SAN FRANCISCO
WATER EMERGENCY TRANSPORTATION AUTHORITY

LOCAL HAZARD MITIGATION PLAN

SEPTEMBER 2016

Record of Reviews and Revisions

Revision #	Date	Sections Reviewed or Revisions Made	Entered by

Contents

1. Introduction

The San Francisco Bay Water Emergency Transportation Authority (WETA) has prepared the 2016 Hazard Mitigation Plan (HMP) in order to assess the natural, technological, and human-caused risks to WETA and reduce the potential impact of the hazards by creating mitigation strategies. The 2016 HMP represents WETA's commitment to create a safer, more resilient community by taking actions to reduce risk and by committing resources to lessen the effects of hazards on the people and property of WETA.

This plan complies with the Federal Disaster Mitigation Act (DMA 2000) (Public Law 106-390), Federal Register 44 CFR Parts 201 and 206, which modified the Robert T. Stafford Disaster Relief and Emergency Assistance Act by adding a new section, 322 - Mitigation Planning. This law, as of November 1, 2004, requires local governments to develop and submit hazard mitigation plans as a condition of receiving Hazard Mitigation Grant Program (HMGP) and other mitigation project grants. WETA staff have coordinated preparation of the HMP in cooperation with community stakeholders, partner agencies and members of the public.

This introduction to the HMP provides a brief description of hazard mitigation planning, local mitigation plan requirements, and an outline of the 2016 HMP. There is also an overview of Federal Emergency Management Agency (FEMA) programs and grants related to hazard mitigation.

1.1 Background

The DMA 2000 provides the legal basis for the Federal Emergency Management Administration (FEMA) mitigation planning requirements for State, local and Indian Tribal governments as a condition of mitigation grant assistance. The DMA 2000 mitigation planning provisions, along with other sections of the Act, provide a significant opportunity to reduce disaster losses across the nation. The language in DMA 2000, taken as a whole, emphasizes the importance of strong State, Tribal, and local planning processes, and comprehensive mitigation program management at the State level. FEMA strongly believes that with hazard mitigation planning, as with most similar efforts, the process of planning is as important as the resultant plan. Therefore, we consider the plan as the written record, or documentation, of the planning process or development of a product (such as goals, or hazard identification).

The development, approval, and implementation of this HMP can dramatically reduce future risk and loss by evaluating risk and identifying mitigation actions. The HMP will also assist WETA in qualifying for several types of funding offered by FEMA including Pre-Disaster Mitigation Project funds (funding for projects that are implemented before a disaster occurs), as well as HMGPs (post-disaster funds for hazard reduction projects). In addition, the HMP improves WETA's access to other types of Federal disaster assistance, including funds for permanent repairs. This increased eligibility for grant programs affords WETA an opportunity to prepare for the future and work with neighbors to protect the local community.

1.2 Purpose

WETA's HMP has been developed to provide a living document that meets the requirements of DMA 2000 and will reduce risks posed by hazards in order to protect the community. Regular updates to the HMP

are required to comply with the guidance of DMA 2000. Since the Association of Bay Area Governments (ABAG) Multi-jurisdiction HMP was completed in 2011 and has not been updated, WETA has developed its own local HMP. Completion of the updated HMP and approval by FEMA will allow WETA to reduce hazards to its staff and passengers, and to apply for HMGP funding. Both pre- and post-disaster hazard mitigation grants are available. Post-disaster funding, which can be used to enhance the resiliency of facilities, is governed by Section 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), 42 U.S.C. 5172. The Act provides FEMA with the authority to fund cost-effective mitigation measures under the Public Assistance program in conjunction with the repair of disaster-damaged public facilities.

As the costs of damage from natural disasters continue to increase, governmental and local agencies, as well as the general public, have come to realize the importance of identifying effective ways to reduce vulnerability and losses. The HMPs assist entities and jurisdictions in reducing impacts from hazards by recognizing vulnerability in relation to risk, identifying resources, creating an orderly data collection process and developing strategies for risk reduction, while helping to guide and coordinate mitigation activities. The resources and information within the HMP:

- Establish a basis for coordination and collaboration among agencies and the public.
- Assist in the integration of mitigation goals and objectives with other WETA plans.
- Identify existing mitigation projects and prioritize future projects.
- Assist in meeting the requirements of federal mitigation programs.
- Lay the foundation for future HMP updates and HMP maintenance.

In addition, the HMP is designed to ensure the long term values of the community are not compromised in the course of preparing for, responding to or recovering from natural and manmade hazards.

1.3 Scope and Planning Area Description

WETA was created by State of California legislation in 2007, superseding the San Francisco Bay Area Water Transit Authority with the intent "to provide a unified, comprehensive institutional structure for the ownership and governance of a water transportation system that shall provide comprehensive water transportation and emergency coordination services for the Bay Area Region" (Government Code Section 66540.2). WETA provides passenger ferry transit service under the operating name San Francisco Bay Ferry. WETA is authorized to plan the expansion of, and to operate water transit services on San Francisco Bay within the nine-county Bay Area.

Current San Francisco Bay Ferry routes include Alameda/Oakland to San Francisco, Harbor Bay to San Francisco, Vallejo to San Francisco, and East Bay to South San Francisco. San Francisco Bay Ferry services carry over 2 million passengers annually on these four routes using a fleet of 12 high-speed passenger ferries. WETA is also planning several expansions of ferry services. Near term expansion services are currently being planned for Richmond and Treasure Island. WETA utilizes land from the local jurisdiction and owns and operates the docking facilities in Alameda, Oakland, Vallejo and South San Francisco. WETA has a license to use two gates at the Downtown San Francisco Ferry Terminal and the facility at AT&T Park,

which are both owned and operated by the Port of San Francisco. **Figure 1** depicts the WETA areas of operation and routes.

Figure 1: WETA areas of operation and routes

1.4 Authority

The requirements for adoption of this HMP by the local governing body, as set forth in the Stafford Act and as amended by DMA 2000, and its implementing regulations are described below. The WETA Board of Directors approved this HMP on xxx date. This is documented in meeting resolution XXX. Appendix G provides documentation of the adoption resolution.

FEMA REGULATION CHECKLIST: PLAN ADOPTION

Adoption by the Local Governing Body

44 CFR § 201.6(c)(5): The local hazard mitigation plan shall include "[d]ocumentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council)."

Element

E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval?

Source: FEMA, *Local Mitigation Plan Review Tool*, March 2013.

1.5 Plan Organization

The WETA HMP is comprised of a base plan and a series of appendices. **Table 1-1** provides an outline of the HMP.

Table 1-1: Plan Sections, Appendices, and Descriptions	
Section 1: Plan Introduction	Section 1 includes an introduction to hazard mitigation planning, lists the HMP planning requirements, and provides a description of the plan.
Section 2: Planning Process	Section 2 describes the planning process for the 2016 HMP, including an overview of how the HMP was prepared, identification of the HMP planning team, involvement of outside agencies and communities, the inclusion of related plans, reports and information as well as stakeholder and public outreach activities.
Section 3: Hazard Identification	Section 3 provides a list and profiles of each of the hazards identified in the 2016 HMP, along with a hazard summary.
Section 4: Risk Assessment	Section 4 describes the risk associated with the hazards within the planning area, the values at risk and the potential losses.
Section 5: Capability Assessment	Section 5 identifies and evaluates the resources available for hazard mitigation within WETA and through stakeholder support.
Section 6: Mitigation Strategy	Section 6 provides the current, ongoing, and completed mitigation projects and programs for WETA and lists mitigation strategies for reducing potential losses.
Section 7: Plan Implementation and Maintenance	Section 7 describes how WETA will implement and maintain the HMP through mitigation actions and ongoing outreach.
Section 8: Changes in HMP Elements since Previous Plan	Section 8 correlates the previous ABAG HMP WETA-specific mitigation actins with those identified for this current effort.
Appendices:	
A:	Local Mitigation Plan Review Tool Crosswalk
B:	References
C:	Planning Process Documentation
D:	Community Outreach Documentation
E:	Risk Assessment Documentation
F:	Plan Maintenance Documentation
G:	Plan Adoption Resolution

2. Planning Process

The requirements for documentation of the HMP planning process are described below. This section summarizes hazard mitigation planning efforts in 2016. In addition, the section describes public and stakeholder outreach efforts as part of the HMP planning process. The section also summarizes the review and incorporation of existing plans, studies and reports used to develop the HMP.

Documentation of the 2016 HMP planning process for the HMP planning team is provided in Appendix B, and documentation of the planning process for the public and stakeholders is found in Appendix C. These appendices document the planning meetings and outreach, and include meeting agendas, presentation materials and other documentation used to conduct the planning process.

FEMA REGULATION CHECKLIST: PLANNING PROCESS

Documentation of the Planning Process

44 CFR § 201.6(c)(1): The plan shall include documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

Elements

A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? 44 CFR § 201.6(c)(1)

A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? 44 CFR 201.6(b)(2)

A3. Does the Plan document how the public was involved in the planning process during the drafting stage? 44 CFR 201.6(b)(1) and 201.6(c)(1)

A4. Does the Plan document the review and incorporation of existing plans, studies, reports, and technical information? 44 CFR 201.6(b)(3)

A5. Is there discussion on how the community will continue public participation in the plan maintenance process? 44 CFR 201.6(c)(4)(iii)

A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? 44 CFR 201.6(c)(4)(i)

Source: FEMA, *Local Mitigation Planning Handbook Review Tool,* March 2013

WETA recognizes the importance of disaster mitigation as part of an integrated program to assure the safety of its users and its facilities. Since its inception, WETA has engaged in mitigation activities as part of its overall facilities management process. Those activities have included seismic strengthening, inundation modeling and hardening, and facility security. For a more detailed description of previous and ongoing mitigation activities, see discussion in WETA's Capabilities Assessment (Section 5). The integration of mitigation into all planning activities and WETA programs is discussed in Mitigation Strategy (Section 6).

WETA was not included as a special district within any of the four Bay Area counties that it serves. However, all of the cities that are within the area served by WETA were included in the planning process. This was due to the fact that all WETA ferry routes originate in one county and terminate in another.

WETA contracted consulting firm Navigating Preparedness Associates (NPA) to work with staff to develop and submit a pre-disaster mitigation planning grant application to FEMA. NPA was familiar to WETA and had successfully provided technical support to WETA for other preparedness projects.

2.1 Overview of the Planning Process

The mitigation plan process included four broad tasks:

- Organize resources
- Assess risks
- Develop HMP
- Implement the HMP and monitor progress

The Association of Bay Area Governments Multi-Jurisdictional Hazard Mitigation Plan and Resiliency web portal were reviewed to assure that hazards identified by WETA were as inclusive as those in the region. Hazard analysis information from that Plan and the associated web portal have been synthesized and included directly or by inference into the WETA plan. Other multi-hazard mitigation plans that have been approved by FEMA for special districts were also reviewed.

Current hazard mitigation activities (or the lack thereof) were identified and evaluated by the planning team. The evaluation of current activities allowed those activities to be reviewed in relation to the WETA hazard risk assessment, which in turn, identified those hazards that required additional or initial mitigation activities. Mitigation options for each hazard were then identified, analyzed, and prioritized. These options or alternatives became the core of WETA's action plan.

The HMP will be integrated with WETA's existing emergency response plans and planning mechanisms. Emergency preparedness operations will be guided by the HMP, which can also guide and support asset management on project prioritization during the 5-year plan period. Additionally, the HMP will inform capital improvement programs and project planning.

2.2 Formation of the Planning Team

In early 2016, WETA formed a planning team tasked with updating the HMP. The Team was led by the WETA Director of Operations and a senior planner and was responsible for updating and addressing all section of the Plan. Key efforts by the core team included:

- Review of material on the Association of Bay Area Government Resiliency web portal
- Review of progress since the last Plan update
- Review of existing WETA plans
- Identification of critical assets
- Hazards identification and risks assessment
- Mitigation strategies development
- Engagement with community in the planning process
- Solicitation and incorporation of feedback from external stakeholders and the public

2.3 Planning Team Meetings

The Team met three times to review development of the HMP. These meeting were staggered so that each provided the opportunity to focus on a specific section of HMP development. Stakeholder agencies that support WETA facilities such as the Ports of Oakland and San Francisco, and cities that host WETA

ferry terminals were invited to participate. Documentation of the planning team meetings including agenda, meeting notes, presentations and sign-in sheets are included in Appendix B.

- The first team meeting was conducted on April 22, 2016. The planning team reviewed the need for the HMP update. The team discussed the HMP planning process, planning activities, timelines for HMP completion and made staff assignments for supporting plan development. The WETA public information officer joined the team to analyze options and activities for public engagement. Based on outcomes of the first team meeting, WETA placed material related to the HMP planning process on its website, Facebook page and Twitter account. Documentation of these activities is included in Appendix C
- A second meeting was held on June 9, 2016. The planning team reviewed and confirmed applicable hazards. In addition, previous hazard occurrences were identified and added to the Plan. The team also discussed the public outreach strategy and focused on four main groups: ridership; Port staff; the International Organization of Masters, Mates and Pilots; and the San Francisco Bay Conservation and Development Commission. Documentation and notes for these activities is included in Appendix C
- A third planning team meeting was conducted on August 18, 2016. During this meeting the team was provided with the initial draft HMP including proposed mitigation activities. The group discussed the mitigation goals, mitigation activities and other components of the HMP. The process for reviewing the HMP was discussed. Documentation of these activities is included in Appendix C

2.4 Local Government Participation

Coordination among local agencies is essential for both updating the WETA HMP and successful implementation. WETA utilizes land from the local jurisdiction and owns and operates the docking facilities in Alameda, Oakland, Vallejo and South San Francisco. WETA has a license to use two gates at the Downtown San Francisco Ferry Terminal and the facility at AT&T Park, which are both owned and operated by the Port of San Francisco. Ports within the Bay Area are operated by city governments. Within the WETA area of operation, these include the Port of Benicia, Port of Oakland, Port of Redwood City, Port of Richmond, Port of San Francisco and Port of South Vallejo. All aforementioned governments are essential participants in the WETA HMP planning process. Representatives from the City and County of San Francisco (Owner of the Port of San Francisco), Department of Emergency Management and the Port of Oakland participated as members of the planning team and attended the planning team meetings. They provided in-depth review and comments on draft versions of the HMP. Documentation of local government participation is contained in Appendix C.

2.5 Stakeholder Coordination/Buy-In

The WETA planning team was responsible for coordinating all applicable private and public partners within WETA's jurisdiction. WETA operates in several local jurisdictions; coordination and buy-in are fundamental in achieving WETA goals and actions. Coordinating mitigation projects with private and public partners provides WETA the opportunity to align mitigation projects with other local priorities.

In addition to inviting all the jurisdictions that contain WETA operated facilities to participate on the planning team, WETA provided a copy of the final draft HMP to them for review and comment. WETA also provided a copy of the final draft HMP to its contract operator and other transit agencies for review and comment.

2.6 Public Participation

Once the planning process commenced, WETA provided public notification through its website, and Facebook and Twitter accounts. Additionally, WETA conducted a public online survey to solicit their input on the hazards that WETA faces, the safety of WETA ferry operations and the mitigation activities that the riders recommend WETA undertake. The draft HMP was placed on the WETA website for public review and comment. Finally, notification of the draft HMP review and adoption by the WETA Board was advertised. Appendix D provides documentation of community outreach efforts and public participation.

2.7 Review of Existing Plans, Reports, Studies, Technical Documents, and Data

The review and incorporation of existing plans, studies, reports, and technical information (44 CFR §201.6(b)(3)), as required by the federal regulations are described below.

During the planning process, members of the planning team reviewed and incorporated information from several existing plans, studies, and reports into the 2016 HMP. These reports are listed below:

- 2016 WETA Emergency Operations Plan. The hazard section of the EOP provided a basis for the hazards identified in the HMP.
- 2016 draft WETA Strategic Plan. This plan was used to align strategic objectives with hazard mitigation goals.
- ABAG 2011 Regional Hazard Mitigation Plan. This provided background and regional knowledge.
- Comprehensive Annual Financial Report, Fiscal Year Ended June 30, 2014.
- California Climate Adaptation Planning Guide (APG): The 2012 APG provides information on the effects of climate change on California, and provided adaptation planning guidance used in the development of the climate change hazard profile.
- 2013 State of California Multi-Hazard Mitigation Plan. The State HMP was reviewed to ensure the alignment of the WETA HMP with the state's current hazard profiles and mitigation strategy.

3. Community Profile

The history of the San Francisco Bay Area and its development as a center of commerce was shaped by its location at the entrance to one of the world's best natural harbors. The Spanish colonized northern California in the 18th century. During the Spanish colonial period and while the Bay Area was part of Mexico (after the 1821 Mexican Revolution), it was sparsely populated and economically insignificant. Situated at the tip of a windswept peninsula without a source of fresh water or local firewood, San Francisco lacked most of the basic facilities for a 19th-century settlement. These natural disadvantages forced the town's residents to bring water, fuel and food to the community. The first of many environmental transformations was the city's reliance on filled marshlands for real estate. Much of the present downtown is built over the former Yerba Buena Cove, granted to the city by military governor Stephen Watts Kearny in 1847.

On July 7, 1846, during the Mexican–American War, Navy Commodore John D. Sloat claimed California for the United States. On January 30, 1847, a proclamation changing the name Yerba Buena to San Francisco took effect. The city and the rest of California officially became a United States territory in 1848 by the Treaty of Guadalupe Hidalgo, which ended the Mexican–American War. California was admitted to the United States as a state on September 9, 1850. The State of California soon chartered the City of San Francisco and San Francisco County. At the time the county and city were not coterminous; the county contained modern-day northern San Mateo County.

