides non-emergency services, educates the public regarding fire prevention and emergency preparedness, responds to non-emergency service calls on an "as available" basis, and enforces fire prevention codes.[61]

The FCFD is dispatched through Public Safety Communications along with other fire agencies in San Mateo County, in which the closest unit responds to emergency calls, regardless of jurisdiction. The FCFD also has an Automatic Aid agreement with the City of Hayward Fire Department for the San Mateo Bridge. In addition, the FCFD participates in the Master Mutual Aid System for the State of California, which provides fire resources throughout the State. The FCFD provides Advanced Life Support (ALS) with a paramedic assigned to every fire engine.

The FCFD has 33 full time employee positions, including fire captains and firefighters, a management coordinator, and an administrative secretary. The FCFD participates in a shared services model with the City of San Mateo, which provides for the Fire Chief, Deputy Fire Chief, Battalion Chiefs and an Emergency Preparedness Coordinator. In addition, Foster City and San Mateo have a contract for service with the Belmont Fire Protection District for a Fire Chief, Administrative Battalion Chief and Operational Battalion Chief services.

Fire Station 28 houses a minimum of one reserve truck that may be deployed with on duty personnel in the event of a disaster or when additional personnel arrive. Foster City's shared service relationship increases its collective manpower and returning personnel can be directed to staff additional engine and truck companies as needed.

From 2005 through 2014, annual calls received by the Fire Department ranged from a low of 1,513 in 2009 to a high of 2,243 in 2013. The majority of the calls received each year were for medical emergencies. In 2014, medical emergencies accounted for 42 percent of calls, followed by 31 percent classified as false alarms or non-emergency, 14 percent service calls, 11 percent other emergency, and 3 percent fire calls. FCFD has an average call response time of 4 to 6 minutes and achieves 98 percent response rate for medical responses, meaning the FCFD responds to all medical calls within 6 minutes, 59 seconds, 98 percent of the time.

[61] City of Foster City (2015), Final Environmental Impact Report for the Foster City General Plan Update and Climate Action Plan, p. 3.10-1.

Every fire agency earns a rating calculated by the Insurance Service Office (ISO). This rating, known as a Pubic Protection Classification (PPC), is utilized by many insurance providers to calculate insurance premiums within the district. Ratings range from 1 to 10. Class 1 generally represents superior property fire protection and Class 10 indicates that the area's fire suppression program does not meet ISO's minimum criteria. An audit by the ISO upgraded the Foster City Fire Department from a Class 3 to a Class 2 Fire Protection Rating, effective December 2000.

Foster City provides a Community Emergency Response Team (CERT) program including emergency preparedness training. As of 2015, over 700 citizens have been trained through this program with over 350 active members. The program is being expanded to include a "Business CERT" program.

8.1.4 Police Services

Figure 8-3. Foster City Police Department

The Foster City Police Department consists primarily of the Administration and Field Operations/Patrol Divisions. The Administrative Division is responsible for criminal investigations, crime prevention, youth services, crime analysis, evidence and property control, budget preparation, press and community relations. It is also responsible for records processing and storage, computer analysis and maintenance, radio communications and dispatch services for the Police Department. The Field Operations Division consists of the uniformed officers who enforce laws, make arrests, respond to calls for service, and conduct investigations. The division includes the traffic unit, the canine unit, the bicycle unit, field training officers, evidence technicians and community service officers. The Field Operations Division also focuses on intervention and prevention of youth-related crime and violence, drug activity, and domestic violence.

8.1.5 Water Supply

The Estero Municipal Improvement District (EMID) provides water and sewer service to Foster City and water service to the Mariner's Island area of San Mateo. EMID purchases all of its water from the San Francisco Public Utilities Commission (SFPUC) as a contractual member of the Bay Area Water Supply Conservation Agency (BAWSCA).

The SFPUC's water system consists of three regional water supply and conveyance systems: The Hetch Hetchy system, the Alameda system, and the Peninsula system. The Hetch Hetchy system is supplied by runoff from the upper Tuolumne River watershed on the western slope of the Central Sierra Nevada Mountains. The Alameda system includes conveyance facilities connecting the Hetch Hetchy aqueducts and the Alameda water sources to the Peninsula system. The Peninsula system includes

water facilities that connect the EMID and other Peninsula customers to the SFPUC distribution system and the Bay Division Pipelines. EMID does not have any groundwater or recycled water sources to supplement its supply.[62]

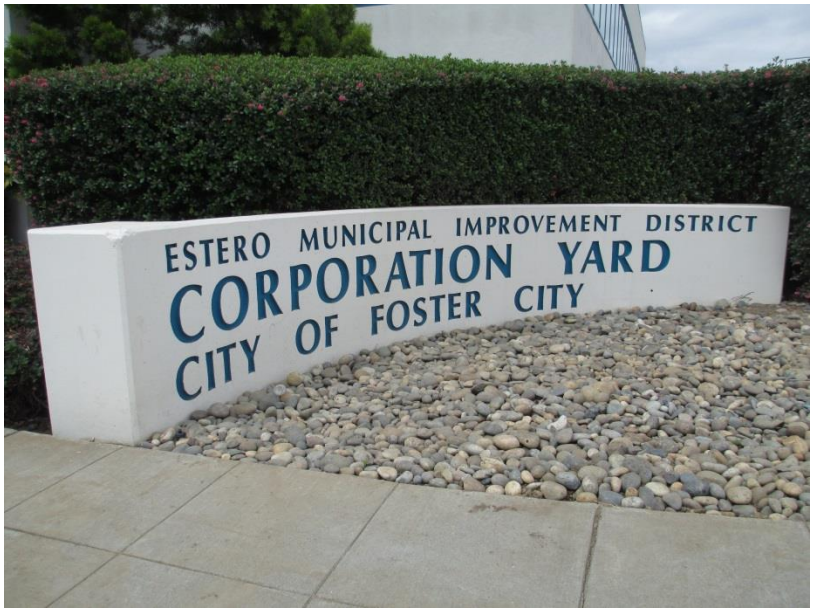


Figure 8-4. Estero Municipal Improvement District Corporation Yard

The SFPUC's water system has been undergoing a Water System Improvement Program (WSIP), a $4.8 billion dollar, multi-year capital program to upgrade the SFPUC's regional and local water systems. The program will deliver capital improvements that enhance the SFPUC's ability to provide reliable, affordable, high quality drinking water in an environmentally sustainable manner to 2.6 million people in the greater Bay Area. The program consists of 83 projects – 35 local projects located within San Francisco and 48 regional projects, spread over seven counties from the Sierra foothills to San Francisco. The objectives of the WSIP are to:

- Improve the system to provide high-quality water that reliably meets all current and foreseeable local, State, and Federal requirements.
- Reduce vulnerability of the water system to damage from earthquakes.
- Increase system reliability to deliver water by providing the redundancy needed to accommodate outages.
- Provide improvements related to water supply/drought protection.
- Enhance sustainability through improvements that optimize protection of the natural and human environment.