Starting overnight as the base for the California gold rush of 1848, the Bay Area quickly became the largest and most important population, commercial, naval and financial center in the West. The gold rush led to a large boom in population, including considerable immigration. Between January 1848 and December 1849, the population of San Francisco increased from 1,000 to 25,000. The rapid growth continued through the 1850s and expanded again under the influence of the 1859 Comstock Lode silver discovery. San Francisco became America's largest city west of the Mississippi River until it lost that status to Los Angeles in 1920.

The Bay Area was devastated by a great earthquake and fire in 1906, but was quickly rebuilt. Much of the growth of region was supported by filling shallow areas of San Francisco Bay. Today, these areas of filled soil are particularly prone to liquefaction as the result of a large earthquake. After the 1906 earthquake, large numbers of San Francisco residents moved to the Oakland area and established it as a thriving seaport and commercial center.

Today, the Bay Area remains the leading financial center in the western United States and has continued to prosper and increase in population growth and density in recent years by its inclusion of Silicon Valley and other technology and research centers.

3.1 Geography, Topography and Climate

Climate influences the occurrences of natural hazards; extreme climate conditions can result in drought, flooding, landslides, severe weather and wildfires. The San Francisco Bay Area is in a spectacular region

with valleys and ridges, views and access to rivers, the Pacific Ocean, and the Bay, and generally enjoys a mild climate. Many of those ridges and valleys have been formed by active earthquake faults that can generate devastating shaking, ruptures and ground failures.

The typically mild climate is subject to occasional severe winter and spring storms leading to landslides in the hills and flooding of the valleys. During the fire season, typically from May through November, the region is subject to periods of Diablo Winds bringing high temperatures, gusting winds, and low humidity. Tinder-dry trees, brush, and grasslands are subject to fires that can become catastrophic on the edges of urban development. Given an increasingly mobile population, our citizens and crops are subject to disease epidemics. Natural disasters can lead to secondary events that are disasters in of themselves, including hazardous material releases and dam failures. During the period from 1950 to 2009, all or part of the Bay Area was subjected to 59 disasters, or about a third of over 200 disasters occurring in the entire State of California during that 60-year period (ABAG Multi-Jurisdictional Local Hazard Mitigation Plan for the San Francisco Bay Area, 2011).

The nine most significant hazards affecting the Bay Area, based on past history, as well as on the State Hazard Mitigation Plan, are related to:

- Earthquakes (surface faulting, ground shaking, liquefaction, landslides, and tsunamis)
- Weather (flooding, landslides, wildfires, drought, and climate change)

The focus of this planning effort is on natural hazards, that is, natural occurrences that can pose a risk of injury, loss of life, or damage to property, though other hazards related to man-made conditions are considered, including terrorism and civil unrest.

3.2 Socioeconomic Factors

The population, economic, and housing factors in the various areas of the San Francisco Bay Area are described in this section. Understanding these socioeconomic factors is imperative to determining the potential impacts a natural hazard event can have on the region's population and economy.

3.2.1 Population

The San Francisco Bay Area, located in Northern California, is home to more than seven million people. The area consists of nine counties and 101 cities. All of the region's nine counties border the San Francisco Bay.

The Bay Area has a land area of 4.4 million acres (excluding bay waters and large lakes). The major type of land use varies strongly by county, from nearly, completely urbanized San Francisco County to Napa County, which has only a few medium-sized towns and one small city. Contra Costa, Alameda, and Santa Clara Counties all are highly urbanized along the Bay Shore, with varying degrees of development further inland. San Francisco County is by far the most urbanized county in the region, with virtually all of its land characterized as urban in 2005.

Like many other urban areas, the Bay Area will continue to grow for the foreseeable future. An estimated additional 1.7 million people will live here and over 850,000 new jobs will be created by the year 2030. An additional 600,000 homes will need to be built. This region faces challenges of serving this growth with

efficient transportation, housing, and infrastructure, while balancing it with the natural disasters that threaten the region and economy (ABAG's Projections 2009 and ABAG's Existing Land Use, 2005).

3.2.2 Economy

The San Francisco Bay Area economy is one of the most vibrant and expanding in the United States. The Bay Area is the second largest economic region in the state, accounting for over one-fifth of California's total population. The region has experienced a decisive economic recovery from the Great Recession (which occurred from fourth quarter 2007 through the second quarter 2009) and is poised for continued expansion. Although employment growth since 2010 has far outpaced recent history or long term expectations, in fact by the end of 2014, the region had just returned to the employment peak of the 2000 (the peak of the dot-com bubble). Population and labor force are growing more slowly, and have not matched the pace of employment change because many of the "new" jobs have been filled by existing residents. Population growth continues, increasing the demand for new housing units, while financing for new residential construction from either the private or public sectors is less readily available than earlier in the century.

In all, much of the recent growth has been in sectors and locations that were already areas of competitive advantage for the region. The three fastest growing major occupation categories—computer and mathematical, food preparation, and sales and related occupations reflect the combination of highly technical, distributive and local serving industry expansion.

Labor force participation, close to 67 percent, is higher than the average for the State or nation, and has ceased its decline from the 2009 peak. The region has a highly educated workforce, and shows signs this high education level will continue well into the future. The majority of the adult age groupings have seen growth in the share that are college educated, and most of the younger adult age groups are better educated than the next older population group. Total personal income growth (the change in the sum of all income across the entire population) has been strong in the region, although, adjusting for inflation, household incomes remain below their 2007 levels.

The region's challenges continue to be related to the interplay of employment change, population shifts, and housing supply. Key uncertainties include:

- A history of job change driven by innovative but volatile industries
- Housing and location choices of a changing population, to what degree the increasingly urban lifestyle continues to be the choice for aging retirees as well as for today's young adults as they begin to form families
- Meeting the housing needs for a widespread of income groups: the concentration of occupation growth at both the low and high ends of the spectrum means the region will need housing affordable to households at multiple income levels

3.2.3 Housing

As of 2010, the Bay Area had 2,686,148 housing units spread across 557,664 acres of residential land in nine counties. These residential lands are characterized by a variety of different use densities, ranging from single unit rural areas to high rise multi-unit urban areas. Many Bay Area housing units are soft story

buildings which are extremely vulnerable to collapse after a large earthquake. Newer housing buildings have been constructed to meet stringent earthquake resistance codes although all face potential loss of water and waste water service.

3.2.4 Infrastructure

San Francisco Bay Area transportation and utility facilities and networks are vital lifelines during and following disasters, as well as in the functioning of the region and its economy. One of the main reasons for the interdependencies of infrastructure systems is that they tend to be geographically located in the same areas. For example, water, sewer, and natural gas pipelines tend to be under local roads. Communications and electrical cables are either located under those roads or adjacent to them. All have similar exposures to hazards that are related to serving the developed portions of the region.

Cities, counties, transit districts, water suppliers, wastewater system operators, and other utilities have worked together to set regional priorities for the mitigation of hazards associated with these systems. Because of the large number of special districts involved in operating utility and lifeline systems, a variety of agencies is responsible for them. These agencies understand that it is much easier to try to fix problems before a disaster than to deal with the many interdependent problems afterward.

Transportation

The San Francisco Bay Area's transportation system is a complex network of federal and state highways, local roads, light and heavy rail, bus transit, airports, ports, and ferries.

- The system contains over 20,800 miles of highways and roads, with 9,000 miles of bus routes, 470 miles of rail transit, and 750 miles of bikeways
- As a region located on San Francisco Bay, the system includes eight toll bridges – seven owned by the state, and one, the Golden Gate Bridge, owned by the Golden Gate Bridge and Highway Transportation District. It also includes approximately 2,000 state-owned and an additional 2,000 locally-owned road structures, including overpasses, interchanges, and smaller bridges
- There are three international airports, a federal airfield, a United States Air Force Base and 36 public general aviation airports and private airstrips
- Finally, the region has five public ports, several private ports, and five commuter ferry lines. The entire system is planned and coordinated by the Metropolitan Transportation Commission (MTC), an organization whose job is to ensure that this system functions smoothly and effectively, as well as to plan responsibly to meet the future mobility needs of the region's growing population. While much has been accomplished to manage the transportation needs of the growing population, transportation systems operate at a high load and are often congested. This presents potential vulnerabilities to the communities serviced with respect to both emergency response and for normal commerce

Dozens of other organizations work together to build and maintain this system, including the federal Department of Transportation (DOT), the Federal Highway Administration (FHWA), the Federal Aviation Administration (FAA), the state agencies of Caltrans and the California Transportation Commission (CTC),

city and county governments, and special transit districts (ABAG Multi-Jurisdictional Local Hazard Mitigation Plan for the San Francisco Bay Area, 2011)

Water/Wastewater

The regional water and wastewater systems are managed by a network of public special districts, city and county departments, and private companies. There are over 100 water retailers and wholesalers in the region. While most wastewater collection and treatment is handled by cities and counties, some special districts treat wastewater. ABAG has estimated that there are 32,000 miles (each) of water and sewer pipelines.

Some communities within the region develop their urban, suburban, and rural water supplies from groundwater and surface waters within the nine-county area (Napa River, Russian River, Guadalupe River, and a variety of other creeks and springs). Others rely on groundwater and surface waters that are imported from watersheds and basins outside the region (including Tuolumne, Mokelumne, Sacramento, San Joaquin, and Eel River watersheds). The State of California Water Project and the United States Bureau of Reclamation Central Valley Project are large suppliers of water to the Bay Area region.

Conserved and recycled water is another source of water and estimates of its potential are provided in the State of California Water Plan and in a range of Urban Water Management Plans in the region. Recycled water in the region is used in a wide range of applications, including landscape irrigation, industrial cooling, and agricultural needs, as well as an environmental water source for wetland restoration. The Department of Water Resources estimates that close to 50 million gallons per day of recycled water is produced here, and planned projects have the potential to double this amount within the next decade ABAG Multi-Jurisdictional Local Hazard Mitigation Plan for the San Francisco Bay Area, 2011).

3.2.5 Land Use and Development Trends

FEMA RECOMMENDATION: RISK ASSESSMENT

Description of Vulnerability: Land Use and Development Trends

44 CFR § 201.6(c)(2)(ii)(C): The plan should describe vulnerability in terms of "[p]roviding a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions."

Source: FEMA, *Local Mitigation Plan Review Tool*, Plan Strengths and Opportunities for Improvement, March 2013.

Urban land totaled 1,075,200 acres in 2000 and the region added 63,700 acres of new or significantly denser urban development from 2000 to 2005. The region is projected to continue to grow, adding 1,977,200 more people, 719,700 new households, and 1,657,650 new jobs between 2005 and 2035 (Plan Bay Area, 2013).

This growth continues to place increasing pressure on the region to expand urban development, both by increasing the density of areas of existing urban and inner suburban housing, and by the conversion of agricultural and grazing lands to suburban development. Over the next ten years, WETA will open two maintenance facilities, expand the terminal facilities in downtown San Francisco and open new terminals in Richmond and Treasure Island (WETA, 2016).

WETA's ferry facilities are susceptible to potential liquefaction during an earthquake, as most facilities are within the estimated liquefaction zone (ABAG, 2013). According to this model, the WETA facilities are in areas where approximately 73% of the land will liquefy during an earthquake measuring 7.1M.

4. Risk Assessment

A risk assessment helps answer questions about "what if" situations, such as "what if there is major earthquake on the Hayward Fault?" Once risks are understood, vulnerabilities to them may be analyzed and measures taken to mitigate the vulnerabilities.

FEMA REGULATION CHECKLIST: RISK ASSESSMENT

Hazard Identification

44 CFR § 201.6(c)(2)(i): "[The risk assessment shall include a] description of the type of all natural hazards that can affect" the jurisdiction.

Elements

B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect the jurisdiction? See 44 CFR § 201.6(c)(2)(i)

B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for the jurisdiction? See 44 CFR § 201.6(c)(2)(i)

Source: FEMA*, Local Mitigation Plan Review Guide*, *March 2013.*

Note: **For coverage of Elements B3 and B4, see Sections 6.5 and 6.7, below.**

4.1 Hazard Identification Process

The risk assessment process enabled WETA to better understand its vulnerability to natural, man-made, or technological hazards. The information gathered during the process serves as a basis for emergency management planning, as a justification for preparedness related expenditures, and as a foundation for mitigation actions and recovery policy decisions. Information collected from the hazard mitigation survey results, contained in Appendix D, informed the selection of hazards. Other, local hazard mitigation plans such as those from the City and County of San Francisco and Solano County were also reviewed. The data from the risk assessment provided the framework for WETA to develop and prioritize mitigation strategies and actions in order to reduce risk and vulnerability from future hazard events.

The risk assessment process followed the methodology described in the FEMA publication "Understanding Your Risks – Identifying Hazards and Estimating Losses," and is based on a five-step process:

- Identifying Hazards
- Profiling Hazards
- Inventorying Assets
- Assessing Vulnerability/Estimating Losses
- Analyzing Development Trends

4.1.1 Results and Methodology

Hazard exposure mapping was performed by using geographical information system (GIS) tools and a local understanding of the environment surrounding the San Francisco Bay Area. GIS exposure mapping was performed for four of the five hazards having potential to threaten the WETA system: including Earthquakes, Tsunamis, Severe Storm Flood and Sea Level Rise. Hazard exposure evaluation assessed exposure levels of the hazard to WETA high priority assets. Under each hazard scenario, high priority assets were identified for high exposure areas. Refinements in the assessment can be made in future plan updates to incorporate site-specific information with regard to existing protections, hazard sensitivity, and adaptive capacity.

Generally, the main hazards of concern to WETA facilities are related to earthquakes, followed by tsunamis. This is based on both the asset exposure mapping information, institutional understanding and past performance of the high priority assets when faced with the hazards examined.

4.2 Hazard Profiles

The WETA service area is subject to a number of natural and manmade hazards. This section focuses on those hazards that may affect WETA facilities and vessels and may have an impact on WETA transit services.

4.2.1 Earthquake

An earthquake is both the sudden slip on an active fault and the resulting shaking and radiated seismic energy caused by the slip (United States Geologic Survey (USGS)), 2016. The majority of active faults in the WETA jurisdiction are strike-slip faults. For this type of fault one side of a fault line slides past the other horizontally, causing major events when drastic slips occur. The rupture from this type of fault extends almost vertically into the ground.

Major faults cross through all Bay Area counties. The region is seismically active since it is situated on the boundary between two tectonic plates: the North American Plate and the Pacific Plate. A number of active faults cross the WETA jurisdiction. 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. All WETA facilities are located in areas with potential for high shaking. This is the major reason earthquakes pose the largest threat to WETA's infrastructure and requires the bulk of existing and planned hazard mitigation efforts. In terms of ground failure, associated with earthquakes, all WETA assets are identified as in very high liquefaction susceptibility zones.

Earthquakes are a significant concern to the WETA jurisdiction as they can cause serious structural damage to buildings, overlying aqueducts, transportation facilities, utilities, and can lead to loss of life. Seismic shaking is by far the single greatest cause of damage from an earthquake in the WETA jurisdiction, followed by liquefaction (USGS, 2016). In addition, earthquakes can cause collateral emergencies including tsunamis, dam and levee failures, fires, and landslides.

Regulatory Environment

Numerous building and zoning codes exist at a state and local level to decrease the impact of an earthquake event on residents and infrastructure. Building and zoning codes include the Alquist-Priolo Earthquake Fault Zoning Act of 1972, Seismic Hazards Mapping Act of 1990, 2013 California Standards Building Code (CSBC), as well as relevant jurisdictional codes and general plans. To protect lives and infrastructure in the WETA jurisdiction, the building division of each jurisdiction ensures codes regarding hazards are met.

The 1971 San Fernando Earthquake resulted in the destruction of numerous structures built across its path. This led to passage of the Alquist-Priolo Earthquake Fault Zoning Act. This Act prohibits the construction of buildings for human occupancy across active faults in the State of California. Similarly, extensive damage caused by ground failures during the 1989 Loma Prieta Earthquake focused attention on decreasing the impacts of landslides and liquefaction. This led to the creation of the Seismic Hazards Mapping Act. This Act increases construction standards at locations where ground failures are probable during earthquakes. Active faults in the WETA jurisdiction have been included under the Alquist-Priolo Geologic Hazards Zones Act and Seismic Hazards Mapping Act.

The 2013 CSBC is based on the International Building Codes (IBC), which is widely used throughout the United States. CSBC was modified for California's conditions to include more detailed and stringent building requirements. The WETA jurisdiction utilizes the 2010 CSBC to regulate the infrastructure in the region. This includes unreinforced masonry (URM) buildings. For new buildings, the WETA jurisdiction includes earthquake safety provisions, with enhancements for essential services buildings, hospitals, and public schools.

In 2013 condition assessments were performed at WETAs oldest facilities, Oakland Alameda Main Street and Alameda Harbor Bay. The report findings were generally good condition with adequate seismic structural capacity. All recommended repairs were completed by 2015.