EMID does not hold any existing water rights – all of its water supply assurances are the result of its contract with the SFPUC. In 1984, the SFPUC executed a Settlement Agreement and Master Water Sales Contract with the members of BAWSCA. The Contract is governed by the Master Sales Agreement (MSA), which expired in June of 2009. In August of 2009, BAWSCA and its member agencies signed a new Water Supply Agreement and Individual Water Sales Contract with SFPUC. The Contract runs through June 30, 2034 and guarantees a supply assurance of 184 million-gallons-

[62] City of Foster City (2015). Final Environmental Impact Report for the Foster City General Plan Update and Climate Action Plan, SCH#2012072003, September 2015, p. 3.10-9 (most of the information in this section is from this source).

per-day (MGD) to BAWSCA member agencies. The portion of that supply assurance to EMID, and BAWSCA's recent water demand projections for EMID through 2035, is shown in Table 8-4, which shows that EMID water demand is, and will remain, significantly lower than its SFPUC assured supply.

Table 8-4. EMID Current and Future Water Supply and Demand (Acre Feet/Year)

	2015	2020	2025	2030	2035
Normal Year Supply	6,608	6,608	6,608	6,608	6,608
EMID Demand Projections	4,495	4,551	4,506	4,473	4,484
Annual Excess	2,113	2,057	2,102	2,135	2,135
Percent Excess	32	31	32	32	32

Source: BAWSCA, 2014 Regional Demand and Conservation Projections; Estero Municipal Improvement District, 2010-2015 Urban Water Management Plan

Although the Master Agreement and accompanying Water Supply Contract expire in 2034, the Supply Assurance (which quantifies San Francisco's obligation to supply water to its individual wholesale customers) survives their expiration and continues indefinitely.

According to SFPUC's Water System Improvement Program (WSIP), the supply assurance is subject to reductions in the event of drought, water shortage or earthquake, or rehabilitation/maintenance of the system. Table 8-5 shows SFPUC's projected deliveries to EMID for a single dry year or for five consecutive dry years, based on the 2015 allocation of 6,608 acre-feet-per-year (AFY). The SFPUC WSIP calls for 10 percent supply reductions in the first 2 dry years, followed by 20 percent reductions for the next 3 dry years. The percent reductions should be the same for any given five consecutive dry years. During the period of supply reductions, EMID would have to reduce demand by implementing its Water Shortage Contingency Plan adopted in 1993.

Table 8-5. Projected EMID Supply Assurance for a Single and Multiple Dry Years

	2015	Dry Year 1	Dry Year 2	Dry Year 3	Dry Year 4	Dry Year 5
Supply (AFY)	6,608	5,947	5,947	5,286	5,286	5,286
% Reduction	--	10%	10%	20%	20%	20%

The existing connection to SFPUC is via a single 24-inch main approximately 19,800 feet long which travels, in San Mateo, along East Third Avenue, Ninth Avenue, and Crystal Springs Road to the SFPUC's Crystal Springs No. 2 pipeline. In addition to the 24-inch transmission main, EMID has two separate 12-inch emergency supply connections with California Water Service Company (which serves the City of San Mateo) and with Mid-Peninsula Water Agency (formerly called Belmont County Water District, which serves the cities of Belmont, San Carlos, and part of Redwood City). EMID has agreements with both agencies that allow EMID to use these connections during emergency situations. EMID owns and operates three steel water tanks and one concrete tank. Each steel tank can store four million gallons and the concrete tank can store eight million gallons, for a total storage of twenty (20) million gallons.[63]

[63] Estero Municipal Improvement District (2010), 2010-2015 Urban Water Management Plan, p.3.

Figure 8-5. Foster City Water Storage Tanks

Booster pumps are necessary to pump water from the storage tanks into the distributions system. The booster pump station has two electrical pumps and four engine driven pumps. The engine driven pumps are powers by natural gas with propane backup.

EMID is required to prepare an *Urban Water Management Plan* every five years to project water demand and supply availability as well as plans to address potential water shortages. EMID also is required to prepare Water Supply Assessments for proposed developments.

Peakload Water Supply Requirements

The most recent Water Supply Assessment prepared by EMID[64] includes a comparison of the supply allocations and projected total system demand through the twenty year planning horizon as required by SB 610. During a period of five consecutive dry years, the SFPUC's plan calls for 10 percent reductions in the first 2 years followed by 20 percent reductions for the next 3 years. To meet the reductions, EMID will have to cut back its consumption in kind by implementing the Water Shortage Contingency Plan based on the severity of the drought (see below for more detail).

The Water Supply Assessment concludes that there will continue to be sufficient supplies to meet all projected demand, including the net additional demand generated from proposed development projects in all conditions until year 2030. This conclusion is dependent on EMID implementing the mandatory demand reduction as outlined in the EMID Water Shortage Contingency Plan.

[64] Estero Municipal Improvement District (2016), Water Supply Assessment for the Lincoln Center Life Sciences Research Campus Project EIR, p. G-15-16.

EMID Water Supply Shortage Contingency Plan[65]

The EMID Water Shortage Contingency Plan was adopted in January 1993 in response to the Assembly Bill X1-11 requiring all California urban water retailers supplying water to more than 3,000 customers, or supplying more than 3,000 acre-feet-per-year (AFY) of water, to adopt a water shortage contingency plan as part of the Urban Water Management Plan. EMID's Water Shortage Contingency Plan includes four (4) stages with associated triggering levels.

Stage I: This is the normal stage where there is a continuing effort to conserve water regardless of water supply. This stage involved public education and enforcement of current regulations such as requiring the installation of ultra-low-flow toilets in new construction.

Stage II: This stage is triggered when the total volume of SFPUC water storage falls below the 2-year demand base by 5 to 20 percent. The Stage II shortage will result in mandatory water conservation with a goal of reducing water demand 5 to 20 percent as determined necessary by the EMID Board. A resolution declaring a water shortage emergency with a list of prohibited water uses will be adopted by the EMID Board of Directors. This stage will include increased public education, such as water bill inserts advising customers how to conserve water.

Stage III: This stage is triggered when the total volume of SFPUC water storage falls below the 2-year demand base by 20 to 30 percent. The Stage III shortage will result in mandatory water conservation with a goal of reducing water demand 20 to 30 percent as determined necessary by the EMID Board. In this stage and the next stage, a larger range of prohibited uses will be considered and a new rate structure with progressive penalties for overuse will be implemented.

Stage IV: Stage IV is triggered when the total volume of SFPUC water storage falls below the 2-year demand base by 30 to 50 percent. In this stage a mandatory rationing program will be initiated with a goal of reducing water demand up to 50 percent.

Table 8-6 shows the 3-year estimated minimum water supply from SFPUC to EMID as a three-year worst case supply projections (e.g., in case of drought or other causes of reduced water supply) based on the 2010-2015 Urban Water Management Plan allocation. The calculated supply would not meet the projected demand on any single dry year, from 2015-2030. In this case, EMID would implement additional measures to reduce consumption (as described in the Water Shortage Contingency Plan of the 2010-2015 Urban Water Management Plan). These measures could include enforcement of regulations to reduce wasting of water, water conservation/public education programs, and water rationing measures in periods of longer-term shortage.