Past Occurrences

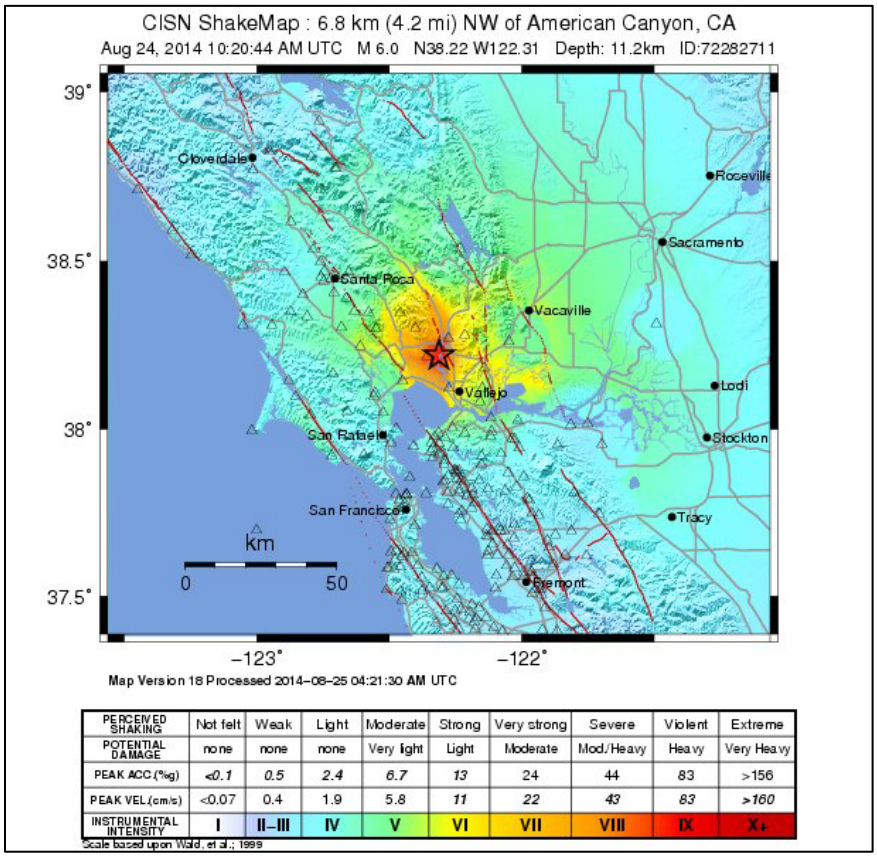
A Richter scale magnitude 7.8 and Mercalli intensity XI earthquake struck the Coast of Northern California at 5: 12a.m on April 18th, 1906. The earthquake lasted less than a minute, but had a disastrous impact on San Francisco and the surrounding region. The earthquake also ignited several fires in the City of San Francisco, which burned for up to three days and destroyed nearly 500 city blocks. Larger earthquakes generally affect larger areas; the 1906 earthquake caused extensive damage in San Francisco, Oakland, San Jose and Santa Rosa. More than 3,000 people died as a result of this earthquake.

More recently, the 1989 Loma Prieta earthquake caused extensive damage in the Santa Cruz Mountains, as well as in Oakland and San Francisco dozens of miles away. This earthquake occurred with an epicenter in the Santa Cruz Mountains on October 17th, 1989 at 5:04p.m. with a magnitude of 6.9. Heavy damage impacted Santa Cruz and Monterey counties, but effects also extended northward into the San Francisco Bay Area, both on the Peninsula and the East Bay. Liquefaction caused significant damage in the Marina District of San Francisco and 62,000 people evacuated the World Series game that day after the shaking had ceased. A segment of the San Francisco-Oakland Bay Bridge collapsed as did a segment of Interstate 880/Cypress Viaduct in West Oakland. The earthquake resulted in the deaths of 63 people and an additional 3,757 injuries as well as over $6 billion in damages.

The current Alameda/Oakland ferry service was started as a direct result of the Loma Prieta earthquake in direct response to the collapse of a section of the San Francisco-Oakland Bay Bridge and the nearly month-long closure that followed. The evening of the earthquake, private excursion vessel operators moved people across the Bay. By the following Monday, emergency funding had been secured and ferries were being operated between the San Francisco Ferry Building, Oakland's Jack London Square, and a temporary terminal at the foot of Main Street in Alameda. After the Bay Bridge was reopened, ferry service operated by Red and White fleet and sponsored and funded by the City of Alameda, Port of Oakland, MTC and Caltrans was continued. Over a transition period beginning in 2009, WETA acquired the vessels and facilities of the City of Alameda Ferry. Additionally, following the earthquake, ferry ridership increased dramatically on the existing City of Vallejo Baylink Ferry service.

Many more moderate to great earthquakes (over magnitude 6.0) have affected the Bay Area; 22 such events have occurred in the last 160 years – for an average of one every seven years, and future large earthquakes are a certainty. Recently, the Napa earthquake occurred in August 2014. The 6.0 magnitude earthquake struck the Bay Area on August 24, 2014. A shakemap provided by the USGS is contained below. The earthquake was localized approximately six miles southwest of Napa Valley, caused an estimated $360 million in damages and resulted in over 200 casualties, including one fatality. Napa Division Fire Chief, John Callanan, stated that the event triggered six major fires. No WETA facilities were damaged during this event and WETA scheduled service was not disrupted.

Figure 4.1: 2014 Napa Earthquake Shake Map



Source: USGS 2014

Location/Geographic Extent

The San Francisco Bay Area is transected by a series of subparallel faults that together accommodate the relative motion between the Pacific and North American plates. The San Andreas Fault and six other significant fault zones are present in the Bay Area: the Calaveras, Concord-Green Valley, Greenville, Hayward, Rodgers Creek, and San Gregorio Faults. Active faults can consist of multiple breaks along curved and complex traces (USGS, 2016).

Magnitude/Extent

The most common method for measuring earthquakes is magnitude, which measures the strengths of earthquake. Although the Richter scale is known as the measurement for magnitude, the majority of scientists currently use either the moment magnitude scale (Mw) or Modified Mercalli Intensity scale (MMI). The effects of an earthquake in a particular location are measured by intensity. Earthquake intensity decreases with distance from the epicenter of the earthquake.

The magnitude of an earthquake is related to the total area of the fault that ruptured, as well as the amount of offset (displacement) across the fault. As shown in Table 4.1, there are seven earthquake magnitude classes, ranging from great to micro. A magnitude class of great can cause tremendous damage

to infrastructure in the WETA jurisdiction, compared to a micro class, which results in minimal or no damage to infrastructure. The majority of the region is classified as having "very strong" shaking potential, the areas surrounding the San Andreas and Hayward faults are classified as having "violent" shaking potential, and the rest of the region is classified as having "strong" shaking potential. See Figure 4.2 below.

Table 4.1: Earthquake Moment Magnitude Scale		
Magnitude Class	**Magnitude Range (M = Magnitude)**	**Potential Damage**
Great	M > 8	Tremendous damage
Major	7 <= M < 7.9	Widespread heavy damage
Strong	6 <= M < 6.9	Severe damage
Moderate	5 <= M < 5.9	Considerable damage
Light	4 <= M < 4.9	Moderate damage
Minor	3 <= M < 3.9	Rarely causes damage
Micro	M < 3	Minor or no damage

http://earthquake.usgs.gov/learn/topics/mag_vs_int.php

The MMI Scale measures earthquake intensity as shown in **Table 4.2**. The MMI Scale has 12 intensity levels. Each level is defined by a group of observable earthquake effects, such as ground shaking and/or damage to infrastructure. Levels I through VI describe what people see and feel during a small to moderate earthquake. Levels VII through XII describe damage to infrastructure during a moderate to catastrophic earthquake.

Table 4.2: Modified Mercalli Scale - Earthquake Magnitude and Intensity		
Magnitude (M_w)	**Intensity (Modified Mercalli Scale)**	**Description**
1.0 – 3.0	I	I. Not felt except by very few people under especially favorable conditions.
3.0 – 3.9	II – III	II. Felt by a few people, especially those on upper floors of buildings. Suspended objects may swing.
		III. Felt quite noticeably indoors. Many do not recognize it as an earthquake. Standing motorcars may rock slightly.
4.0 – 4.9	IV – V	IV. Felt by many who are indoors; felt by a few outdoors. At night, some awakened. Dishes, windows and doors rattle.
		V. Felt by nearly everyone; many awakened. Some dishes and windows broken; some cracked plaster; unstable objects overturned.
5.0 – 5.9	VI – VII	VI. Felt by everyone; many frightened and run outdoors. Some heavy furniture moved; some fallen plaster or damaged chimneys.
		VII. Most people alarmed and run outside. Damage negligible in well-constructed buildings; considerable damage in poorly constructed buildings.
6.0 – 6.9	VII – IX	VIII. Damage slight in special designed structures; considerable in ordinary buildings; great in poorly built structures. Heavy furniture overturned. Chimneys, monuments, etc. may topple.
		IX. Damage considerable in specially designed structures. Buildings shift from foundations and collapse. Ground cracked. Underground pipes broken.
7.0 and Higher	VIII and Higher	X. Some well-built wooden structures destroyed. Most masonry structures destroyed. Ground badly cracked. Landslides on steep slopes.
		XI. Few, if any, masonry structures remain standing. Railroad rails bent; bridges destroyed. Broad fissure in ground.
		XII. Virtually total destruction. Waves seen on ground. Objects thrown into the air.

Source: http://earthquake.usgs.gov/learn/topics/mercalli.php

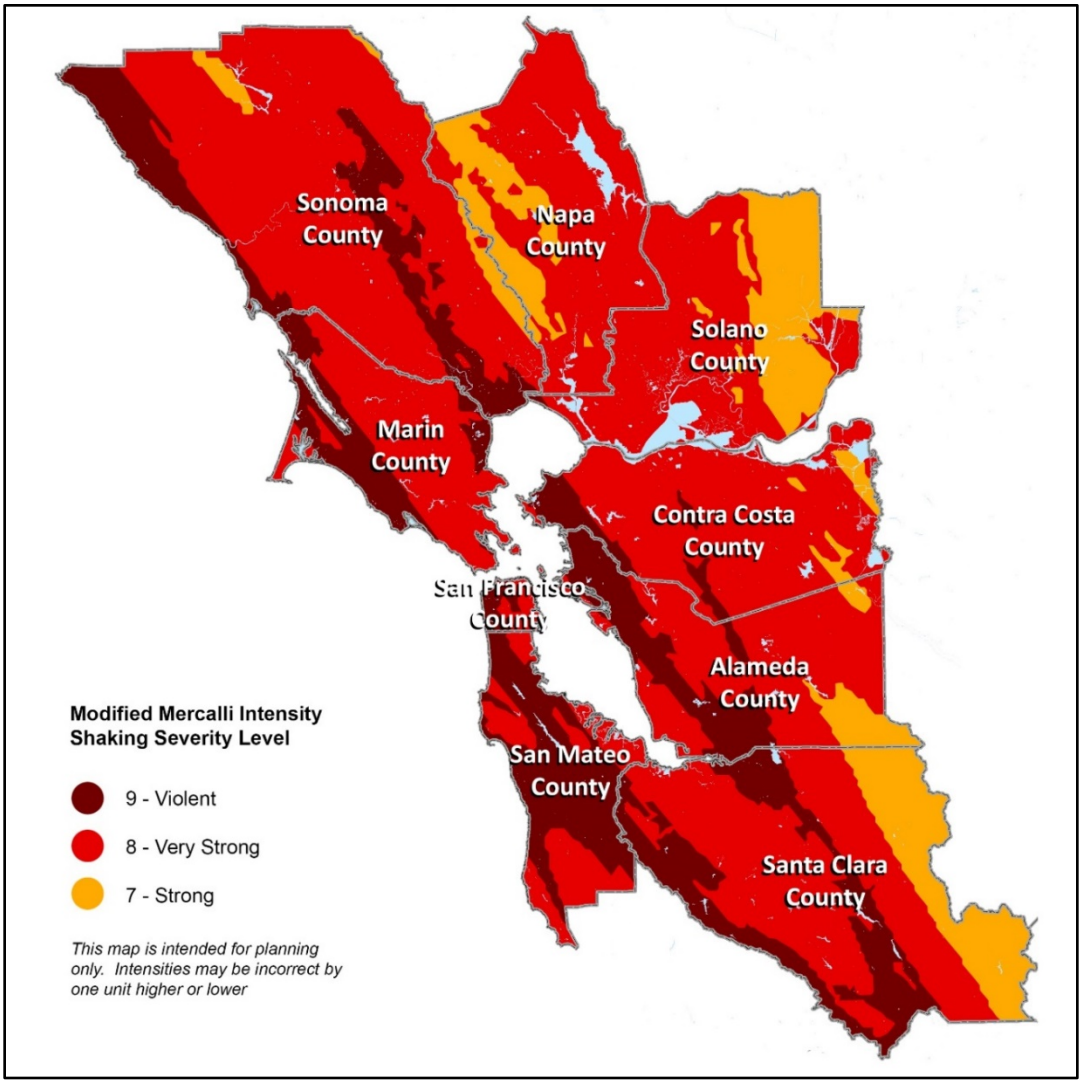
A particular seismic related concern for WETA is potential failure of the Port of San Francisco seawall during a major earthquake. Reinforcing the seawall that provides the Port with inundation protection is a key activity that the City of San Francisco is planning. The Seawall – constructed more than a century ago – is the foundation of over 3 miles of San Francisco waterfront stretching from

Fisherman's Wharf and Telegraph Hill to South Beach and Mission Creek. The seawall support WETA's headquarters at Pier 9 and the contract operator's facilities at Pier 41, the Ferry Building. It stabilizes ground below The Embarcadero multimodal transportation and utility corridor, and provides flood protection to downtown.

The Seawall requires significant improvements to survive the next major earthquake and to address increasing flood risk from sea level rise and climate change. Improvements under consideration include: a) strengthening the ground below the seawall, b) improving the ground landside of the seawall, c) constructing a new seawall, d) strengthening or replacing bulkhead walls and wharves, and e) relocating or replacing critical utilities.

Frequency/Probability of Future Occurrences

While earthquakes occur less frequently than other primary natural hazard events, they have accounted for the greatest combined losses (deaths, injuries, and damage costs) in disasters since 1950 in California and have the



greatest catastrophic disaster potential (California Office of Emergency Services, 2013). The USGS database shows that there is a 62 percent probability of an earthquake magnitude 6.7 or greater before the year 2032 (US Geological Survey, 2016). Shaking potential for the region is shown below in **Figure 4.1**. This map represents the composite shaking hazard across the Bay Area based on all earthquake scenarios and likelihood information using the MMI scale.

Figure 4.2: San Francisco Bay Area Shaking Potential

Source: USGS 2013. See http://resilience.abag.ca.gov/earthquakes/

4.2.2 Tsunami

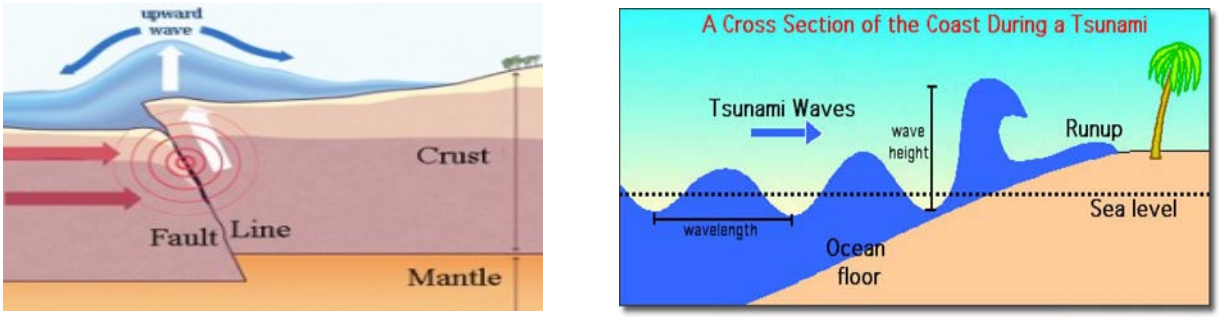
Tsunamis associated with an earthquake also pose a significant threat to WETA. As sea levels rise due to climate change, this threat will increase. WETA assets in Oakland and Alameda are particularly at risk from tsunamis. Facilities in San Francisco and planned facilities at Treasure Island and Richmond are also threatened by tsunamis, while WETA vessels should have sufficient warning times to avoid areas with significant tsunami run-up.

A tsunami is a series of waves generated in a body of water by a disturbance that vertically displaces the water. Generally, subduction zone earthquakes of magnitude 7.5 or greater at plate boundaries may cause tsunamis. Tsunamis also may be generated by submarine and subaerial landslides (which may also be caused by earthquakes), submarine volcanic eruptions, and the collapse of volcanic edifices. The Bay Area may be affected by tsunamis from both distant sources, such as large earthquakes elsewhere in the Pacific Rim and from relatively local sources off the coast of Northern California, such as local earthquakes and landslides.

A single tsunami may involve a series of waves, known as a train, of varying heights. It is important to note that the first wave is often not the largest. In open water, tsunamis exhibit long wave periods of up to several hours, and wavelengths that can extend up to several hundred miles. These characteristics distinguish tsunamis from typical wind-generated swells on the ocean, which might have a period of about 10 seconds and a wavelength of 300 feet. Tsunamis may travel across the ocean at speeds of about 500 miles per hour. The height or amplitude of a tsunami wave in deep water is generally one to three feet or less, and thus may not be noticeable to people on ships. As tsunami waves approach land, however, and as the ocean shallows, the waves slow to around 30 to 60 miles per hour, but grow significantly in height.

Tsunami run-up (see **Figure 4.2**) occurs when a peak in the tsunami wave travels from the near-shore region onto the shore. Run-up is a measurement of the height of the water onshore observed above a reference sea level. It refers to both the distance inland, and the elevation above normal high tide, that a tsunami can reach after moving past the normal shoreline during dry-land inundation from a given point on the coast. Run-up is generally expressed as elevation above normal high tide. Run-up elevation numbers from the same tsunami will vary along a coastline due to the influence of offshore bathymetry and onshore topography.

Figure 4.3: Tsunami Creation and Run-up Cross-Section



Source: SMS-Tsunami-Warning.com

Tsunamis not only affect beaches open to the ocean, but also may cause damage to ports, harbors, bays, tidal flats, and the shores of large coastal rivers. Due to their long wavelengths, tsunami waves can also diffract around land masses. Therefore, the notion that offshore islands, peninsulas, and even man-made breakwaters may provide protection is false.

Regulatory Environment

There are very few formal regulations that pertain to tsunami events in general.

Past Occurrences

Since the year 1850, 54 tsunamis have reached the San Francisco Bay. Nine of these tsunamis originated in Alaska and were caused by an earthquake, by an earthquake and landslide, or by a volcano and earthquake. Only one tsunami has been recorded as originating along the central California Coast: A 4-inch wave run-up was recorded at the Presidio gauge station shortly after the 1906 earthquake.

Little damage occurred in San Francisco as a result of the tsunami generated by the Japan Tohoku earthquake of March 11, 2011. The Tohoku tsunami produced a maximum measured amplitude of 24 inches at the San Francisco Marina and estimated maximum currents of approximately 7 knots per hour. Currents in excess of 3 knots are known to cause damage to fixed piers and structures and to present hazards to water navigation. Two piles were broken, and boats toppled over in the San Francisco Marina. Damage was minimized, however, since the largest surges occurred during low tide.

Location/Geographic Extent

In 2009, the California Office of Emergency Services (CalOES) and the Tsunami Research Center at the University of Southern California produced statewide tsunami inundation maps for California. The maps were prepared to assist coastal communities in identifying their tsunami hazards, and were intended as a basis for creating tsunami evacuation and emergency response plans. The inundation lines on these maps represent the maximum estimated tsunami run-up based on several extreme, but realistic, tsunami sources.

The land area susceptible to inundation is a direct result of wave height at the shoreline during the tsunami event. How much water arrives is controlled by how much water has been displaced due to surface rupture at the earthquake source. Tide level and offshore and onshore topography are critical factors in determining how much land is inundated for a given section of coastline. Flat coastal communities are the most vulnerable to tsunamis, and if the tsunami arrives at high tide, rather than low, run up and inundation are far worse.

A rupture of the Alaska-Aleutians subduction zone fault would send waves into San Francisco Bay within four to five hours. Waves from an earthquake on this fault could threaten Oakland and the Alameda Estuary location of WETA ferry terminals as well as San Francisco. Oakland sits at the terminus of the deep water shipping channel, which would focus the waves from the ocean, through the Golden Gate strait, and directly to its shores.

"The shipping channel is a pretty efficient transmitter of tsunami energy through the Golden Gate and towards Oakland," said the USGS', Eric Geist, an expert in the probability of tsunami generation. Northern San Francisco, along Fishermen's Wharf and the Marina District, could also be at risk, inundated by water up to 15 feet above sea level, if it hits at high tide. The San Francisco Bay Ferry Terminal is also in the inundation zone. The potential inundation zone is depicted in **Figure 4.3**, below.

Figure 4.4: Bay Area Tsunami Inundation Zone

Source: Produced from California Emergency Management Agency, California Geological Survey, University of Southern California

Magnitude/Extent

Potential tsunami inundation maps were developed in 2009 by the California Department of Conservation and may be viewed at: http://www.conservation.ca.gov/cgs/geologic_hazards/Tsunami/Inundation_Maps/Pages/index.aspx.

The inundation modeling used to create the 2009 maps estimates that maximum tsunami wave run-up elevation at the Golden Gate would be 13 feet at the shoreline, with run-up to 19 feet along northern portions of San Francisco near Crissy Field (National Geodetic Vertical Datum). This wave run-up would dissipate as it moved east, north, and south, out of the gate, and into San Francisco Bay. By the time it reached the eastern shoreline of the Bay at Alameda Island, run-up would be 13 feet. Maximum wave heights in the bay at San Francisco International Airport from the scenarios used to create the inundation maps are below three feet.

Frequency/Probability of Future Occurrences

Probability-based tsunami inundation maps and products that can be used for site evaluation, land-use planning, and building design and construction are currently being developed by the State of California, NOAA, and FEMA. Release of these products is anticipated over the next several years, depending on funding. Because the majority of the region's faults are strike-slip faults, a tsunami is not expected to be a major threat as a result of a near-source, regional earthquake. However, the nearby Point Reyes Thrust Fault may displace water, causing a tsunami. The primary tsunami threat to the San Francisco Bay Area, however, is from distant-source earthquakes originating in subduction zones elsewhere in the Pacific basin, particularly from the Alaska and Aleutian Subduction Zone. Data from the California Seismic Safety Commission indicates that since 1872, Alaska earthquakes have produced tsunami run-ups in the Bay Area on nine separate occasions, yielding a recurrence interval of 15.67 years. Historically, the run-ups from these events have been several inches at most.

Tsunami is a hazard profiled in this HMP that will be significantly impacted by the effects of climate change. Current projections for temperature suggest increases in mean maximum temperature around the globe, which almost certainly indicates increasing the increasing severity of heat waves. The frequency of these heat waves is also likely to increase. As temperatures grow warmer, sea level is projected to rise at an accelerated rate. Factors such as astronomical tides and variations in storm intensity and winds likely will affect water levels in all coastal regions. The impacts of climate change on these factors are still being refined, but an increase in tsunami run-up is probable as a result of projected sea level rise.

4.2.3 Civil Unrest

Civil unrest is defined as civil disorder, a broad term that is typically used by law enforcement to describe disruption of typical social order; it may involve a strike or protest, and it can be peaceful or involve violence. Both riots and rebellions are forms of civil unrest. Incidents of civil unrest often occur after national or local events incite anger in the populace and may be triggered by various causes such as political protests, racial strife or sporting events. Civil disorders and disturbances are human-caused events with potential for endangering life and damaging property.

The Bay Area has historically experienced episodes of civil unrest. Civil disturbances may be mitigated through planning, Mitigation activities for civil disturbance are not solely a police function but are a shared responsibility of elected officials, community leaders, business leaders, service organizations and community residents.

Regulatory Environment

While basic constitutional rights guarantee free assembly, civil unrest associated with such events has the potential to result in injuries, loss of life, and destruction of property. Heightened vigilance and strategic organization, and training on the part of law enforcement can mitigate damage and casualties from civil disturbances.

Past Occurrences

City police departments in the San Francisco Bay Area region have dealt with civil unrest on many occasions. Recent examples include the October 2014 Major League Baseball San Francisco Giants World Series victory riots, November 2014 unrest in Oakland following the Ferguson verdict, and Black Lives Matter protestors blocking traffic on the San Francisco-Oakland Bay Bridge on Martin Luther King Jr. Day, 2016.

Major League Baseball San Francisco Giants World Series Victory Riots 2014: A celebration in San Francisco's streets as a result of the Giants' World Series victory on October 29, 2014 turned violent in some areas with people injured by gunfire, officers hurt by bottles thrown by revelers, and police making arrests. Violence left three people injured, two by gunshots and one in a stabbing.

Ferguson Verdict Civil Unrest 2014: Hundreds of people marched through downtown Oakland, blocked traffic on Interstate-580, broke windows, and set small fires during a night of protests on November 24, 2014 over a grand jury's decision not to indict Ferguson, Missouri police Officer Darren Wilson in the fatal shooting of Michael Brown. More than 40 people were arrested.

Black Lives Matter Protestors Block Bay Bridge 2016: Protesters linked with the Black Lives Matter movement chained themselves together on the busy San Francisco-Oakland Bay Bridge on Monday, January 18th, 2016, blocking rush-hour traffic traveling toward San Francisco. Bridge traffic was stopped for more than 30 minutes before California Highway Patrol officers partially reopened the five westbound lanes. The combination of professional protestors, anarchists, demonstrations, and counter demonstrations at many public gatherings has created the potential for civil unrest. Often events deemed to be celebrations can cause civil disturbances and create loss. When dealing with events that have the potential to become incidents of civil unrest, law enforcement’s most important goal is safeguarding citizens and property.

Location/Geographic Extent

The entire San Francisco Bay Area region is vulnerable to civil unrest. While there are no specific hazard zones that can be identified or predicted for civil unrest, WETA ferry terminals located in highly urban areas such as Oakland and San Francisco are more likely to experience this hazard.

Magnitude/Extent

Civil unrest may result from a wide variety of causes, ranging from local to international. All regional assets are susceptible to risk from civil disturbances. Local government facilities including San Francisco and Oakland City Halls as well as the San Francisco-Oakland Bay Bridge are considered most at risk since several demonstrations or rallies have originated in these locations in the past. Other police and fire facilities have also been targeted during past events. Previous experience indicates that Critical Response (police stations, fire stations) also are at risk during periods of civil unrest. In addition, Critical Operating Facilities, such as regional ports and ferry landings, etc. are at risk of damage or destruction and may be rendered temporarily inoperative for some period of time. Depending upon the nature of the event, however, any assets owned by local government organizations/agencies may be considered vulnerable to damage or destruction as a result of civil unrest.

Frequency/Probability of Future Occurrences

While it is not possible to make long term predictions of civil unrest events, it is highly probable that such events will occur in the WETA jurisdictions from time to time. Because of the extreme unpredictability of civil unrest events, no specific estimates can be made concerning potential losses

4.2.4 Severe Storms/Winds

Severe weather is any destructive weather event which has the potential to damage property or cause loss of life. Additionally, excessive localized precipitation over a short period of time may result in related flash floods threatening life and property. Severe weather is generally any destructive weather event, but usually occurs in the San Francisco Bay Area region as localized storms that bring heavy rain, hail, lightning, and strong winds. A few instances of extreme heat have been recorded; however, winter storms are a major part of the severe weather hazard profile documented in this section.

Regulatory Environment

There are very few formal regulations that pertain to severe weather events in general.

Past Occurrences

Since 1950, 14 federally-declared major severe weather events have occurred in the WETA jurisdiction as shown in Table 4.3. These events include severe storms, coastal storms, and winter storms; flooding, landslides, and mudslides, and heavy rains and flooding. According to the California Governor's Office of Emergency Services (Cal OES), Emergency and Disaster Proclamations Executive Orders (November 2003 to present), one winter storm event occurred affecting the WETA jurisdiction in 2008 and two droughts occurred in 2009 and 2014 lasting for several years. On May 21, 2011, WETA experienced piling failure at Harbor Bay Ferry Terminal, due to inadequate design and strong wind and wave conditions. Costs to complete repairs were $300,000. Other weather-related disasters affecting the WETA jurisdiction include flooding, heavy rains, and severe storms.

Ferry service suspension has occurred on several occasions due to severe weather. Service interruptions within the past five years include:

- December 30, 2014: South San Francisco to Oakland; 3 trips
- December 22, 2016: Oakland to South San Francisco; 3 trips
- December 22, 2016: San Francisco to Oakland; 1 trip

Table 4.3: Past Disasters in WETA Jurisdiction (Alameda, San Francisco, San Mateo, and Solano counties)

Disaster Number	Declaration Date	Disaster Type	Incident Type	Explanation
Federal Declarations (DR)				
894	2/11/1991	DR	Freezing	Severe Freeze
1044	1/10/1995	DR	Severe Storm(s)	Severe Winter Storms, Flooding, Landslides, Mud Flow
1046	3/12/1995	DR	Severe Storm(s)	Severe Winter Storms, Flooding, Landslides, Mud Flow
1155	1/4/1997	DR	Severe Storm(s)	Severe Storms, Flooding, Landslides, and Mudslides
1203	2/9/1998	DR	Severe Storm(s)	Severe Winter Storms and Flooding
1628	2/3/2006	DR	Severe Storm(s)	Severe Storms, Flooding, Landslides, and Mudslides
1646	6/5/2006	DR	Severe Storm(s)	Severe Storms, Flooding, Landslides, and Mudslides
Emergency Declarations (EM)				
3023	1/20/1977	EM	Drought	Drought
3248	9/13/2005	EM	Hurricane	Hurricane Katrina Evacuation Support
CalOES Emergency and Disaster Proclamations / Executive Orders				
	1/5/2008 to 1/14/2008		Winter Storms	
	2/27/2009		Drought	3-year State-wide Drought
	1/17/2014		Drought	State of Emergency Declaration
Other Disasters				
845	10/18/1989	DR	Earthquake	Loma Prieta Earthquake
919	10/22/1991	DR	Fire	Oakland Hills Fire

The National Climatic Data Center, the National Geophysical Data Center, and the National Oceanographic Data Center; which includes the National Coastal Data Development Center—were recently merged into the National Centers for Environmental Information (NCEI). NCEI is responsible for hosting and providing access to one of the most significant archives on Earth, with comprehensive oceanic, atmospheric, and geophysical data. NCEI is the nation's leading authority for environmental information.

The NCEI Storm Events Database contains detailed data on several severe weather events for the San Francisco Bay Area region. The information below summarizes the magnitude and severity of three of these events.

- February 27, 2006: A strong winter storm brought wind gusts up to 71 mph to the San Francisco Airport. No fatalities or injuries were reported.
- March 19, 2011: A series of weather systems brought heavy rain, strong winds, high surf, and a tornado affected the District on March 16-21, 2011. Two deaths occurred during this time. Reports indicated that as many as fourteen sailboats and one houseboat floated free in Richardson Bay during the event with some becoming beached off Strawberry Point.
- February 6, 2015: A strong winter storm impacted California following up on nearly a month and a half without precipitation and the driest January on record. The storm brought heavy rain, gusting winds, and damage to trees and powerlines along with some minor flooding of urban areas. No fatalities or injuries were reported.

Location/Geographic Extent

Severe weather affects all areas of the WETA service area as the particular hazard has no geographical boundaries. Throughout the region, there are wind speed, wave height and variations in the average amount of rainfall received due to terrain differences.

Magnitude/Extent

The San Francisco Bay Area experiences what climatologists classify as a Mediterranean type of climate. This climate regime is typified by nearly 90 percent of the annual precipitation occurring a relatively narrow window of about 16 weeks. The most severe storms occur during the late fall to early spring. The climate pattern can generate severe and prolonged periods of heavy rain. The WETA jurisdiction experiences periods of heavy rains on an annual recurring basis. Some of these severe winter storms may also contain embedded thunderstorms. Thunderstorms are typically few in number and are more likely to appear in the spring or late fall.

Though difficult to capture magnitude and severity of severe storms in a generalized region, two data sources can be used to develop a general sense of the magnitude and severity of severe storms within the WETA jurisdiction. Data from both the Spatial Hazard Events and Losses Database (SHELDUS™) and NCDC Storm Events Database can be used to develop models of weather in the region. Wind gusts of over 60 mph have been reported in heavy rainstorms and gusts have reached over 77 mph in the region. Freezing temperatures in the region have been known to cause frost/ice while extremely high temperatures of 90 to 100 degrees Fahrenheit have resulted in heat waves. Average rainfall varies throughout different parts of the WETA jurisdiction, but typically averages around 20-24 inches annually (US Climate Data, 2016).

Frequency/Probability of Future Occurrences

Severe weather/storms will continue to occur annually throughout the WETA jurisdiction. The frequency and probability of future occurrences is highly likely (near 100 percent probability in the next year). Due

to previous weather patterns and global warming, increases in the probability of future occurrences of severe weather events in the region are anticipated.

Impacts of Climate Change

Severe weather/storms are one of the hazards profiled in this HMP that will be significantly impacted by the effects of climate change. The vulnerability and exposure of people and property to damage from severe weather/storms and subsequent flooding is significant and widespread; however, this vulnerability is expected to become greater as increasing development density occurs in the San Francisco Bay Area region placing more people and infrastructure in harm's way. Additionally, current projections for temperature suggest increases in mean maximum temperature around the globe, which predicts increasing severity and frequency of heat waves. As temperatures grow warmer, sea level also rises at an accelerated rate due to thermal expansion. Factors such as astronomical tides and variations in storm intensity and winds likely will affect water levels in all coastal regions. The impacts of climate change on these factors are still being refined, but an increase in storm surge is probable in addition to projected sea level rise. Little information is available indicating the impacts of climate change on small scale, short-lived damaging weather events such as thunderstorms and extreme winds.

4.2.5 Terrorism

Terrorism is the use of force or violence against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion, or ransom. The Federal Bureau of Investigation (FBI) categorizes terrorism in the United States as one of two types:

- Domestic Terrorism – terrorist activities that focus on facilities or populations without foreign direction
- International Terrorism – terrorist activities that are foreign-based and/or sponsored by organizations or groups outside the United States

The distinction between domestic or international terrorism refers not to where the terrorist act takes place but rather to the origin of the individuals or groups responsible for it. For example, the 1995 bombing of the Murrah Federal Building in Oklahoma City was an act of domestic terrorism, but the attacks of September 11, 2001, were carried out by international groups.

Terrorists often use threats to create fear among the public, to convince citizens that government is powerless to prevent violent acts, and to get immediate publicity for their causes. Weapons of mass destruction (WMD), including incendiary, explosive, chemical, biological, radiological, and nuclear agents, have the capability to cause mass casualties to a significant number of people, thus posing the threat of a catastrophic incident

Intentional attacks are much harder to predict than naturally occurring events. Terrorists could attack the WETA jurisdiction in numerous different ways, including (but not limited to) the following:

- Conventional bomb
- Biological agent
- Chemical agent
- Nuclear bomb
- Radiological agent
- Arson/incendiary attack
- Armed attack (active shooter)
- Cyber-terrorism
- Intentional hazardous materials release
- Assaults on infrastructure and electronic information systems

Past Occurrences

Little data exists to show that communities in the WETA service area have experienced acts of terrorism. The history of terrorism on United States soil includes the large-scale attacks of Jun 12, 2016 at an Orlando Florida nightclub, September 11, 2001, on the World Trade Center in New York and the Pentagon in Washington, D.C. and the ensuing anthrax attacks, the 1995 bombing of the Murrah Federal Building in Oklahoma City, and, the earlier bombing of the World Trade Center in 1993. There have been numerous smaller scale shootings, bombings and fires that have been labeled as terrorist incidents.

Recent terrorist threats and attacks on ferries or ferry transportation infrastructure have occurred in a number of countries. They include:

- February 27, 2004. A terrorist attack resulted in the sinking of SuperFerry 14 and the deaths of 116 people in the Philippines. This event represented the world's deadliest terrorist attack at sea.
- July 25, 2014. Kenyan police shot and killed two armed men suspected of planning an attack on a ferry in the port city of Mombasa after one of them tried to hurl a grenade at approaching police.