[65] Estero Municipal Improvement District (2016), Water Supply Assessment for the Lincoln Center Life Sciences Research Campus Project EIR, p. G-11.

Table 8-6. Projected Deliveries for Three Multiple Dry Years

		Current Deliveries During Multiple Dry Years		
	One Critical Dry Year	Year 1	Year 2	Year 3
SFPUC System-Wide Shortage (%)	10%	10%	20%	20%
Wholesale Allocation (MGD)	152.6	152.3	132.5	132.5
EMID Allocation Factor (%)[66]	3.00	3.00	3.00	3.00
EMID Allocation, AFY	5,132	5,132	4,456	4,456
EMID Allocation, MGD	4.58	4.58	3.98	3.98
Allocation as % of 5.9 MGD Assurance	78	78	67	67

Water Quality[67]

The major water source originates from the spring snowmelt flowing down the Tuolumne River to the Hetch Hetchy Reservoir, where it is stored. This water source meets all Federal and State criteria for watershed protection. Additionally, stringent disinfection treatment practices, extensive bacteriological-quality monitoring, and high operational standards are maintained.

Hetch Hetchy water is supplemented with surface water from two local watersheds. Rainfall and runoff from the Alameda Watershed – within the greater 128,424-acre Southern Alameda Creek Watershed and spanning more than 35,000 acres in Alameda and Santa Clara counties – are collected in the Calaveras and San Antonio reservoirs and treated at the Sunol Valley Water Treatment Plant.

Rainfall and runoff from the 23,000-acre Peninsula Watershed in San Mateo County are stored in Crystal Springs, San Andreas, and Pilarcitos reservoirs and treated at the Harry Tracy Water Treatment Plant in San Bruno.

In 2011, the Hetch Hetchy Watershed provided approximately 85 percent of the total water supply, with the remainder contributed by the two local watersheds.

In order to ensure that tap water is safe to drink, the United States Environmental Protection Agency (USEPA) and California Department of Public Health (CDPH) prescribe regulations that limit the amount of certain contaminants in water provided by public water systems.

SFPUC Water Quality Division regularly collects and tests water samples from reservoirs and designated sampling points throughout the system to ensure that the water delivered to customers meets or exceeds Federal and State drinking water standards. In 2011, Water Quality staff conducted more than 69,875 drinking water tests in the transmission and distribution systems. This monitoring effort is in addition to the extensive treatment process control monitoring performed by treatment plant staff and online instruments. In addition to monitoring done by SFPUC, EMID staff conduct water quality monitoring and testing throughout EMID's service area to assure compliance with the California Department of Public Health standards.

[66] In a dry year where system-wide mandatory reductions are necessary, the SFPUC System-Wide Shortage Percentage is calculated based upon the total system demand in the prior non-drought year and the total available water supplies. The Wholesale Allocation is then determined based upon the Tier 1 Drought Allocation Plan. The EMID Allocation factor is calculated from the Tier 2 Drought Allocation Plan, which is based on a variety of factors including each Wholesale Customer's historical water purchases over the last 3 years. The EMID Allocation Factor is based on the Tier 2 Drought Implementation Plan (DRIP) value of 3.00% and a total system demand of 238 MGD as calculated for the 2010 Urban Water Management Plan Tier 1 Drought Allocation Plan and the Tier 2 Drought Allocation Plan model runs. See Appendix F of the EMID 2010-2015 Urban Water Management Plan.

[67] City of Foster City (2015), Final Environmental Impact Report for the Foster City General Plan Update and Climate Action Plan, p. 3.10-11.

8.1.6 Wastewater

Wastewater collection services for Foster City are provided by EMID and wastewater treatment is provided at the jointly-owned San Mateo Wastewater Treatment Plant. EMID's wastewater collection system consists of more than 66 miles of sanitary sewer lines, more than 8.5 miles of sewer force mains, 44 pumping stations, 15 permanent standby generators, and four portable generators. After collection, wastewater is pumped to the San Mateo/EMID Wastewater Treatment Plant (WWTP) for treatment.

The San Mateo/EMID Wastewater Treatment Plant operates under a Joint Powers Agreement between the City of San Mateo and EMID. EMID owns approximately 25 percent of the treatment plant. The treatment plant has an average daily dry weather flow capacity of 15.7 MGD, of which 4.3 MGD is the purchased capacity for EMID per the Joint Powers Agreement. In 2013, the WWTP had an average daily dry weather flow of 12.3 MGD. EMID's actual average daily flow was 3.1 MGD. In 2012, the treatment plant's maximum daily dry weather capacity was 22.0 MGD and its maximum peak hour dry weather capacity is 39.5 MGD. According to the Foster City Public Works Director, the daily dry/wet weather capacity of the plant, which has not been reconfigured since 2012, has not changed significantly. Based on current flow data, average daily flows are below the capacities anticipated in the Joint Powers Agreement.

Figure 8-6. San Mateo/EMID Wastewater Treatment Plant

The jointly owned WWTP is an aging facility that needs improvements to continue to meet current and future flows and permit requirements. The National Pollutant Discharge Elimination System (NPDES) permit issued to the WWTP in 2013 included special provisions requiring the development of a comprehensive integrated Master Plan to address flow projections through the year 2035 by combining San Mateo's Collection System CIP with the WWTP Master Plan Improvements.

As a result, a comprehensive 20-year Integrated Wastewater Master Plan (Clean Water Program) was developed by Carollo Engineers. The program addresses the following key elements:

- Repair and replacement of aging infrastructure
- Provide adequate capacity to treat projected flows
- Meet current and future regulatory requirements
- Meet the City's sustainability objectives including recycled water

The estimated share of the WWTP costs for EMID is approximately $116 million. EMID is in the process of evaluating the feasibility of the projects, reviewing cost allocations and developing a funding strategy.

8.1.7 Evacuation Routes

Evacuation routes can include a roadway, waterway or trail that will allow an orderly removal of people and possessions from an area endangered due to floods, hazardous materials or other emergency. There are basically two types of evacuation routes: major evacuation routes (those that allow use by automobiles) and minor evacuation routes (those that allow use by pedestrians and bicyclists). Evacuation routes for Foster City are limited by the waterways and freeways that surround the City.

Foster City participates in the San Mateo County Smart Corridors Project, through a Memorandum of Understanding adopted in 2008. The Smart Corridors Project includes as one of its objectives to enhance the ability to respond to emergencies and incidents to improve safety and reduce impacts to the transportation system.

The use of any particular evacuation route would depend on the type and location of a specific emergency, which, if any, routes had sustained damage, and many other factors. Selection of evacuation routes in an emergency would be under the purview of law enforcement and/or the City's Emergency Services Director, usually the City Manager.

Evacuation by water is not likely to be useful due to the fact that both the Foster City Lagoon and San Mateo's Marina Lagoon are enclosed waterways and that boats suitable for evacuation of large numbers of people are not available. The use of Werder Pier for evacuation by boat is also not considered likely due to the deterioration of the structure, ownership by San Mateo County and costs of constructing facilities.

The San Francisco Bay Area Water Emergency Transportation Authority (WETA) is a regional public transit agency tasked with operating and expanding ferry service on the San Francisco Bay and with coordinating the water transit response to regional emergencies. WETA currently utilizes its existing facilities and vessel fleet to provide emergency response and recovery transportation services and considers the agency's emergency response mandate when planning expansion terminals and routes. Additionally, WETA provides emergency response through the provision of expanded ferry service on its regular routes. WETA has criteria to assess potential ferry terminal locations that include whether there it a market for the service and has concluded that there is not a suitable market in Foster City. Even if Foster City decided to pursue a location for ferry services, the Werder Pier site is not appropriate for ferry service for many reasons, including its location in a residential neighborhood without adequate parking and its lack of accessibility to employment centers.

8.1.8 Minimum Road Widths

Government Code Section 65302(g) (1) requires Safety Elements to include a discussion of "…minimum road widths and clearances around structures, as those items relate to identified fire and geologic hazards." In **Foster City**, minimum required roadway widths are 20 feet, in order to provide adequate access for fire vehicles.

9 MITIGATION & ADAPTATION STRATEGY

9.1 Overview

The development of the mitigation and adaptation strategy involved:

- Establishing mitigation goals that represent the vision for reducing or avoiding losses from the identified hazards
- Consideration and evaluation of potential mitigation actions that could help achieve the goals
- Assessment of capabilities to implement the mitigation strategies
- Prioritization of the potential mitigation actions to identify the highest priority items and which items should be accomplished in the near term vs. longer term

9.2 Safety/Mitigation Goals

S-A. Strong infrastructure. Preserve the quality of life by ensuring the City's infrastructure and municipal services are capable of withstanding reasonably foreseeable risks and hazards.
S-B. Emergency Response. Maintain an effective emergency response program that anticipates the potential for disasters and ensures the ability to respond promptly, efficiently and effectively, to provide continuity of services during and after an emergency.
S-C. Long-term community resilience. Ensure the long-term community resilience of the community by improving the resiliency to hazards and planning for post-disaster recovery.
S-D. Empower residents and community groups. Provide on-going education/resources to empower residents and community groups to be better educated, prepared and self-reliant in order to protect themselves from unreasonable risk to life and property posed by the hazards specific to Foster City.
S-E. Build sense of community. Build a strong sense of community and allegiance among residents, employees and visitors to Foster City by ensuring access to transparent, frequently updated hazard and emergency response information before, during and after any disaster event.

9.3 Capabilities to Implement Mitigation Strategies

The mitigation strategies are based on existing local authorities, policies, programs and resources, as well as the ability to expand on and improve these existing tools. The planning team utilized the Mitigation/Adaptation Strategy Evaluation tools provided by the ABAG Resilience Program to evaluate potential strategies with respect to feasibility, social benefits, economic benefits, environmental improvement and community objectives. These capabilities are discussed in Section 8.

9.4 Analysis of Mitigation Strategies

The development and analysis of mitigation strategies included identifying the highest priority measures as indicated in Table 9-1 as well as ensuring that each identified hazard was addressed in the mitigation strategies, as indicated in Table 9-2.

The decision on priority was made based on a variety of criteria, not simply on an economic cost-benefit analysis. The planning team used the Mitigation/Adaptation Strategy Evaluation Worksheet provided by ABAG, which included criteria such as technical and administrative feasibility, political acceptability, social appropriateness, legal and economic soundness, and environmental

consciousness. The City has examined the hazard exposure to the vulnerable assets and City-owned critical facilities mentioned in Section 7. The City has determined that the combination of construction type, age and shaking exposure of the City facilities listed below is significant, and has prioritized these specific mitigation tasks for the next five years. Project worksheets detailing the implementation process, funding strategy, responsible agency and approximate time frame are included in Appendix F. Some strategies are already in progress through the City's Capital Improvement Program planning, and those detailed project worksheets are attached in Appendix G.

The priorities will be provided to the City Council for adoption pending approval of this LHMP by FEMA. During the discussion and implementation of future plans, City departments can nominate projects that they believe will provide the greatest benefit when considering available funding. The City intends to use this same approach in the review, preparation and implementation of future projects.

Table 9-1. High Priority Mitigation Measures

Related Goal	Strategy	Hazard(s)	Timeline	Ranking
S-A Strong Infrastructure	Wastewater Treatment Plant Improvements	Earthquake Ground Shaking; Liquefaction; Flooding; Sea Level Rise	By 2025	1
S-A Strong Infrastructure	Levee Protection Planning and Improvements	Flooding; Levee Failure; Sea Level Rise	5 years	2
S-A Strong Infrastructure	Wastewater Lift Stations Rehabilitation	Earthquake Ground Shaking; Liquefaction	Ongoing in Tri-Annual Phases	3
S-A Strong Infrastructure	Evaluation/Replacement of Air Release Valves (ARVs) on the Wastewater Line between Lift Station #59 and the Wastewater Treatment Plant	Earthquake Ground Shaking; Liquefaction	5 years	4
S-A Strong Infrastructure	Water Booster Pump Station Seismic Retrofit	Earthquake Ground Shaking; Liquefaction; Fire	By 2018	5
S-A Strong Infrastructure	Potable Water Tank Seismic Evaluation Retrofit	Earthquake Ground Shaking; Liquefaction; Fire	By 2018	6
S-A Strong Infrastructure	Lagoon Pump Station Seismic Evaluation	Earthquake Ground Shaking; Liquefaction; Flood; Levee Failure; Sea Level Rise	By 2018	7
S-D Empower Residents and Community Groups	Emergency Preparedness Education and Outreach	All Hazards	Current and ongoing	8
S-A Strong Infrastructure	Water Transmission Main Evaluation	Earthquake Ground Shaking; Liquefaction; Fire	Current and ongoing	9
S-A Strong Infrastructure	Water System Pressure Reducing Station Evaluation	Earthquake Ground Shaking; Liquefaction; Fire	5 years	10
S-A Strong Infrastructure	Police Station Assessment	Earthquake Ground Shaking; Liquefaction	Long Term	11
S-A Strong Infrastructure	Recreation Center	Earthquake Ground Shaking; Liquefaction	Long Term	12