Location/Geographic Extent

The form and locations of many natural hazards are identifiable and, even in some cases, predictable; however, there is no defined geographic boundary for terrorism. Based on previous events, it is presumed that critical facilities and services and large gatherings of people are at higher risk. Public transportation facilities have been a repeated target of terrorists. This is due to the open nature of the facilities, the large numbers of people that use them and the paralyzing affects that terrorist attacks have on communities' ability to provide transportation for daily life. Terrorist attacks on transportation systems thus have an impact that is much greater than to loss of human life and injuries and the damage done to infrastructure. By shutting down vital services and requiring increased security, they have a disproportionate economic cost.

Magnitude/Extent

The damage caused by a terror attack is dependent on the method of attack. Large bomb attacks could destroy major infrastructure, kill many people and disrupt regional functioning for a significant time. Cyber-terrorism would cause very different types of damage, possibly severely hampering local government operations and local business with no direct injuries or loss of life. In addition to direct physical damage, terrorist attacks breed fear. Even an unsuccessful attempt to attack the region would seriously impact the comfort level of residents and could affect local business.

The time and place of individual terrorist acts cannot be forecast with great accuracy. However, anti-terrorist organizations such as local law enforcement, the Northern California Regional Intelligence Center and federal agencies work collaboratively to detect, deter and disrupt potential terrorist activity. Terrorists can strike not just large cities, but in any community of any size. While no amount of planning and mitigation can remove 100 percent of the risk from terrorism, hazard mitigation and preparedness can help reduce the risk. Given the lack of information on observed historical damages, frequency of occurrence, intensity and damage parameters, no estimate is available for the probability of a future occurrence of a terrorist event.

It is not possible to estimate the probability of a terrorist attack. The approach experts use to prioritize mitigation and preparedness efforts is to identify critical sites and assess the vulnerability of these sites to terrorist attack. Vulnerability of these sites is determined subjectively by considering factors such as visibility (e.g., does the public know this facility exists in this location?), accessibility (e.g., is it easy for the public to access this site?) and occupancy (e.g., is there a potential for mass casualties at this site?).

Public transportation systems are potentially subject to terrorist attacks and have been the venue for numerous previous terrorist incidents. The open nature of buses, trains and ferries, and the confluence of transit facilities with other public meeting places and tourism attractions results in heightened vulnerabilities. In circumstances, such as these, multiple organizations bear responsibility for mitigation activities.

Buildings and other structures constructed to resist earthquakes and fires usually have qualities that also limit damage from blasts and resist fire spread and spread of noxious fumes. Efforts to retrofit buildings to resist earthquakes often provide cost-effective opportunities to incorporate measures to mitigate against attacks using bombs, chemical and biological agents.

4.2.6 Sea Level Rise

The Bay Area will be subject to multiple, new or worsening hazards over the next several decades due to global climate change caused by increased greenhouse gas concentrations in the atmosphere. In 2010, the San Francisco Bay Conservation and Development Commission (BCDC) and NOAA's Office for Coastal Management (NOAA OCM) brought together local, regional, state and federal agencies and organizations, as well as non-profit and private associations for a collaborative planning project along the Alameda County shoreline – the Adopting to Rising Tides (ART) Subregional Project – to identify how current and future sea level rise induced flooding will affect communities, infrastructure, ecosystems and economy.

Since then, the ART Program has continued to both lead and support multi-sector, cross-jurisdictional projects that build local and regional capacity in the San Francisco Bay Area to plan for and implement

adaptation responses. These efforts have enabled the ART Program to test and refine adaptation planning methods (ART Approach) to integrate sustainability and transparent decision-making from start to finish, and foster robust collaborations that lead to action on adaptation.

Sea level rise has the potential to increase the frequency and severity of coastal, riverine and localized nuisance flooding. In particular, even with intervention, rising sea levels may cause more frequent and longer flooding of existing flood-prone areas, shoreline erosion, and permanent inundation in the coastal zones. Sea level is projected to rise 16 inches by 2050 and 55 inches by 2100 (ABAG).

As sea levels rise, groundwater and salinity levels are also predicted to rise. This will increase the risk of salt water intrusion into below-grade assets including sensitive electrical/mechanical equipment. In addition, increasing groundwater levels may increase liquefaction susceptibility, and may increase the need for routine flood management activities. All WETA Facilities including those planned for future operation are at risk due to sea level rise. Most will face potential for repeated inundation as sea levels continue to rise.

Frequency/Probability of Future Occurrences

Sea level rise is an ongoing and increasing process that will continue for the foreseeable future until increased global temperatures caused by climate change are halted. The effects of sea level rise will worsen over the rest of the century.

Magnitude/Extent

Inundation caused by sea level rise will occur globally with specific amounts determined by the topography and hydrology characteristics of the location. Current models predict that sea levels with rise between 1 and 1.4 meters in the Bay Area by 2100. Inundation from sea level rise in the Bay Area will predominantly affect the north and east bay including Alameda Island, Mare Island, southern Solano County and the southern coast of Napa County. All WETA facilities are at risk from sea level rise.

Past Occurrences

Sea level rise is a process that has occurred repeatedly over earth's history. The current, rapid rise in global temperature is the greatest since the development of infrastructure critical to sustain our modern civilization.

4.2.7 Hazards Summary

While WETA is subject to a number of hazards, a major earthquake and a tsunami pose the most significant natural hazard threats. A major earthquake could damage many or even all WETA ferry terminals and maintenance facilities and severely disrupt WETA service when it may be most needed to move first responders and disaster survivors. A tsunami will likely produce enough warning to minimize the effects on vessels and passengers and allow evacuation of facilities but may cause major damage to shore side facilities. Impacts from an earthquake or tsunami are likely to be significant and costly and place WETA in a position where it will likely compete with other organizations for scarce repair resources. Terrorist incidents or criminal actions on a ferry also pose noteworthy threats. While they may be isolated events

that are not systematically predictable, their outcomes could result in potential long-term impacts on WETA ridership and the need for heightened security at terminals.

4.3 Vulnerability Assessment

A vulnerability assessment involves evaluating at-risk assets, describing potential impacts, and estimating losses for each hazard. The intention of a vulnerability assessment is to help WETA understand the greatest risks it faces. The vulnerability assessment defines and quantifies at-risk populations, buildings, critical facilities, and other assets, and is based on the best available data and the significance of the hazard. The vulnerability assessment further examines the impact of the identified hazards on the WETA, determines what WETA assets are most vulnerable to each hazard, and estimates potential losses to facilities for each hazard.

FEMA RECOMMENDATIONS: RISK ASSESSMENT

Assessing Vulnerability

The plan should describe vulnerability in terms of (see 44 CFR § 201.6(c)(2)(ii)(A)-(B)):

(A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.

(B) An estimate of the potential dollar losses to vulnerable structures identified above and a description of the methodology used to prepare the estimate.

Vulnerability Description

44 CFR § 201.6(c)(2)(ii): "The plan shall include" a "description of the jurisdiction's vulnerability to the hazards described in" the plan. "This description shall include an overall summary of each hazard and its impact on the community."

Element

B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability? See 44 CFR § 201.6(c)(2)(ii)

Source: FEMA, *Local Mitigation Plan Review Tool*, Plan Strengths and Opportunities for Improvement, March 2013.

4.3.1 Hazard Risk Rating

For the 2016 Hazard Risk Rating (HPR), the risk for each hazard was rated using the Calculated Priority Risk Index (CPRI). The CPRI examines four criteria for each hazard: probability, magnitude/severity, warning time, and duration (**Table 4-4**). For each hazard, an index value is assigned for each CPRI category from 0 to 4 with "0" being the least hazardous and "4" being the most hazardous situation. This value is then assigned a weighting factor and the result is a hazard ranking score (**Table 4-5**).

Table 4-4: Calculated Priority Risk Index				
CPRI Category	**Degree of Risk Chart**			**Assigned Weight**
	Level ID	**Description**	**Index Value**	
Probability	Unlikely	• Extremely rare with no documented history of occurrences or events. Annual probability of less than 0.001.	**1**	**45%**
	Possible	• Rare occurrences with at least one documented or anecdotal historic event. Annual probability of between 0.01 and 0.001.	**2**	
	Likely	• Occasional occurrence with at least two or more documented historic events. Annual probability of between 0.1 and 0.01.	**3**	
	Highly Likely	• Frequent events with a well-documented history of occurrence. Annual probability of greater than 0.1.	**4**	
Magnitude-Severity	Negligible	• Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure). • Injuries or illnesses are treatable with first aid and there are no deaths. • Negligible quality of life lost. • Shut down of critical facilities for less than 24 hours.	**1**	**30%**
	Limited	• Slight property damages (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). • Injuries and illnesses do not result in permanent disability and there are no deaths. • Moderate quality of life lost. • Shut down of critical facilities for more than 1 day and less than 1 week.	**2**	
	Critical	• Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure). • Injuries or illnesses result in permanent disability and at least one death. • Shut down of critical facilities for more than 1 week and less than 1 month.	**3**	

	Catastrophic	• Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure). • Injuries or illnesses result in permanent disability and multiple deaths. • Shut down of critical facilities for more than 1 month.	**4**	
Warning Time	< than 6 hours	• Population receives less than 6 hours of warning.	**4**	**15%**
	6 to 12 hours	• Population receives between 6-12 hours of warning.	**3**	
	12 to 24 hours	• Population receives between 12-24 hours of warning.	**2**	
	> than 24 hours	• Population receives greater than 24 hours of warning.	**1**	
Duration	< than 6 hours	• Disaster event will last less than 6 hours.	**1**	**10%**
	6 to24 hours	• Disaster event will last between 6-24 hours.	**2**	
	24 hrs. to 1 week	• Disaster event will last between 24 hours and 1 week.	**3**	
	> than 1 week	• Disaster event will last more than 1 week.	**4**	

Table 4-5: Hazard Ranking Score

HAZARDS	Probability	Weighted 45%	Magnitude Severity	Weighted 30%	Warning Time	Weighted 15%	Duration	Weighted 10%	CPRI Ranking
Earthquake	4	1.80	3	0.90	4	0.60	4	0.40	**3.70**
Sea Level Rise	4	1.80	4	1.20	1	0.15	4	0.40	**3.65**
Severe Storms/High Winds	4	1.80	1	0.30	1	0.15	3	0.30	**2.55**
Tsunami	2	.90	3	0.90	2	0.45	3	0.30	**2.55**
Civil Unrest	2	0.90	1	0.30	3	0.45	2	0.20	**1.85**
Terrorism	2	0.90	1	0.30	1	0.15	3	0.30	**1.65**

CPRI Hazard Risk Scoring				
Risk Level	**Severe**	**High**	**Moderate**	**Low**
Rank Score	4	3 – 3.9	2 – 2.9	1 – 1.9

4.3.2 Overview of Vulnerability Assessment

Both earthquakes and sea level rise represent a high risk to WETA. Earthquakes represent a continuous threat that provide no warning and can have catastrophic results. Seas level rise is a long term threat that will change the natural environment, particularly coastal areas, that can be prepared for and managed. Both hazards can be mitigated to some extent through proactive planning and directed activity. Severe storms and tsunamis are a moderate threat. Risk from tsunamis and severe storms will likely increase along with rising sea level.

4.3.3 Asset Inventory, Methodology, and Data Limitations

The location and operations of high-risk facilities such as critical infrastructures and key WETA assets are a significant concern with respect to a disaster. The planning team used FEMA's "Public Assistance Guide" (FEMA 322) that defines critical facilities as shelters, hospitals emergency operations centers (EOCs), data centers, utility plants or high hazardous materials facilities, as well as the FEMA Hazard Mitigation Handbook that described three categories of facilities for analysis to revise the list: critical facilities associated with WETA operations and safety; high potential loss facilities such as key maintenance facilities; and critical infrastructure such as ports and ferry terminals. **Table 4-6** lists the critical facilities for the 2016 HMP.

Table 4-6: WETA Critical Facilities		
Facility Name	**Category**	**Site Purpose**
WETA Administration Offices 9 Pier, Suite 111 San Francisco, CA 94111	Critical Facility	Administrative offices and EOC
Pier 9 Berthing Facility 9 Pier San Francisco, CA 94111	Critical Infrastructure	Ferry berthing facility
Harbor Bay Ferry Terminal 215 Adelphian Way Alameda, CA 94502	Critical Infrastructure	Ferry terminal
Alameda Main Street Ferry Terminal 2990 Main Street Alameda, CA 94501	Critical Infrastructure	Ferry terminal
Oakland Clay Street Jack London Square Ferry Terminal 10 Clay Street Oakland, CA 94607	Critical Infrastructure	Ferry terminal
Vallejo Ferry Ticket Office 289 Mare Island Way Vallejo, CA 94590	Critical Facility	Ticket office
Vallejo Ferry Terminal 289 Mare Island Way Vallejo, CA 94590	Critical Infrastructure	Ferry terminal
North Bay Operations & Maintenance Facility Building 165 - Landside 1050 Nimitz Avenue Vallejo, CA 94592	Critical Facility	Ferry vessel maintenance and alternate EOC
North Bay Operations & Maintenance Facility Waterside 1050 Nimitz Avenue Vallejo, CA 94592	Critical Facility	Ferry vessel maintenance and berthing
Regional Spare Float 1050 Nimitz Avenue Vallejo, CA 94592	Critical Facility	Spare float for emergency water operations
South San Francisco Oyster Point Terminal 911 Marina Boulevard South San Francisco, CA 94080	Critical Infrastructure	Ferry terminal

4.3.4 WETA Vulnerability and Assets at Risk to Specific Hazards

A quantitative vulnerability assessment provides planners with an understanding of the risks that individual facilities may be exposed to and potential losses that may be incurred. **Table 4-7** depicts individual assets, their exposure to various hazards and the values at risk.

Table 4-7: Facilities at Risk to Specific Hazards

Facility Name/Hazard	Earthquake	Sea Level Rise	Severe Storms	Tsunami	Civil Unrest	Terrorism	Potential Loss
WETA Administration Offices Pier 9	X	X	X	X	X	X	$1,000,000
Pier 9 Berthing Facility 9 Pier	X	X	X	X	X	X	$2,500,000
Harbor Bay Ferry Terminal	X	X	X	X	X	X	$6,000,000
Alameda Main Street Ferry Terminal	X	X	X	X	X	X	$10,000,000
Oakland Clay Street Jack London Square Ferry Terminal	X	X	X	X	X	X	$6,000,000
Vallejo Ferry Ticket Office	X	X	X	X	X	X	$100,000
Vallejo Ferry Terminal	X	X	X	X	X	X	$8,000,000
North Bay Operations & Maintenance Facility Landside	X	X	X	X	X	X	$13,000,000
North Bay Operations & Maintenance Facility Waterside	X	X	X	X	X	X	$13,000,000
Regional Spare Float 1050 Nimitz Avenue Vallejo, CA 94592	X	X	X	X	X	X	$2,700,000
South San Francisco Oyster Point Terminal	X	X	X	X	X	X	$22,000,000
Total							**$84,300,000**

Table 4-8: Vessels at Risk to Specific Hazards							
Vessel Name/Hazard	**Earthquake**	**Sea Level Rise**	**Severe Storms**	**Tsunami**	**Civil Unrest**	**Terrorism**	**Potential Loss**
Peralta			X	X		X	$5,500,000
Encinal			X	X		X	$2,300,000
Bay Breeze			X	X		X	$2,000,000
Gemini			X	X		X	$10,400,000
Pisces			X	X		X	$10,400,000
Scorpio			X	X		X	$11,300,000
Taurus			X	X		X	$11,300,000
Vallejo			X	X		X	$5,000,000
Intintoli			X	X		X	$7,000,000
Mare Island			X	X		X	$7,000,000
Solano			X	X		X	$10,500,000
Total							**$82,700,000**

FEMA requires that an estimation of loss be conducted for the identified hazards to include the number of potential structures impacted by the hazards and the total potential costs. The analysis of potential losses calculated in **Table 4-8** used the best data currently available to produce the estimations of loss. These estimates may be used to understand relative risk from hazards and potential losses. There are uncertainties in any loss estimation method, resulting from lack of scientific study and the exact result of hazard effects on the built environment, and from the use of approximations that are necessary for a comprehensive analysis.

A quantitative assessment has been prepared for the critical facilities affected by each hazard assessed, and multiplied by a value of percent damage. The percent damage was determined by the geographic area at stake, previous history of damage from the type of hazard, and potential for severity from the hazard profiles (**Table 4-9**).

Table 4-9: Summary of Potential Loss

Hazard Type	# of Critical facilities	Percent Damage	Replacement Value	Estimated Replacement Loss
Earthquake	11	100	$84,300,000	$84,300,000
Sea Level Rise	11	50	$84,300,000	$42,1500,000
Severe Storms	23	20	$168,250,000	$33,650,000
Tsunami	15	50	$105,950,000	$52,975,000
Civil Unrest	11	10	$84,300,000	$8,430,000
Terrorism	23	10	$168,250,000	$16,825,000

5. WETA's Capabilities Assessment

FEMA REGULATION CHECKLIST: CAPABILITY ASSESSMENT

Capability Assessment

44 CFR § 201.6(c)(3): – The plan must include mitigation strategies based on the jurisdiction's "existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools."

Elements

C1. Does the plan document the jurisdiction's existing authorities, policies, programs and resources, and its ability to expand on and improve these existing policies and programs? 44 CFR § 201.6(c)(3)

C2. Does the Plan address the jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? 44 CFR § 201.6(c)(3)(ii)

Source: FEMA, *Local Mitigation Plan Review Tool*, March 2013.

Note: **For coverage of Elements C3 – C5, see Section 8, Mitigation Strategies. For coverage of Element C6, see Section 9, Plan Maintenance.**

The reason for conducting a capability assessment is to identify WETA's capacity to successfully implement mitigation activities. Understanding internal and external processes, resources and skills forms the basis of implementing a successful HMP. Understanding strengths and weaknesses also helps ensure that goals and objectives are realistic and attainable.

The planning team conducted an assessment of WETA's capabilities that contribute to the reduction of long-term vulnerabilities to hazards. The capabilities include authorities and policies, such as legal and regulatory resources, staff, and fiscal resources. Staff resources include technical personnel such as planners/engineers with knowledge of development and land management practices, planners, engineers with an understanding of natural or human-caused hazards, and staff with expertise of the hazards to passenger vessel operations. The planning team also considered ways to expand on and improve existing policies and programs with the goal of integrating hazard mitigation into the day-to-day activities and programs of WETA.

In carrying out the capability assessment, several areas were examined:

- Planning and regulatory capabilities
- Administrative and technical resources
- Fiscal resources including grants, mutual aid agreements, operating funds and access to funds
- Technical and staff resources to assist in implementing/overseeing mitigation activities
- Previous and Ongoing Mitigation Activities

5.1 Planning and Regulatory Capabilities

WETA was created by State of California legislation in 2007, superseding the San Francisco Bay Area Water Transit Authority (WTA) with the intent "To provide a unified, comprehensive institutional structure for the ownership and governance of a water transportation system that shall provide comprehensive water transportation and emergency coordination services for the Bay Area Region" (Government Code Section 66540.2). WETA provides passenger ferry transit service under the operating name San Francisco Bay Ferry. WETA is authorized to operate and plan the expansion of water transit services on San Francisco Bay within the nine county Bay Area region.

ABAG provided the previous Bay Area HMP and continues to be a resource for mitigation and resiliency planning. In addition, it is a resource for collaboration with Bay Area governments and agencies. The Metropolitan Transportation Commission (MTC) is the lead agency for identifying and funding transportation needs across the Bay Area. The MTC recognizes the unique and significant role WETA plays in addressing the transportation and emergency response needs for the Bay Area. Currently ABAG and MTC have agreed to merge into one new agency. The future agency's objectives and focus are still being defined. WETA will continue to work with the new agency in representing the water transportation community and identifying further water transportation needs as well as unified mitigation activities to build resilience throughout the Bay Area.

5.2 NFIP Participation and Floodplain Management Activities

FEMA REGULATION CHECKLIST: RISK ASSESSMENT

Vulnerability Description: NFIP Insured Structures

44 CFR § 201.6(c)(2)(ii): The plan must "address NFIP insured structures that have been repetitively damaged by floods."

Elements

B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? See 44 CFR § 201.6(c)(2)(ii)

Source: FEMA*, Local Mitigation Plan Review Guide*, March 2013.

WETA has critical facilities in communities that participate in the National Flood Insurance Program (NFIP). WETA does not have any facilities with a repetitive loss (RL) or any substantive insurance claims associated with flooding. WETA will continue to support communities in achieving the maximum community service rating, as applicable and appropriate.

5.3 Administrative/Organizational Capabilities

WETA serves as a unique authority to alleviate transportation stress while securing emergency transportation. The WETA Emergency Response Plan (ERP) is designed to support the management of emergency water transportation after a catastrophic incident. In addition, the ERP describes agencies

involved, resources available to WETA, an operational framework and actionable guidance during incident response and recovery, and operational guidance for the WETA emergency operations center (EOC).

The WETA Strategic Plan identifies the strategic importance of the ferry system on a rapidly expanding and overstressed transportation system throughout the Bay Area. The 2016 Strategic Plan presents a vision for the next 20 years of ferry service in the San Francisco Bay Area. This plan comes at a pivotal period in WETA's history. Rising ridership driven by a strong regional economy with focused job growth in San Francisco has made the ferry more popular than ever. Pre-existing services in Vallejo, Alameda and Oakland have transitioned smoothly from city-run services to WETA operations. The first new terminal built in the Bay Area in decades – in South San Francisco – is thriving after an initial ramp up period. Funded projects such as the North Bay and Central Bay maintenance facilities as well as expansion of the downtown San Francisco terminal and a new terminal in Richmond are all in the final design or construction phase. And finally, expansion candidate terminals throughout San Francisco Bay are seeking funding to enter project implementation.

WETA also maintains a ten-year Short Range Transit Plan (SRTP) which provides a fiscally constrained projection for the FY2016-2025 period. Because of funding limitations, the plan assumes a modest enhancement to existing service levels and expansion only for terminals with a dedicated funding source: Richmond and Treasure Island.

WETA participates with several organizations that are concerned with inter-agency cooperation and coordination, maximizing fiscal resources, transportation system development, passenger safety, disaster response, recovery, and mitigation, and similar issues. Some of those organizations and agencies includes:

- United States Coast Guard Sector San Francisco
- Northern California Area Maritime Security Committee
- California Department of Fish and Wildlife, Office of Spill Prevention and Response (OPSR)
- Bay Area Metropolitan Transportation Commission (MTC)
- ABAG
- Federal Transit Administration (FTA)
- American Public Transport Association (APTA)
- California Transit Association (CTA)
- Passenger Vessel Association

To support its roles as an emergency authority and as a transit provider, WETA is included or signatory to mutual aid agreements including:

- State of California Master Mutual Agreement
- San Francisco Bay Area Transit Operators Mutual Aid Agreement
- San Francisco Vessel Mutual Assistance Plan (SF-VMAP)

5.4 Fiscal Capabilities

WETA normally operates as a transportation agency with funding for operations derived from:

- Fares
- Bridge tolls
- Transportation sales taxes
- Local transportation funding
- State Transit Assistance

WETA does not currently receive any funding specifically for emergency response activities or the provision of emergency water transportation operations. WETA will need early assistance from the State or Federal government or another mechanism to contract additional crews and vessels, and meet other increased operational expenses after a disaster in order to support emergency water transportation operations. Below are emergency funding programs that may support rapid reimbursement to WETA after such an event.

Federal Transportation Administration (FTA) Emergency Relief (ER) funding is available to entities that receive Federal transit funding directly from FTA, whether as a State, a designated recipient of 5307 Program funding, or as a direct recipient of program funds. Eligible recipients are typically States, local government authorities and public transit systems. Eligible recipients may apply for FTA ER Program funds on behalf of themselves and any sub-recipients.

In the event of an emergency or major disaster affecting public transportation systems, FTA will consult with the affected transit systems to determine the scope and extent of damage or the existence of other eligible costs. If a presidential or State declaration of an emergency or major disaster is in effect, the affected transit systems may be eligible for reimbursement of eligible ER costs through FTA's ER Program.

In some cases, transit services may be eligible for reimbursement under the Federal Highway Administration (FHWA) ER Program, a special program from the Highway Trust Fund (HTF) for the repair and reconstruction of federal-aid highways and roads and trails on federal lands, which have suffered serious damage as a result of a natural disaster or catastrophic failures from an external cause. For example, if a road or bridge has been damaged or destroyed by a disaster, and a temporary structure or alternate route is not practical as a temporary connection, additional detoured or temporary ferry or other transit services may be eligible for reimbursement under FHWA's ER Program. The program can also fund the operating costs of movement of survivors, rescue operations, temporary public transportation service, or reestablishing, expanding, or relocating service before, during or after an emergency. Maintenance and operation of additional ferryboats or transit is eligible as a temporary substitute service.

5.5 Technical and Staff Resources

The population supported by this HMP is WETA's ridership and staff. WETA serves this population by providing passenger vessel service on established routes and emergency water transportation operations. Except when at WETA facilities or on WETA vessels, this population is under the jurisdiction of other organizations. At the confluence of WETA transit service and other population services such as retail

markets and tourist attractions, WETA collaborates with partner organizations to pool resources to mitigate overall hazards and terrorism hazards in particular. Pooled capabilities include:

- The Neptune Coalition
- The Northern California Regional Intelligence Center
- Department of Homeland Security, National Infrastructure Protection Plan, 2015 Transportation Systems Sector-Specific Plan
- Northern California Area Maritime Security Committee

WETA can communicate public information announcements regarding service changes and status of emergency operations using the following capabilities:

- Public media outlets through the MTC joint information system and the National Emergency Alert System: This includes broadcast television, radio and newspapers
- 511 through MTC: The 511 Traveler Information System, a free phone and social media platform that provides current information to the public on Bay Area traffic conditions, incidents, detour routes, and driving times, as well as schedules, routes, and fares for public transit services and transportation alternatives
- WETA/SF Bay Ferry website, Facebook page, and Twitter accounts
- BayAlerts: BayAlerts is a subscription based rider notification system that provides San Francisco Bay Ferry riders with important, timely, and customized ferry service information

Emergency Communication Systems: During an incident resulting in loss of power, landline and cellular telephone, and email communications may not be available. WETA uses the following communications systems for emergency operations:

- Satellite phones – WETA's EOC, Maintenance facilities, certain WETA staff and select contracted operator management have satellite phones. WETA's EOC also has an MTC provided satellite phone for regional transportation agency and Operational Area conference calls. It is likely that satellite phone networks may become overloaded if landline and cellular telephone service is not available
- VHF radios – provide vessel-to-vessel communications and vessel to land communications. Each WETA vessel and the contracted operator dispatch center have VHF radios. All passenger vessels, USCG Sector SF, and the Marine Exchange monitor VHF radio channels
- P25 Trunked multi-band radio – provide interoperable radio communications with emergency management agencies, local law enforcement, and first responders. These radios also have VHF channels for communication to vessels

WETA also conducts routine facility condition inspections to mitigate potential risks that include:

- Safety and condition analysis inspections
- Underwater structural condition assessments

5.6 Previous and On-going Mitigation Activities

Much of WETA's mitigation efforts during the past six years have occurred as an outcome of the transition from the former San Francisco Bay Water Transportation Authority (WTA). WETA was created by State of California legislation in 2007, superseding the WTA with the intent: "To provide a unified, comprehensive institutional structure for the ownership and governance of a water transportation system that shall provide comprehensive water transportation and emergency coordination services for the Bay Area Region" (Government Code Section 66540.2). Over a two-year transition period, WETA acquired the capital assets and operating facilities that included the Alameda-Oakland and Harbor Bay services managed by the City of Alameda, and the Vallejo Baylink system managed by the City of Vallejo.

FEMA REGULATION CHECKLIST: PLAN REVIEW AND REVISION

Progress in Local Mitigation Efforts

44 CFR § 201.6(c)(d)(3): "A local jurisdiction must review and revise its plan to reflect . . . progress in local mitigation efforts . . .."

Element

D2. Was the Plan revised to reflect progress in local mitigation efforts? 44 CFR § 201.6(d)(3).

Source: FEMA, *Local Mitigation Plan Review Tool*, March 2013.

Specific actions completed during and following the transition under the ABAG regional HMP included:

1. Updated the WETA Water Emergency Transportation System Management Plan and renamed it the WETA Emergency Response Plan, March 2016
2. Updated the WETA EOP, April 2016
3. Acquired additional vessels
4. Initiated ferry service on new routes including South San Francisco and developed plans for additional routes to Richmond and Treasure Island
5. Initiated development of new maintenance facilities in at Alameda Point and Mare Island in 2014. The new facilities will meet/exceed California building code requirements for earthquake resistance, provide for designated alternative EOCs and contain their own backup electrical generation capacity

In addition, WETA upgraded and made structural improvements to ferry terminal structures to provide great ability to function after an earthquake or severe storm. These actions include:

1. 2013 –Structural assessments of all ferry terminals and maintenance support facilities
2. 2014 – Rehabilitated the gangway structure for the Main Street, Alameda ferry terminal
3. 2013-2014 – Replaced the float, gangway and guide piles at the Clay Street, Oakland ferry terminal
4. 2015 - Rehabilitated the dry-dock float, service mooring chains and gangway shore pin connection at the Vallejo Ferry Terminal, Vallejo
5. 2015 – Replaced the guide pilings at the 2015 Harbor Bay, Alameda ferry terminal

WETA also conducts routine facility condition inspections to mitigate potential risks that include:

- Monthly safety and condition analysis inspections
- Annual underwater structural condition assessments

6. Mitigation Strategy

The mitigation strategy of the HMP is to maintain and enhance a disaster-resilient Authority by reducing the potential for loss of life, property damage, and environmental degradation from natural disasters, while supporting economic recovery from such disasters. This goal is unchanged from the previous HMP and continues to be the goal of WETA in designing its mitigation program.

FEMA REGULATION CHECKLIST: MITIGATION STRATEGY

Local Hazard Mitigation Goals

44 CFR § 201.6(c)(3)(i): The plan shall include a "description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards."

Element

C3. Does the Plan include goals to reduce or avoid long-term vulnerabilities to identified hazards? 44 CFR § 201.6(c)(3)(i)

Identification and Analysis of Mitigation Actions

44 CFR § 201.6(c)(3)(ii): The mitigation strategy shall include "a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

Elements

C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for the jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? See 44 CFR § 201.6(c)(3)(ii)

Source: FEMA, *Local Mitigation Plan Review Tool*, March 2013.

6.1 Overview of Mitigation Strategy and Goals

Mitigation goals are guidelines that represent what the community wants to accomplish through the HMP. Goals are broad statements that represent a long-term, community-wide vision. The planning team reviewed example goals and objectives and determined which goals best met WETA's objectives for

mitigation. The goals also align with the hazards in the HMP and input provided by stakeholders and the public. **Table 6-1** lists the goals for the HMP.

Table 6-1: 2016 Hazard Mitigation Goals
Goal 1: Protect life, property, and reduce potential injuries from natural, technological, and human-caused hazards.
Goal 2: Improve public understanding, support and need for hazard mitigation measures.
Goal 3: Promote disaster resistance for WETA's existing and future built environment.
Goal 4: Strengthen partnerships and collaboration to implement hazard mitigation activities.
Goal 5: Enhance WETA's ability to effectively and immediately respond to disasters.

6.2 Identification and Analysis of Mitigation Actions

WETA's previous HMP efforts were included in the ABAG HMP effort in 2010. Many of the ABAG mitigation strategies are still relevant to WETA mission. **Table 6-2** provides a revised set of future WETA-specific mitigation actions.

Table 6-2: WETA-Specific Actions and Hazards Mitigated

Goal	Strategy Number	Mitigation Strategy	Applicable Hazards	Mitigation Type
1	1-1	Assess the vulnerability of critical facilities including fuel tanks subject to damage during natural disasters or security threats.	EQ, TS, SW, SR, TR, CU	Mit.
1	1-2	Retrofit or replace critical facilities that are vulnerable to damage in natural disasters.	EQ, TS, SW, SR	Mit.
1	1-3	Clarify to staff, the Contract Operator, elected officials and the public, the extent to which WETA facilities are expected to perform and remain functional following a major earthquake.	EQ	Mit.
1	1-4	Identify and mitigate potential impacts to WETA facility contents, architectural components, and equipment that will prevent critical buildings from being functional after major natural disasters. Contents and equipment includes computers and servers, phones, files, and other tools used by staff to conduct daily business.	EQ, TS, SW	Mit.
1	1-5		EQ, TS, SW, SR	Mit.

1	1-6	Encourage joint meetings of security and operations personnel at critical facilities to develop innovative ways for these personnel to work together to increase safety and security.	TR, CU	Mit.
1	1-7	Investigate the possibility of using security cameras for the secondary purpose of post-disaster damage assessment.	EQ, TS, SW, TR, CU	Res.
1	1-8	Pre-position emergency power generation capacity (or use rental/lease agreements for these generators) in critical buildings to maintain continuity of government and services.	EQ, TS, SW, TR	Prep.
1	1-9	Explore ways to require that hazardous materials stored in the flood zone be elevated or otherwise protected from flood waters.	TS, SW	Mit.
1	1-10	Comply with all applicable building and fire codes, as well as other regulations (such as state requirements for fault, landslide, and liquefaction investigations in particular mapped areas) when constructing or significantly remodeling government-owned facilities.	EQ, TS, SW, TR, CU	Mit.
1	1-11	Prior to acquisition of property to be used as a critical facility, conduct a study to ensure the absence of significant structural hazards and hazards associated with the building site.	EQ, TS, SW, SR	Mit.
1	1-12	Establish plans for delivery of fuel.	EQ, TS, SW	Mit.
2	2-1	Conduct and/or promote attendance at local or regional hazard conferences and workshops for elected officials and staff to educate them on the critical need for programs in mitigating hazards.	EQ, TS, SW, SR, TR, CU	Mit.
3	3-1	As a critical infrastructure operator, designate a back-up Emergency Operations Center with redundant communications systems.	EQ, TS, SW, TR, CU	Res.
3	3-2	Stay informed of scientific information compiled by regional and state sources on the subject of rising sea levels and global warming, especially on additional actions that local governments can take to mitigate this hazard including special design and engineering of government-owned facilities in low-lying areas, such as wastewater treatment plants, ports, and airports.	EQ, TS, SW, SR	Mit.
3	3-3	Inventory WETA global warming emissions, set reduction targets and create an action plan.	SR	Mit.

3	3-4	Develop a continuity of operations plan that includes back-up storage of vital records, such as plans and back-up procedures to pay employees and vendors if normal finance department operations are disrupted, as well as other essential electronic files.	EQ, TS, SW, TR	Prep.
3	3-5	Promote transportation options such as bicycle trails, commute trip reduction programs, incentives for carpooling and public transit.	SR	Mit.
3	3-6	Purchase only Energy Star equipment and appliances for local government use.	SR	Mit.
3	3-6	Practice and promote sustainable building practices using the United States Green Building Council's LEED program or a similar system.	SR	Mit.
4	4-1	Continue to participate in general mutual-aid agreements.	EQ, TS, SW, TR, CU	Res.
5	5-1	Expand the WETA water-based transportation “system” for movement of first responders and survivors in the event of major earthquakes	EQ	Prep.
5	5-2	Develop a plan for short-term and intermediate-term sheltering of staff.	EQ, CU, TR	Res.
5	5-3	Encourage employees to have a family disaster plan.	EQ, TS, SW, SR, TR, CU	Prep.
5	5-4	Offer CERT/NERT-type training to employees.	EQ, TS, SW, TR, CU	Prep.
5	5-5	Periodically assess the need for changes in staffing levels, as well as for additional or updated supplies, equipment, technologies, and in-service training classes.	EQ, TS, SW, TR, CU	Mit.
5	5-6	Participate in developing and maintaining a system of interoperable communications.	EQ, TS, SW, TR, CU	Res.
5	5-7	Maintain WETA’s emergency response and operations plans current by incorporating changes to resources, staff and response processes. Conduct after action reviews of actual response events.	EQ, TS, SW, TR, CU	Prep.
5	5-8	Expand participation in disaster exercises involving regional emergency management agencies including cities where ferry terminals are located, ports, other transit providers and regional authorities.	EQ, TS, SW, TR, CU	Prep.
5	5-9	Develop procedures for the emergency evacuation of areas identified on tsunami evacuation maps.	EQ, TS	Res.