Table 9-2. Relationship of Mitigation Strategies to Hazards

Hazard	Related Mitigation Strategies
Dam Failure	S-A-1-d: Emergency Power for Critical Infrastructure S-A-1-e: Monitoring of Water, Sewer and Lagoon Systems S-A-2-b: Maintain Levees and Lagoon for Flood Protection
Drought	S-A-3-b: Water Supply S-C-2-a: Use of Uniform Codes
Earthquake Ground Shaking & Liquefaction	S-A-1-a: Protect City's Infrastructure and Facilities S-A-1-b: Police Station Assessment S-A-1-c: Recreation Center Assessment S-A-1-d: Emergency Power for Critical Infrastructure S-A-1-f: Bridge Inspections S-A-1-g: Earthquake Resilient Pipelines S-A-2-c: Lagoon Pump Station Building Seismic Evaluation S-A-3-d: Water Booster Pump Station Seismic Retrofit S-A-3-e: Potable Water Tank Seismic Evaluation Retrofit S-A-3-f: Water Transmission Main Evaluation S-A-3-g: Water System Pressure Reducing Station Evaluation S-A-4-a: Wastewater Treatment Plant Improvements S-A-4-b: Lift Station #59 Improvements S-A-4-c: Evaluation/Replacement of Air Release Valves on Wastewater Line between Lift Station #59 and WWTP S-A-4-d: Wastewater Lift Stations Rehabilitation S-C-2-a: Use of Uniform Codes S-C-2-b: Site Specific Geotechnical Analyses S-D-2-a: Geotechnical Reports Library S-D-2-b: Seismic Safety Education S-D-2-c: Non-Structural Hazards Assessment S-D-2-d: Private Utility Lines at Bridges
Tsunami	S-A-2-a Levee Protection Planning and Improvements S-A-2-b: Maintain Levees and Lagoon for Flood Protection S-A-2-c: Lagoon Pump Station Building Seismic Evaluation S-C-1-a: Incorporate Sea Level Rise Consideration into Planning Process S-C-2-a: Use of Uniform Codes S-C-2-b: Site Specific Geotechnical Analyses
Extreme Heat	S-C-2-a: Use of Uniform Codes
Fire	S-A-3-a: Water Supply and Delivery for Fire-Fighting S-A-3-b: Water Supply S-A-3-c: Water Delivery System S-A-3-d: Water Booster Pump Station Seismic Retrofit S-A-3-e: Potable Water Tank Seismic Evaluation Retrofit S-A-3-f: Water Transmission Main Evaluation S-A-3-g: Water System Pressure Reducing Station Evaluation S-B-2-e: Post-Disaster Repair of Water and Wastewater Systems S-C-2-a: Use of Uniform Codes S-C-4-a: Development Review for Fire Safety S-C-4-b: Annual Inspections for Fire Safety and Hazardous Materials S-C-4-c: Fire Sprinklers S-D-3-a: Fire Education/Prevention

Hazard	Related Mitigation Strategies
Flood	S-A-1-d: Emergency Power for Critical Infrastructure S-A-1-e: Monitoring of Water, Sewer and Lagoon Systems S-A-2-a Levee Protection Planning and Improvements S-A-2-b: Maintain Levees and Lagoon for Flood Protection S-A-2-c: Lagoon Pump Station Building Seismic Evaluation S-A-4-a: Wastewater Treatment Plant Improvements S-C-1-a: Incorporate Sea Level Rise Consideration into Planning Process S-C-2-a: Use Most Current Uniform Codes S-C-3-a: Flood Plain Regulations S-C-3-b: FEMA's National Flood Insurance Program S-C-3-c: Protect Flood Protection Qualities of Natural Areas
Levee Failure	S-A-1-d: Emergency Power for Critical Infrastructure S-A-1-e: Monitoring of Water, Sewer and Lagoon Systems S-A-2-a: Levee Protection Planning and Improvements S-A-2-b: Maintain Levees and Lagoon for Flood Protection S-A-2-c: Lagoon Pump Station Building Seismic Evaluation S-C-1-a: Incorporate Sea Level Rise Consideration into Planning Process
Sea Level Rise	S-A-1-d: Emergency Power for Critical Infrastructure S-A-1-e: Monitoring of Water, Sewer and Lagoon Systems S-A-2-a: Levee Protection Planning and Improvements S-A-2-b: Maintain Levees and Lagoon for Flood Protection S-A-2-c: Lagoon Pump Station Building Seismic Evaluation S-A-4-a: Wastewater Treatment Plant Improvements S-C-1-a: Incorporate Sea Level Rise Consideration into Planning Process S-C-2-a: Use of Uniform Codes S-C-3-a: Flood Plain Regulations S-C-3-c: Protect Flood Protection Qualities of Natural Areas
Hazardous Materials	S-C-2-a: Use of Uniform Codes S-C-4-b: Annual Inspections for Fire Safety and Hazardous Materials S-C-5-a: Hazardous Materials
Crime	S-D-4-a: Crime Prevention/Education S-D-4-b: Development Review for Crime Prevention. S-B-1-d: Police Services S-E-2-a: Crime Prevention
Transportation	S-A-1-a: Protect the City's Infrastructure and Facilities S-A-1-d: Emergency Power for Critical Infrastructure S-A-1-f: Bridge inspections S-B-2-d: Critical Intersection Lights

Hazard	Related Mitigation Strategies
All Hazards	S-A-1-d: Emergency Power for Critical Infrastructure S-B-1-a: Emergency Response S-B-1-b: Emergency Plan S-B-1-c: Mutual Aid S-B-2-a: Emergency Operations Center S-B-2-b: Back-up Emergency Operations Center S-B-2-c: Emergency Power for Critical Buildings S-B-2-d: Critical Intersection Lights S-B-2-e: Post-Disaster Repair of Water and Wastewater Systems S-C-2-a: Use of Uniform Codes S-C-6-a: Post Disaster Services S-D-1-a: CERT Classes S-D-1-b: Emergency Preparedness Education and Outreach S-E-1-a: Community Events S-E-1-b: Cross-Cultural Events

9.5 Goals, Policies and Mitigation Action Plan

The previous sections of this plan have analyzed hazards, the vulnerability of the City to these hazards and the existing capabilities to mitigate potential impacts from these hazards. The City has evaluated this information and established the following goals, policies and mitigation programs to help create a more resilient and disaster resistant community. Many ongoing mitigation programs are continued in this plan as well as new programs added (see Table 4-2 for an assessment of existing mitigation programs and whether they are carried forward in the new Plan).

Table 9-3. Foster City Mitigation Goals, Policies and Programs

Goal	Policy	Program	
S-A	**Strong infrastructure.** Preserve the quality of life by ensuring the City's infrastructure and municipal services are capable of withstanding reasonably foreseeable risks and hazards.		
	S-A-1	**Protect the City's Infrastructure and Emergency Facilities from Seismic and Geologic Hazards.** The City will take measures to prevent damage to the City's infrastructure and emergency facilities resulting from seismic and geologic hazards.	
		S-A-1-a	**Protect City's Infrastructure and Facilities.** The City will protect the City's infrastructure and facilities from damage due to seismic and geologic hazards through proper design and retrofitting older facilities to current standards.
		S-A-1-b	**Police Station Assessment**. Conduct an assessment of the Police Department facility and its use related to an earthquake to identify strategies that can improve the facility's resilience, including determining the feasibility of replacing the building. (High Priority)
		S-A-1-c	**Recreation Center Assessment.** Conduct an assessment of the Recreation Center facility (a potential emergency shelter location) and its use related to an earthquake to identify strategies that can improve the facility's resilience, including determining the feasibility of replacing the building. **(**High Priority)