Codes:

CU – Civil Unrest
EQ – Earthquake
SR – Sea Level Rise
SW – Storms and High Winds
TR – Terrorism
TS – Tsunami
Mit. – Mitigation
Prep. – Preparedness
Res. – Response

6.3 Mitigation Action Plan

The requirements for prioritization of mitigation actions, as provided in the federal regulations implementing the Stafford Act as amended by DMA 2000, are described below.

FEMA REGULATION CHECKLIST: MITIGATION STRATEGY; PLAN REVIEW AND REVISION

Implementation of Mitigation Actions

44 CFR § 201.6(c)(3)(iii): The mitigation strategy section shall include "an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction.

Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs."

Element

C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost-benefit review), implemented, and administered by the jurisdiction? 44 CFR § 201.6(c)(3)(iii)

Plan Review and Revision

44 CFR § 201.6(d)(3): "A local jurisdiction must review and revise its plan to reflect…changes in priorities…"

Based on these criteria, WETA prioritized potential mitigation projects and included them in the action plan discussed below in **Table 6-3**. The mitigation action plan developed by the planning team includes the action items that WETA intends to implement during the next five years, assuming funding availability. The action plan includes the implementing department, an estimate of the timeline for implementation, and potential funding sources.

The planning team does not presume the expertise to prescribe which projects will be implemented. The prioritization of projects in the HMP is a means to provide a basis for implementing the mitigation strategies, but all new mitigation actions and projects will be formally prioritized and selected by the implementing department. This will accommodate the project funding, schedule of the department, staff requirements, and ability to integrate the new project into existing and ongoing projects. Departments will take into account the funding source, the cost effectiveness of the project, alternative projects, the compatibility of the new project with ongoing projects, the extent to which the project addresses the risks assessed in Section 3, and the potential of economic and social damage.

Prioritization

To assist with implementing the Mitigation Action Plan, the planning team used the following ranking process to provide a method to prioritize the projects for the Action Plan. Designations of High, Medium, and Low priorities have been assigned to each action item using the following criteria:

Does the action:	• Solve the problem? • Address vulnerability assessment? • Reduce the exposure or vulnerability to the highest priority hazard? • Address multiple hazards? • Offer benefits that equal or exceed costs? • Implement a goal, policy, or project identified in the General Plan or Capital Improvement Plan?
Can the action:	• Be implemented with existing funds? • Be implemented by existing state or federal grant programs? • Be completed within the five-year life cycle of the LHMP?
Will the action:	• Be implemented with currently available technologies? • Be accepted by the community? • Be supported by community leaders? • Adversely affect segments of the population or neighborhoods? • Require a change in local ordinances or zoning laws? • Result in positive or neutral impact on the environment? • Comply with all local, state, and federal environmental laws and regulations?
Is there:	• Sufficient staffing to undertake the project? • Existing authority to undertake the project?

Each positive response is equal to one point. Answers to the criteria above determined the priority according to the following scale:

1–6 = Low priority	7–12 = Medium priority	13–18 = High priority

Benefit-Cost Analysis

Conducting benefit/cost analysis for a mitigation activity can assist WETA in determining whether a project is worth undertaking now, in order to avoid disaster related damages later. Cost-effectiveness analysis evaluates how to best spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating hazards can provide decision makers with an understanding of the potential benefits and costs of an activity, as well as a basis for comparing alternative projects.

Funding

The funds required to implement the mitigation action plan will come from a variety of sources including: Federal Hazard Mitigation Grants, fares, bonds, fees and assessments, and others. Some projects are (or

will be) included in capital improvement budgets, while some, especially ongoing projects, are included in department operating budgets.

Prior to beginning a project or when federal funding is involved, the implementing department will use a FEMA approved benefit/cost analysis approach to identify the actual costs and benefits of implementing these mitigation actions. For non-structural projects, implementing departments will use other appropriate methods to weigh the costs and benefits of each action item, and then develop a prioritized list.

Implementation

Mitigation projects were assigned one of three categories as a tentative schedule for implementation: short-range, mid-range, and long-range. Implementation of short-range projects will typically begin within the next three years. Mid-range projects will require some planning and likely require funding beyond what is currently allocated to the WETA general fund. Projects in the mid-range category will generally begin implementation in the next three to five years. Long range projects will require great planning and funding, and will generally begin implementation within five years and beyond.

Table 6-3: Mitigation Action Plan

Action Item #	Priority	Action Description	Timeline	Funding Source	Implementing Department
1-1	High	Assess the vulnerability of critical facilities including fuel tanks subject to damage during natural disasters or security threats. Develop a risk register by facility	Short	General Operating Fund	Operations
1-2	High	Retrofit or replace critical facilities that are vulnerable to damage in natural disasters.	Medium		Operations
1-3	High	Clarify to staff, the Contract Operator, elected officials and the public, the extent to which WETA facilities are expected to perform and remain functional following a major earthquake.	Short	General Operating Fund	Planning

1-4	High	Identify and mitigate potential impacts to WETA facility contents, architectural components, and equipment that will prevent critical buildings from being functional after major natural disasters. Contents and equipment includes computers and servers, phones, files, and other tools used by staff to conduct daily business. Verify that objects subject to toppling or falling are properly secured.	Short	General Operating Fund	Operations
1-5	High	Support and encourage efforts of other lifeline infrastructure agencies as they plan for and arrange financing for seismic retrofits and other disaster mitigation strategies. (Such as reinforcing the seawall at the Port of San Francisco)	Ongoing	General Operating Fund	Planning
1-6	Medium	Encourage joint meetings of security and operations personnel at critical facilities to develop innovative ways for these personnel to work together to increase safety and security.	Short	General Operating Fund	Operations / Safety
1-7	Medium	Investigate the possibility of using security cameras for the secondary purpose of post-disaster damage assessment.	Short	General Operating Fund	Security
1-8	High	Pre-position emergency power generation capacity (or use rental/lease agreements for generators) in critical buildings to maintain continuity of government and services.	Medium	General Fund	Operations / Planning
1-9	High	Explore ways to require that hazardous materials stored in the flood zone be elevated or otherwise protected from tsunami inundation.	Medium	General Fund	Operations

1-10	High	Comply with all applicable building and fire codes, as well as other regulations (such as state requirements for fault, landslide, and liquefaction investigations in particular mapped areas) when constructing or significantly remodeling government-owned facilities.	Ongoing	General Fund	Operations
1-11	High	Establish plans for delivery of fuel. Continue to explore alternative fuel sources. Practice refueling from the Maritime Administration Pre-positioned Medium Speed Logistics Roll-on-roll-off ships using the recently developed procedures.	Short	General Fund	Operations / Planning
2-1	Medium	Conduct and/or promote attendance at local or regional hazard conferences and workshops for elected officials and staff to educate them on the critical need for programs in mitigating hazards.	Ongoing	General Fund	Administration
3-1	High	As a critical infrastructure operator, practice using the Emergency Operations Centers and redundant communications systems at the North and Central Bay Maintenance Facilities.	Short	General Fund	Operations
3-2	Medium	Stay informed of scientific information compiled by regional and state sources on the subject of rising sea levels and global warming, especially on additional actions that local governments can take to mitigate this hazard including special design and engineering of government-owned facilities in low-lying areas, such as wastewater treatment plants, ports, and airports.	Ongoing	General Fund	Planning

3-3	High	Utilize proven technologies for vessels and facilities to improve environmental performance.	Ongoing	General Fund	Operations / Planning
3-4	Medium	Develop a continuity of operations plan that includes back-up storage of vital records, such as plans and back-up procedures to pay employees and vendors if normal finance department operations are disrupted, as well as other essential electronic files.	Medium	General Fund	Planning
3-5	High	Promote transportation options such as bicycle trails, commute trip reduction programs, incentives for carpooling and public transit.	Ongoing	General Fund	Planning
3-6	Medium	Purchase only Energy Star equipment and appliances for local government use.	Ongoing	General Fund	All
4-1	High	Continue to participate in general mutual-aid agreements including the San Francisco Bay Transit Operators Mutual Aid Agreement and the San Francisco Bay Area Vessel Mutual Assistance Plan.	Ongoing	General Fund	Operations
5-1	High	Expand the WETA water-based transportation “system” for movement of first responders and survivors in the event of major earthquakes. Implement the new routes from Richmond, California and Treasure Island.	Ongoing	Federal Transit Authority	Operations
5-2	High	Develop a plan for short-term and intermediate-term sheltering of staff.	Short	General Fund	Operations
5-3	High	Encourage employees to have a family disaster plan.	Ongoing	General Fund	All
5-4	Medium	Encourage CERT/NERT-type training to employees.	Medium	General Fund	Planning

5-5	Medium	Periodically assess the need for changes in staffing levels, as well as for additional or updated supplies, equipment, technologies, and in-service training classes.	Ongoing	General Fund	All
5-6	High	Participate in developing and maintaining a system of interoperable communications.	Ongoing	General Fund	Operations
5-7	High	Maintain WETA's emergency response and operations plans current by incorporating changes to resources, staff and response processes. Conduct after action reviews of actual response events.	Ongoing	General Fund	Operations
5-8	High	Expand participation in disaster exercises involving regional emergency management agencies including cities where ferry terminals are located, ports, other transit providers and regional authorities.	Medium	General Fund	Operations
5-9	High	Develop procedures for the emergency evacuation of areas identified on tsunami evacuation maps.	Medium	General Fund	Planning

7. Plan Implementation and Maintenance

This section provides direction on processes for implementing the HMP and keeping it current, relevant and useful over its five-year life. It addressed integrating the HMP into other planning process such as the strategic plan and the yearly budget, and ongoing outreach to the public.

7.1 Implementation

While the planning process is important in creating the HMP, the real value is in developing an actionable document that leads to reduced risk. To this end, WETA and other partners will endeavor to accomplish the mitigation action based upon priority and available resources.

7.1.1 Role of Planning Committee in Implementation and Maintenance

The planning team represents WETA staff and other stakeholders that contributed to the development of the HMP. The planning team oversaw the development of the 2016 plan and provided recommendations on key elements of the HMP, including the maintenance strategy.

Each member of the planning team was given the opportunity to provide input during the HMP development. This philosophy will be continued for future HMP revisions through evaluations, maintenance, and updates of data, processes, and programs. The planning team will convene annually to perform reviews of the HMP and its implementation.

If planning team members can no longer serve on the planning team, the WETA lead planner will assign another staff person to be on the planning team so that every department or agency is represented.

7.2 Monitoring, Evaluating, and Updating the Plan

WETA is responsible for over keeping the HMP relevant over its five-year life. As such, the planning team must engage in continual monitoring of the effectiveness of the mitigation actions accomplished and evaluate changes in the hazards profiles and the need for new mitigation activities. The objective is to both update the status of the plan and modify the mitigation actions as required.

7.2.1 Maintenance Schedule

Annually during March, the planning team will review the HMP and the implementation of mitigation actions to develop an annual progress report. This may assist WETA's annual budget review process by providing information on mitigation projects and activities that have been completed or implemented. The annual progress report process will serve to incorporate new information into the HMP. As updates to the HMP are completed, WETA will keep the public informed of the changes and newly recommended mitigation activities. The HMP progress report will also be posted on the WETA website on a dedicated page, provided to the local media through a press release, and presented in the form of a report to local agencies. The planning team will strive to complete the review and deliver the progress report process by June of each year.

Section 201(.6.d)(.3) of 44_CFR requires that local HMPs be reviewed, revised as appropriate, and resubmitted for approval in order to remain eligible for benefits awarded under the DMA. WETA intends to update its HMP on a 5-year cycle.

FEMA REGULATION CHECKLIST: PLAN MAINTENANCE PROCESS

Monitoring, Evaluating, and Updating the Plan

44 CFR § 201.6(c)(4)(i): The plan shall include a plan maintenance process that includes a "section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle."

Element

A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating, and updating the mitigation plan within a five-year cycle)?

Incorporation into Other Planning Mechanisms

44 CFR § 201.6(c)(4)(ii): The plan shall include a plan maintenance process that includes a "process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate."

Element

C6. Does the plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate?

7.2.2 Maintenance Evaluation Process

The planning team will monitor the hazard mitigation strategies during the year. Each March, team members will meet to provide information for and evaluate the progress of the 2016 HMP. This evaluation will include:

- A summary of any hazard events that occurred during the prior year and their impact on the planning area
- A review of successful mitigation initiatives identified in the HMP
- A brief discussion about the targeted strategies that were not completed
- A re-evaluation of the action plan to determine if the timeline for identified projects needs to be amended, and the reason for the amendment, e.g., funding issues
- Any recommendations for new projects
- Any changes in or potential for new funding options (grant opportunities)
- Any impacts of other planning programs or initiatives in the WETA jurisdiction that involve hazard mitigation

The planning team will write a progress report that will be provided to the WETA and team member agencies for review and incorporation in the budget process as mitigation projects are completed or implemented.

7.2.3 Update Process

Based on needs identified by the planning team, the update will, at a minimum, include the following elements:

- The hazard risk assessment will be reviewed and updated using the most recent information and technologies
- The action plan will be reviewed and revised to account for any initiatives completed, dropped, or changed and to account for changes in the risk assessment
- Any new WETA or member agency policies identified under other planning mechanisms, as appropriate
- The draft HMP update will be sent to appropriate agencies and organizations for comment
- The public will be given an opportunity to comment on the updated version prior to adoption
- WETA will adopt the updated HMP

At a minimum of six months prior to the expiration date of the 2016 HMP, the planning team will implement a HMP revision schedule to formally update the HMP. The HMP will be revised using the latest FEMA hazard mitigation guidance documents, such as the Mitigation Planning Tool and Regulation Checklist to comply with current hazard mitigation planning regulations.

7.3 Incorporation into Existing Planning Mechanisms

In accordance with federal regulations (44 CFR §201.6(b)(3)), the planning team reviewed and incorporated information into the HMP from the plans, studies, and reports listed below:

- The 2016 WETA Emergency Operations Plan (EOP). The hazards section of the EOP provided a basis for the hazards identified and analyzed in the HMP.
- The 2016 draft WETA Strategic Plan. This plan was used to align strategic objectives with hazard mitigation goals.
- The Association of Bay Area Governments (ABAG) 2011 Regional Hazard Mitigation Plan. This provided background and regional knowledge.
- Comprehensive Annual Financial Report, Fiscal Year Ended June 30, 2014
- California Climate Adaptation Planning Guide (APG): The 2012 APG provides information on the effects of climate change on California, and provided adaptation planning guidance used in the development of the climate change hazard profile.
- 2013 State of California Multi-Hazard Mitigation Plan. The State HMP was reviewed to ensure the alignment of the WETA HMP with the state's current hazard profiles and mitigation strategy.

7.4 Continued Public Involvement

The overall success of the HMP is through implementation of its hazard mitigation strategy and activities to reduce the effects of hazards, protect people and property, and improve the WETA's efforts to respond to and recover from disasters. WETA will strive to keep the public aware of hazard mitigation projects that take place as a result of the HMP. Public information will be released through press releases, WETA website and social media announcements, and WETA's BayAlerts service.

When the time comes to begin revising the HMP, the current FEMA directed update process will be implemented. This will include continued public involvement and input through website and other social media postings, press releases to local media, and surveys.

8. Changes in Elements since Previous (ABAG) HMP

This section describes changes to the WETA HMP organization and structure since the previous plan.

8.1 Changes in Planning Process and Mitigation Actions

FEMA REGULATION CHECKLIST: PLAN UPDATE

Plan Update to Reflect Development Changes

44 CFR § 201.6(d)(3): A local jurisdiction must review and revise its plan to reflect changes in development.

Element

D1. Was the plan revised to reflect changes in development? 44 CFR § 201.6(d)(3)

Source: FEMA, *Local Mitigation Plan Review Tool*, March 2013.

The revised HMP is a more comprehensive and actionable plan. It is a stand-alone document rather than an appendix to the ABAG regional HMP and is uniquely specific to WETA. While the 2010 ABAG HMP provided regional hazards analysis, it did not specify the locations and building-specific hazards of WETA infrastructure. Nor did it correlate those hazards to specific mitigation actions. This WETA HMP is a substantive change to the ABAG HMP and focuses on the WETA-specific hazards, individual mitigation efforts and internal priorities.

The planning team reviewed and approved the general outline of the new HMP. Following the review, the planning team met to analyze and agree on the elements of the HMP, approve the draft mitigation activities and priorities, and recommend forwarding the draft plan to the WETA Board for approval and to FEMA and Cal OES for courtesy reviews.

8.2 Changes to Identified Hazards

Hazards included in the ABAG HMP, however comprehensive, were not specific to WETA. Significant changes to this HMP include the identification and in-depth analysis of WETA-specific hazards and the potential impact of them to WETA facilities.