Goal	Policy	Program	
		S-A-1-d	**Emergency Power for Critical Infrastructure.** The City will provide emergency power at critical City facilities such as major sewer lift stations and lagoon pumps.
		S-A-1-e	**Monitoring of Water, Sewer and Lagoon Systems.** The City will provide and maintain a consolidated remote monitoring capability for the water distribution system, the wastewater collection system and the lagoon system that can be monitored 24 hours a day by Public Works staff or Police Department staff.
		S-A-1-f	**Bridge Inspections.** Facilitate biannual inspections by the California Department of Transportation (CALTRANS) of City owned bridges (Bicentennial, Foster City Boulevard, Rainbow and Shell Boulevard) and incorporate needed improvements into the capital improvement program.
		S-A-1-g	**Earthquake Resilient Pipelines.** Install specially-engineered pipelines in areas subject to faulting, liquefaction or other earthquake hazard.
	S-A-2	**Flood Protection.** The City will maintain the City's levees and lagoon system for flood protection.	
		S-A-2-a	**Levee Protection Planning and Improvements.** Develop a plan to raise the City's levees in order to retain FEMA accreditation and protect the City against sea level rise. (High Priority)
		S-A-2-b	**Maintain Levees and Lagoon for Flood Protection.** The City will maintain the City's levees and lagoon for flood protection pursuant to the "Operation and Maintenance Manual, Foster City Levees and Pump Station" and the "Lagoon Management Plan."
		S-A-2-c	**Lagoon Pump Station Building Seismic Evaluation.** Implement recommendations for seismic upgrades to this 60-year old building. (High Priority)
	S-A-3	**Water Supply.** The City will provide an adequate supply of water for daily use and emergency situations.	
		S-A-3-a	**Water Supply and Delivery for Fire-Fighting.** The City will maintain a water supply and delivery system that can meet potential fire fighting demands through annual exercising of fire hydrants and periodic review of storage needs.
		S-A-3-b	**Water Supply.** The City will study the adequacy of water storage and/or supply facilities.
		S-A-3-c	**Water Delivery System.** The City will ensure the adequacy of the water delivery system through periodic testing, flushing and replacement of parts as needed.
		S-A-3-d	**Water Booster Pump Station Seismic Retrofit**. Complete recommended seismic retrofit to the water booster pump station. (High Priority)
		S-A-3-e	**Potable Water Tank Seismic Evaluation Retrofit.** Implement recommendations for seismic upgrades to the water storage tanks. (High Priority)

Goal	Policy	Program	
		S-A-3-f	**Water Transmission Main Evaluation.** Continue to evaluate the single 24-inch water supply transmission main on an on-going basis. (High Priority)
		S-A-3-g	**Water System Pressure Reducing Station Evaluation**. Continue to evaluate the water pressure reducing stations that reduce SFPUC's supply pressure to EMID system pressure. (High Priority)
	S-A-4	**Wastewater Treatment**. The City will provide wastewater transport and treatment in the most safe and cost-effective manner, consistent with environmental regulations.	
		S-A-4-a	**Wastewater Treatment Plant Improvements**. Improve the Wastewater Treatment Plant to accommodate current and future operational requirements and needs and to be more resilient to hazards. (High Priority)
		S-A-4-b	**Lift Station #59 Improvements**. Maintain and improve the City's main wastewater lift station with replacement of components that provide adequate levels of redundancy.
		S-A-4-c	**Evaluation/Replacement of Air Release Valves on Wastewater Line between Lift Station #59 and WWTP.** Evaluate the need for replacement of the air release valves on the 24" force main between Lift Station #59 and the Wastewater Treatment Plant. (High Priority)
		S-A-4-d	**Wastewater Lift Stations Rehabilitation**. Rehabilitate sewer lift stations by performing preventative maintenance and upgrades to extend their useful life. (High Priority)
S-B	**Emergency Response.** Maintain an effective emergency response program that anticipates the potential for disasters and ensures the ability to respond promptly, efficiently and effectively, to provide continuity of services during and after an emergency.		
	S-B-1	**Emergency Response**. The City will prepare to respond to emergencies through the City's Emergency Operations Plan, training, and other measures.	
		S-B-1-a	**Emergency Response.** The City will prepare to respond to emergencies through use of established procedures, programs of on-going training, periodic exercises of the City's Emergency Operations Plan, and mutual aid agreements.
		S-B-1-b	**Emergency Plan.** The City will maintain the City's Emergency Operations Plan indicating responsibilities and procedures for responding to an emergency.
		S-B-1-c	**Mutual Aid**. Participate in general mutual-aid agreement and agreements with adjoining jurisdictions for cooperative response to fires, floods, earthquakes, and other disasters.
		S-B-1-d	**Police Services**. The City will provide adequate personnel, training, and equipment to support the provision of police services.
	S-B-2	**Emergency Preparedness.** The City will plan for and provide facilities and materials anticipated to be needed to respond to emergencies.	

Goal	Policy	Program	
		S-B-2-a	**Emergency Operations Center**. Maintain the local government's emergency operations center in a full functional state of readiness.
		S-B-2-b	**Back-up Emergency Operations Center**. As an infrastructure operator, designate a back-up Emergency Operations Center with redundant communications systems.
		S-B-2-c	**Emergency Power for Critical Buildings**. Pre-position emergency power generation capacity (or have generation rental/lease agreement for these generators) in critical buildings to maintain continuity of government and services.
		S-B-2-d	**Critical Intersection Lights**. Ensure that critical intersection lights function following loss of power by installing and maintaining battery back-ups and emergency generators.
		S-B-2-e	**Post-Disaster Repair of Water and Wastewater Systems**. Develop a plan for speeding the repair and functional restoration of water and wastewater systems through stockpiling of shoring materials, temporary pumps, surface pipelines, portable hydrants, and other supplies.
S-C	**Long-term community resilience.** Ensure the long-term community resilience of the community by improving the resiliency to hazards, protecting the environment and planning for post-disaster recovery.		
	S-C-1	**Climate Change Adaptation Strategy.** Prepare adaptation strategies that address sea level rise and other climate change induced events.	
		S-C-1-a	**Incorporate Sea Level Rise Consideration into Planning Process.** Incorporate consideration of sea level rise into the development review and infrastructure planning processes, including response strategies that increase resilience to mid-century sea level rise risks for both new and existing development.
	S-C-2	**Strengthen Resilience of Structures.** Incorporate strengthening the resilience of structures into the ongoing development review process.	
		S-C-2-a	**Use of Uniform Codes.** The City will adopt and enforce the most current uniform codes with additional local requirements as necessary tailored to Foster City.
		S-C-2-b	**Site Specific Geotechnical Analyses.** The City will require site specific geotechnical and engineering reports for new structures.
	S-C-3	**Flood Plain Regulations**. The City will control development to minimize risks to persons and property within any special flood hazard area through flood plain regulations.	
		S-C-3-a	**Flood Plain Regulations**. The City will evaluate any proposed development within special flood hazard areas for conformance with the City's flood plain regulations as contained in Chapter 15.36 of the Foster City Municipal Code.
		S-C-3-b	**FEMA's National Flood Insurance Program.** Participate in FEMA's National Flood Insurance Program for affected properties.

Goal	Policy	Program	
		S-C-3-c	**Protect Flood Protection Qualities of Natural Areas.** The City will protect and preserve natural features such as wetlands that serve as natural mitigation against the impacts of flooding.
	S-C-4	**Minimize Loss of Life, Injuries, and Property Damage Due to Fires.** The City will minimize loss of life, injuries, and property damage due to fires through review of development proposals, public education, and maintenance of well-trained fire suppression personnel.	
		S-C-4-a	**Development Review for Fire Safety**. The City will review proposals for new and modified buildings to ensure that fire safety provisions are included as required by the most current uniform codes and local regulations.
		S-C-4-b	**Annual Inspections for Fire Safety and Hazardous Materials.** The City will conduct annual inspections of businesses and multi-family dwellings in order to ensure compliance with fire safety and hazardous materials requirements. The City will continue to provide inspections of residential care facilities at the request of the Department of Social Services.
		S-C-4-c	**Fire Sprinklers.** Require fire sprinklers in all new or substantially remodeled housing, regardless of distance from a fire station.
	S-C-5	**Hazardous Materials**. The City will protect the community from unreasonable risks associated with hazardous materials.	
		S-C-5-a	**Hazardous Materials.** The City will continue to enforce applicable codes related to hazardous materials.
	S-C-6	**Post-Disaster Services**. Consider and plan for how government services will be delivered in a post-disaster environment.	
		S-C-6-a	**Post-Disaster Services**. Consider and adopt regulations to guide City operations following a disaster, such as suspension of some types of government services.
S-D	**Empower residents and community groups.** Provide on-going education/resources to empower residents and community groups to be better educated, prepared and self-reliant in order to protect themselves from unreasonable risk to life and property posed by the hazards specific to Foster City, including access to transparent, frequently updated hazard and emergency response information before, during and after any disaster event.		
	S-D-1	**Educate the Public about Emergency Preparedness.** The City will offer information and programs regarding emergency preparedness.	
		S-D-1-a	**CERT Classes**. Continue to provide emergency preparedness classes and Community Emergency Response Team (CERT) training.
		S-D-1-b	**Emergency Preparedness Education and Outreach.** Continue to utilize available means to educate the public, including schools, businesses and community groups, about emergency preparedness, including but not limited to the City's website, media, classes and special events. (High Priority)

Goal	Policy	Program	
	S-D-2	**Educate the Public about Seismic Hazards**. The City will offer information and programs regarding hazardous buildings and conditions and possible mitigation measures to minimize seismic and geologic hazards.	
		S-D-2-a	**Geotechnical Reports Library**. The City will maintain a geotechnical report library at City Hall.
		S-D-2-b	**Seismic Safety Education.** The City will include seismic safety education in the Fire Department's public education programs, such as Community Emergency Response Team (CERT) training and earthquake preparedness training.
		S-D-2-c	**Non-Structural Hazards Assessment**. The City will include an assessment of non-structural seismic hazards as part of annual inspections of businesses as part of a public education program.
		S-D-2-d	**Private Utility Lines at Bridges.** Work with homeowners' associations to educate them about the need for earthquake-resistant connections when pipes enter and exit bridges and work with them to encourage retrofit of these facilities.
	S-D-3	**Educate the Public about Fire Hazards.**	
		S-D-3-a	**Fire Education/Prevention**. The City will provide a fire education/prevention program to the public, including schools, businesses and community groups through publications, training classes and other means.
	S-D-4	**Educate the Public about Crime Prevention.**	
		S-D-4-a	**Crime Prevention/Education**. The City will provide a variety of crime prevention programs to educate and involve the community, including but not limited to Neighborhood Watch, Apartment Watch, Business Watch, newsletter, security surveys, and programs with community groups and organizations.
		S-D-4-b	**Development Review for Crime Prevention**. The City will review proposals for new and modified buildings for compliance with crime prevention requirements.
S-E	**Build sense of community.** Build a strong sense of community and allegiance among residents, employees and visitors to Foster City by building social connectedness and commitment to the community so that individuals and groups are more empowered to help one another before, during and after any disaster event.		
	S-E-1	**Civic Engagement.** The City will work with businesses, service clubs, faith communities and other local organizations to build social connectedness and commitment to the community.	
		S-E-1-a	**Community Events.** The City will actively promote community events in order to bring together individuals and groups within the community for a common purpose.
		S-E-1-b	**Cross-Cultural Events.** The City will actively promote cross-cultural events in order to celebrate the diversity of the community as well as to bring together individuals and groups so that they become more inter-connected.

Goal	Policy	Program	
	S-E-2	**Police Services**. The City will provide police services necessary to maintain community order and public safety.	
		S-E-1-a	**Police Services**. The City will provide adequate personnel, training, and equipment to support the provision of police services.
		S-E-2-a	**Crime Prevention**. The City will promote community-based crime prevention through Neighborhood Watch, Apartment Watch, Business Watch, newsletter, security surveys, and programs with community groups and organizations.

9.6 Integration with Other Plans, Policies and Regulations

There are many ways the goals, policies and mitigation strategies contained in this LHMP/Safety Element will be integrated with other plans, policies and regulations, including but not limited to:

- **Capital Improvement Program Planning** – The City Council annually approves a detailed Capital Improvement Plan for a five year period and identifies and begins to fund upcoming infrastructure projects on a 10-year horizon. The City Council annually appropriates funding for the current year phases of Capital Improvement Projects. Infrastructure projects identified in this document have been or will be included in the five year Capital Improvement Project Plan for the years in which they are planned for implementation.
- **Annual Budget** – The City Council annually adopts a Fiscal Year Budget which authorizes the funding for all operations, services and projects for the fiscal year planning. Priority projects identified in the Local Hazard Mitigation Plan/Safety Element that require an expenditure output will be included in the Annual Budget in the years in which they are planned for implementation. The Annual Budget includes the appropriation of funding for the Capital Improvement Program discussed above.
- **Five Year Financial Plan** – The City Council annually approves a Five Year Financial Plan which includes revenue and expenditure expectations for the five year period. Approved projects in the Capital Improvement Plan, including any related to the Local Hazard Mitigation Plan/Safety Element would be included in the five year plan to ensure that appropriate funding is available for project completion.
- **Foster City Municipal Code** – The City Municipal Code includes a number of ordinances that would directly impact mitigation measures identified in the Local Hazard Mitigation Plan/Safety Element, for instance updates to the Code may be required in order to implement the post-disaster response measures and/or building code recommendations. Chapter 15.36 includes the City's Flood Plain Management Regulations related to the City's participation in the National Flood Insurance Program.
- **Estero Municipal District Code** – The District Code includes a number of ordinances that would directly impact mitigation measures identified in the Local Hazard Mitigation Plan/Safety Element, for instance updates to the Code may be required in order to implement the post-disaster response measures and/or changes to the Water Distribution system or Wastewater Collection system.
- **Crime Prevention Programs** – Proactive crime prevention makes Foster City a place where residents and visitors are safe from crime. Foster City is frequently listed among the safest cities in the State of California because of the efforts that go into preventing crime before it happens.
- **CERT** – The Community Emergency Response Teams train regularly to be prepared for emergency response and recovery. Having these teams in place with training in triage, medical

response and search and rescue will enhance responsiveness after a disaster and mitigate the impact that effects would have had on individuals and property if left unattended.

- **General Plan Annual Report** – This annual report assesses progress in implementation of programs included in the General Plan and in turn, helps shape the City Council's annual priorities for staff work efforts, the budget and the capital improvement program.
- **Climate Action Plan** – The Climate Action Plan was adopted by the City Council in February 2016 and contains 40 measures that will be prioritized to improve the environmental sustainability of Foster City and the Bay Area region. Specific to the Local Hazard Mitigation Plan/Safety Element, the Climate Action Plan measures are intended to reduce the production of greenhouse gasses and mitigate the potential impact of sea level rise.

10 PLAN MAINTENANCE PROCEDURES

10.1 Implementation, Updating and Enhancement

The City has several planning mechanisms that will be utilized to implement the LHMP/Safety Element, which include:

- General Plan
- Capital Improvements Plan
- City of Foster City Climate Action Plan

In addition, the City enforces the requirements of the California Environmental Quality Act (CEQA), which, since 1988, requires mitigation for identified natural hazards. The City has used these pre-existing programs as a basis for identifying gaps that may lead to disaster vulnerabilities in order to work on the ways to address these risks through mitigation.

The Local Hazard Mitigation Plan/ Safety Element, as part of the General Plan will be included in the Annual Report on the General Plan, which will evaluate progress in implementing the programs and strategies to provide information to assist the City Council in establishing each year's priorities. This document is provided to City Council no later than April 30 of every calendar year.

As required by the Disaster Mitigation Act of 2000, the City of Foster City will update this Plan at least once every five years.

10.2 Monitoring

The City of Foster City will ensure that monitoring of this plan will occur on an on-going basis. However, major disasters affecting Foster City, legal changes, and other triggers will be used. Finally, the plan will be a discussion item on the agenda of the meeting of City department leaders at least once a year. At that meeting, the department heads will focus on evaluating the plan in light of development trends, technological and political changes during the past year or other significant events. The department leaders will be responsible for determining the necessity of plan updates.

10.3 Plan Amendments

Any interested citizen may submit a request to have a proposed amendment of the plan considered. State law restricts the number of amendments to any mandatory element to four each calendar year, although each amendment may encompass a series of individual changes to the Plan. The City Council, by resolution of a majority of its members, may also initiate a proposed amendment at any time it deems suitable or appropriate. Plan amendments will be considered by the Planning Commission, which will make a recommendation to the Foster City City Council. Since General Plan Amendments are legislative actions, the final decision is made by the City Council following a public hearing.

10.4 Continued Public Involvement

The public will continue to be involved whenever the plan is updated and as appropriate during the monitoring and evaluation process. Prior to adoption of updates, the City will provide the opportunity for

the public to comment on the updates. A public notice will be posted prior to the meeting to announce the comment period and meeting logistics.

Additionally, the City of Foster City, led by the Fire Department, will survey the public annually during its observance of National Preparedness Month in September of every year. The survey will include questions related to the public's perception of risk and recommended activities to mitigate against hazards. Findings from this annual survey will be available to the department leaders during their annual review of the plan as discussed in Section 10.2.

10.5 Local Hazard Mitigation Plan-Safety Element Points of Contact

Primary Point of Contact

Name:	Jenelle Masterson
Title:	Emergency Preparedness Coordinator
Mailing Address:	1040 East Hillsdale Blvd., Foster City, CA 94404
Telephone:	650-522-7960
Email:	jmasterson@fostercity.org

Alternate Point of Contact

Name:	Leslie Carmichael
Title:	Consultant Planner
Mailing Address	650 Foster City Blvd., Foster City, CA 94404
Telephone:	650-286-3236
Email:	lcarmichael@fostercity.org

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12 ACRONYMS AND ABBREVIATIONS

ABAG	Association of Bay Area Governments
AFY	Acre feet per year
ALS	Advanced Life Support
ARV	Air Release Valve
BART	Bay Area Rapid Transit
BAWSCA	Bay Area Water Supply Conservation Agency
BCDC	Bay Conservation and Development Commission
CALFIRE	California Department of Forestry and Fire Protection
CalOES	California Governor's Office of Emergency Services
CalTrans	California Department of Transportation
CalWARN	California Waster/Wastewater Agency Response Network
CCAMP	California Coastal Analysis and Mapping Program
CCC	California Coastal Commission
CDPH	California Department of Public Health
CEQA	California Environmental Quality Act
CERT	Community Emergency Response Team
CFR	Code of Federal Regulations
CGS	California Geological Survey
CIP	Capital Improvement Plan
DRIP	Drought Implementation Plan
DSOD	Division of Safety of Dams
EHS	Extremely Hazardous Substances
EIR	Environmental Impact Report
EMID	Estero Municipal Improvement District
EMS	Emergency Medical Services
EOC	Emergency Operations Center
FCFD	Foster City Fire Department
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
ISO	Insurance Service Office
LHMP	Local Hazard Mitigation Plan
MGD	Million gallons per day
MHHW	Mean Higher High Water
MMI	Modified Mercalli Intensity
MSA	Master Sales Agreement
N/A	Not Applicable
N/A	Not Available
NFIA	National Flood Insurance Act
NFIP	National Flood Insurance Program
NFPA	National Fire Protection Association
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRC	National Research Council
OES	Office of Emergency Services
PG&E	Pacific Gas and Electric Company

PPC	Public Protection Classification
PSHA	Probabilistic Seismic Hazard Assessment
RHNA	Regional Housing Needs Assessment
RL	Repetitive Loss
SAFRR	Science Application for Risk Reduction
SCADA	Supervisory Control and Data Acquisition
SCOA	Standard Conditions of Approval
SFHA	Special Flood Hazard Area
SFO	San Francisco International Airport
SFPUC	San Francisco Public Utilities Commission
SLR	Sea Level Rise
UCERF3	Uniform California Earthquake Rupture Forecast 3
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WETA	Bay Area Water Emergency Transportation Authority
WSIP	Water System Improvement Program
WUI	Wildland-Urban Interface
WWTP	Wastewater Treatment Plant

13 APPENDICES

A. Stakeholders Invited to Participate in the LHMP Planning Process
B. Summary of Survey Findings
C. Press Release, October 29, 2015
D. Public Workshop Summary, November 17, 2015
E. Levee Protection Planning Study, July 2015
F. Mitigation Strategy Worksheets
G. Capital Improvement Program Project Worksheets
H. FEMA Approval Pending Adoption, September 16, 2016
I. Final Plan Review Tool, October 20, 2016
J. Foster City Resolution to Adopt the Local Hazard Mitigation Plan & Safety Element, November 21, 2016
K. FEMA Final Approval, November 23, 2016