8.3 Description of Method for Incorporation of Previously-Approved Plan into Existing Planning Mechanisms

ABAG plays a leading role in the development and assessment of hazards for the Bay Area region. Through its Resiliency Program, ABAG continues to analyze and describe Bay Area regional hazards and the risks they pose. In addition, ABAG was at the forefront of identifying climate change as an impact to the Bay Area that will directly impact WETA facilities. The data and risk analyses developed in the 2011 ABAG HMP supplemented by updated ABAG risk analysis and WETA specific occurrence information formed the basis for the revised WETA HMP.

9. Appendices

Appendix A: FEMA Local Mitigation Plan Review Tool Crosswalk

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6, and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community. This section was completed by WETA to ensure the HMP met the requirements of 44 CFR §201.6.

Jurisdiction: San Francisco Bay Water Emergency Transportation Authority	**Title of Plan:** San Francisco Bay Water Emergency Transportation Authority Hazard Mitigation Plan	**Date of Plan:** September, 2016
Local Point of Contact: Chad Mason	**Address:** Pier 9, The Embarcadero, Suite 111 San Francisco, CA 94111	
Title: Senior Planner		
Agency: San Francisco Bay Water Emergency Transportation Authority		
Phone Number: 415.364.1745	**E-Mail:** Mason@Watertransit.org	

1. REGULATION CHECKLIST **Regulation (44 CFR 201.6 Local Mitigation Plans)**	**Location in Plan (section and/or page number)**	**Met**	**Not Met**
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Section 2.1, Appendix B	X	
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies	Section 2.1 and Table 2-1, Appendix B	X	

involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))			
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Section 2.2 and Appendix C	X	
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Section 2.3	X	
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Section 2.4	X	
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Section 2.5 (Suggest creating a "Revision History" Appendix)	X	
ELEMENT A: REQUIRED REVISIONS			

1. REGULATION CHECKLIST Regulation (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Sections 3.1, 3.2, 3.3	X	
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))		X	
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))		X	
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Section 4.2 touches on facilities with the NFIP insurance, but it does not meet this requirement.	X	

ELEMENT B: REQUIRED REVISIONS

1. REGULATION CHECKLIST Regulation (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Section 4.1, Tables 4-1, 4-2, 4-3	X	
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Section 4.2	X	
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Sections 4.3 and 4.4	X	
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Sections 4.4 and 4.5	X	
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Sections 4.4 and 4.5	X	
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Sections 4.5 and 4.6	X	
ELEMENT C: REQUIRED REVISIONS			

1. REGULATION CHECKLIST Regulation (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	N/A		
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	N/A		
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	N/A		
ELEMENT D: REQUIRED REVISIONS This section shall be filled out following subsequent revisions to the Plan.			
ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	Section 5, placeholder pending adoption approval/resolution.		
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))			
ELEMENT E: REQUIRED REVISIONS Will be adopted when 'Approvable Pending Adoption' by FEMA			
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (optional for State reviewers only; not to be completed by FEMA)			
F1. Plan must discuss climate change and its potential effect on the jurisdictions' hazards and the potential to create new hazards for the area.	Section 3.2.12		
ELEMENT F: REQUIRED REVISION			

Appendix B: References

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2. ABAG, (2010). Taming Natural Disasters: Multi-Jurisdictional Local Hazard Mitigation Plan for the San Francisco Bay Area, http://resilience.abag.ca.gov/2011mitigation/
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4. Brocher, T.M., et al, (2015) The M6.0 24 August 2014 South Napa Earthquake. https://profile.usgs.gov/myscience/upload_folder/ci2015Jan2212351337182SRL%20Paper%20Brocher%20et%20al.pdf
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12. Plan Bay Area. (2013, March). Draft Plan Bay Area. Retrieved from http://planbayarea.org/pdf/Draft_Plan_Bay_Area/00-Overview.pdf
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15. State of California Multi-Hazard Mitigation Plan, California Governor's Office of Emergency Services, http://hazardmitigation.calema.ca.gov/docs/SHMP_Final_2013.pdf
16. United States Geological Survey. (2016, April). Earthquake hazard. Retrieved from USGS: http://earthquake.usgs.gov/learn/glossary/?term=earthquake%20hazard
17. United States Geological Survey. (2016, April). Liquefaction Hazards Map. Retrieved from USGS: http://earthquake.usgs.gov/regional/nca/qmap/
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20. Water Emergency Transportation Authority. (2016 March). Emergency Response Plan. San Francisco: WETA

Appendix C: Planning Process Documentation

Appendix C contains documentation of the planning process including meetings of the planning team. The planning process material is presented in chronological order along with a brief explanation of its contents. Key planning process events are summarized in **Table C-1**.

Table C-1:		
Date	**Activity**	**Purpose**
April 26, 2016	Planning Team Meeting Nr. 1	Kick off the HMP update project and solicit participation by stakeholder agencies
June 9, 2016	Planning Team Meeting Nr. 2	Provided draft hazard analysis as a read ahead. Reviewed hazard analysis and collected stakeholder feedback
August 18, 2006	Planning Team Meeting Nr. 3	Provided initial draft HMP including proposed mitigation activities. Discussed mitigation implementation priorities and plan maintenance

On April 26, 2016, the planning team held its initial meeting at WETA Headquarters, Pier 9 the Embarcadero. The meeting invitation email, a read-ahead for participants, the meeting presentation cover sheet and meeting notes follow:

From: Chad Mason [mailto:Mason@watertransit.org]
Sent: Tuesday, April 19, 2016 4:11 PM
To: mblagg@bart.gov; ddemoss@portoakland.com; Schaffer, Edie (ECD) (edie.schaffer@sfgov.org) <edie.schaffer@sfgov.org>; Emma Reed (emma.reed@mbakerintl.com) <emma.reed@mbakerintl.com>; heidingrow@gmail.com; Lee.rosenberg@navigatingpreparedness.com; Keith Stahnke <Stahnke@watertransit.org>; Andrea Ouse (aouse@ci.vallejo.ca.us) <aouse@ci.vallejo.ca.us>
Subject: RE: WETA Hazard Mitigation Planning Meeting No. 1

Good afternoon,

A read ahead document is attached to this message in preparation for the WETA Hazard Mitigation Planning Meeting No. 1 on Friday.

Let me know if you have any questions.

Thanks,

Chad

-----Original Appointment-----
From: Chad Mason
Sent: Wednesday, April 13, 2016 4:45 PM
To: Chad Mason; soliver@alamedaca.gov; Amy.ramirez@sfgov.org; bijan.karimi@sfgov.org; Ceide@oaklandnet.com; GPastor-Cohen@oaklandnet.com; ken.anderson@ssf.net; craig.whittom@cityofvallejo.net; michelle.straub@cityofvallejo.net; mblagg@bart.gov; ddemoss@portoakland.com; diana.r.vanderburg@sfport.com; Schaffer, Edie (ECD) (edie.schaffer@sfgov.org); Emma Reed (emma.reed@mbakerintl.com); heidingrow@gmail.com; Lee.rosenberg@navigatingpreparedness.com; Keith Stahnke; Andrea Ouse (aouse@ci.vallejo.ca.us)
Subject: WETA Hazard Mitigation Planning Meeting No. 1
When: Friday, April 22, 2016 9:00 AM-11:00 AM (UTC-08:00) Pacific Time (US & Canada).
Where: WETA Office, Pier 9, Suite 111, The Embarcadero, San Francisco, CA 94111

Greetings,

Thank you to everyone that responded to the scheduling survey for WETA's Hazard Mitigation Planning Meeting No. 1.

Not all schedules lined up. This date and time accommodates the majority of responsive stakeholders.

A light breakfast will be provided at the meeting.

Please note that there will be future meetings on this project. Our team may reach out to you directly regarding the WETA LHMP and facilities within or near your jurisdiction.

WETA is preparing a Hazard Mitigation Plan (HMP) and requests that your jurisdiction participate in the process as a member of the Planning Team. The HMP is critical for WETA to receive FEMA grant funds to support pre-mitigation activities and post disaster recovery. Attached are some documents to explain the HMP planning process.

The Planning Team will help identify and profile hazards in their areas; analyze the people and facilities at risk of those hazards and develop mitigation actions to lessen or reduce the impact of the profiled hazards.

Our Kick–off Meeting is being scheduled and will last approximately 2 hours. Navigating Preparedness Associates who helped create our Emergency Response Plan will support developing this plan as well and will attend to walk us through the planning process.

The entire planning process will involve a total of 3 meetings over the next few months and will result in draft HMP. We will also create an outreach plan to solicit input beyond that of the Planning Team. The entire planning process will be documented and submitted to FEMA as part of our plan.

We look forward to working together and request you provide input on the best available dates of this initial planning meeting.

Please let me know if you have any questions.

Sincerely,

Chad Mason

Chad Mason
Senior Planner | Planning and Development
San Francisco Bay Area Water Emergency Transportation Authority
Pier 9, Suite #111, The Embarcadero, San Francisco, CA 94111
ph: 415.364.1745 fx: 415.291.3388

WETA

2016 HAZARD MITIGATION PLAN PROJECT KICK OFF MEETING

MEETING PURPOSE

This document is an overview to prepare for the Water Emergency Transportation Authority (WETA) Hazard Mitigation Plan (HMP) project kick-off meeting. This informal meeting will allow the WETA planning team to be introduced and briefed on the process, approach, and roles and responsibilities of personnel participating in the WETA HMP project.

During this kick-off meeting, we will accomplish the following objectives:

1. Ensure the planning team members understand the project and agree with the project approach and timeline.
2. Convey to the planning team members the purpose and necessity of having a HMP, the project scope of work, and the importance of their input for the successful completion of the project.
3. Provide the planning team members with a description of what their roles and responsibilities will be during the planning process.
4. Establish points of contact designated for each department to be included as members of the planning team.
5. Determine a schedule for the planning project and determine the best means of communicating between the project managers and the planning team.
6. Identify hazards for the WETA HMP.

WHAT IS HAZARD MITIGATION?

The Federal Emergency Management Agency (FEMA) describes hazard mitigation as "***any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards.***"[1] Although the requirement set by 44 Code of Federal Regulations (CFR), Subpart M Section 206.401 requires a planning area to describe only natural hazards that may affect the jurisdiction, most planning areas include technological and human-caused hazards in the HMP to represent the total risk from hazards to the planning area. In addition, the State of California, enacted as SB 379, requires all local planning areas to assess vulnerabilities associated with climate change.

Hazards can result in death and destruction of property and infrastructure. The work done to minimize the impact of hazard events to life and property is called hazard mitigation. Often, these damaging events occur in the same locations over time (i.e. earthquakes along fault lines), and cause repeated damage. Because of this, hazard mitigation is often focused on reducing repetitive loss, thereby breaking the disaster cycle. The essential steps of hazard mitigation are:

- Identify and profile hazards that affect the local area.

- Analyze the people and facilities at risk from those hazards.
- Develop mitigation actions to lessen or reduce the impact of the profiled hazards.

WHY THE NEED FOR A HAZARD MITIGATION PLAN?

The Federal Disaster Mitigation Act (2000), Federal Register 44 CFR Parts 201 and 206, as of November 1, 2004, requires local governments to develop and submit HMPs as a condition of receiving Hazard Mitigation Grant Program and other mitigation project grant funding. This includes pre-disaster mitigation funding and post-disaster mitigation funding.

WHAT ARE THE REQUIREMENTS FOR A HAZARD MITIGATION PLAN?

The requirements for an HMP are described in 44 CFR Parts 201 and 206. FEMA has produced a *Local Mitigation Plan Review Tool* to demonstrate how the mitigation plan meets the regulation in 44 CFR § 201.6. The plan review tool has a regulation checklist that provides a summary of FEMA's evaluation of whether the plan has addressed all requirements. Local planners can also use the checklist prior to submitting the plan for approval to ensure they have addressed all the requirements.

The primary tasks that will take place during the planning process include:

1. Capability analysis
2. Vulnerability assessment
3. Hazard identification
4. Defining a hazard mitigation strategy through actions and projects
5. Implementing the hazard mitigation actions and projects

CONSULTANT FACILITATED PROJECT

Navigating Preparedness Associates (NPA) was selected as the consultant firm to facilitate the development of the WETA HMP. NPA has successfully conducted similar projects, and understands the importance of developing a HMP. Responsibilities of the NPA project manager include the following:

- Remain as the consultant point of contact through the project.
- Facilitate meetings with the planning team, stakeholders and the public.
- Develop the plan with project related material, information and associated data received within the project schedule.
- Provide project deliverables within the developed schedule.
- Respond to e-mails and phone calls (typically within a 24-hour period).
- Inform WETA's project manager of any anticipated delays.

WETA HAZARD MITGATION PLAN PROJECT MANAGER ROLES AND RESPONSIBILITIES:

The WETA project manager will liaison with the NPA project manager throughout the project. Responsibilities of the WETA project manager include the following:

- Remain as the point of contact through the project.
- Coordinate and host meetings with the planning team, stakeholders and the public.
- Provide project related material, information and associated data within the project schedule.
- Provide timely review of project deliverables (typically 10 working days).
- Inform NPA's project manager of any anticipated delays.

PRJOECT STAKEHOLDERS AND THE PUBLIC

The HMP planning process includes stringent requirement to include input from stakeholders and the public. Generally, project stakeholders include neighboring jurisdictions and their agencies and departments that might interface with WETA during a disaster response. It is important to ensure consistent representation from participating organizations. The public is represented by community members and community organizations that have interests in the WETA's projects and actions to mitigate hazards and save lives and property.

NPA will gather input from planning team members, stakeholders and the public and current documents that may assist in the development of the HMP. The planning team will be responsible to provide information related to their specific department or division.

NEXT STEPS

The next step following the HMP project kick-off meeting is be to schedule a meeting with the planning team to gather any documents that may provide input for the capability analysis, vulnerability assessment, and hazard identification. We look forward to getting started on this project and anticipate a successful venture for all.

San Francisco Bay Ferry

Local Hazard Mitigation Plan

Project Kick-off Meeting

April 22, 2016

April 26, 2016

To: **Chad Mason/Keith Stahnke**

From: **Lee Rosenberg**

The Water Emergency Transportation Authority (WETA) hosted a meeting with Navigating Preparedness Associates (NPA) on April 22, 2016 to kick off the process of creating/updating a local hazard mitigation plan for the authority including members of the project's Planning Team.

Attendees

Attendee	Organization/Division
Lee Rosenberg	Navigating Preparedness
Emma Reed	Michael Baker International
Chad Mason	WETA
Keith Stahnke	WETA
Desmond DeMoss	Port of Oakland
Edie Schaffer	San Francisco DEM
Ernest	WETA

Summary of Discussion

1. The group discussed the upcoming project timeline and next steps.
    - Next two meetings: (1) review hazards and (2) mitigation goals and actions.
    - Next Planning Team meeting to take place in early June.
    - The hope is to deliver a draft to FEMA in August.
    - Current hazards we are profiling include:
        - Earthquake
        - Severe Storms
        - Tsunami
        - Civil Unrest
        - Terrorism
    - Primary responsibility of Planning Team will be to review LHMP drafts as they are created.
    - Hazard profile drafts will be sent out by end of next week and Planning Team will be given a couple weeks to review them.
    - Expanding service at port could be a potential "capability".
2. The group brainstormed which additional stakeholders to include in upcoming meetings.
    - BCDC

- Golden Gate

3. The group discussed potential implementation steps for a public outreach strategy.
   - Outreach strategy to include:
     - Ridership
     - Port staff
     - MMP
     - BCDC
   - Will need to post a page on the WETA website describing general LHMP planning process.
   - Will post planning document on WETA website for continuing input from the public.
   - Ernest will set up a page specific to the LHMP project and twill "tweet" about starting the planning process.
     - Tweets and Facebook posts will be posted for each update in the LHMP process.

Action Items

Action Item	Responsible Party	Due Date	Status
Send drafts of hazard profiles to Planning Team for editing	NPA	Next 2-3 weeks	
Begin profiling of communities in WETA jurisdiction	NPA	By next meeting	
Create website page describing LHMP process	WETA Ernest	ASAP	
Reach out to additional potential stakeholders	WETA Chad/Keith	Before next meeting	

Points of Contact

For concerns or questions regarding these notes, please contact:

Lee Rosenberg, (925) 381-0583 or lee.rosenberg@navigatingpreparedness.com or Chad Mason/Keith Stahnke at WETA.

On June 9,2016, a second planning team meeting was conducted at WETA headquarters, Pier 9, The Embarcadero. The meeting invitation, meeting read-ahead, capability and risk assessment worksheet, presentation cover page and notes follow:

From: Chad Mason
To: soliver@alamedaca.gov; edie.schaffer@sfgov.org; bijan.karimi@sfgov.org; GPastor-Cohen@oaklandnet.com;
Ceide@oaklandnet.com; ken.anderson@ssf.net; Andrea.Ouse@cityofvallejo.net; mblagg@bart.gov; ddemoss@portoakland.com; diana.r.vanderburg@sfport.com
Cc: Lee.rosenberg@navigatingpreparedness.com; Emma Reed (emma.reed@mbakerintl.com); heidingrow@gmail.com; Keith Stahnke
Subject: RE: WETA Hazard Mitigation Planning Meeting No. 2 - Hazard Identification and Risk Assessment
Date: Wednesday, June 01, 2016 4:07:32 PM
Attachments: DRAFT WETA Risk Assessment.docx

Good afternoon,

The Draft WETA Risk Assessment Document is attached to this message in preparation for the WETA Hazard Mitigation Planning Meeting No. 2. **The meeting will be held on Thursday, June 9 at the WETA Office, Pier 9, Suite 111, The Embarcadero, San Francisco, CA 94111.** This document is a component of the WETA Hazard Mitigation Plan. Please note that internal document references to figures, tables, etc. will be updated at a later date when the entire WETA HMP document is compiled. Feel free to make comments in track changes directly in the document and submit them to me electronically. Let me know if you have any questions.

Thank you for your participation.

Chad

Chad Mason
Senior Planner | Planning and Development
San Francisco Bay Area Water Emergency Transportation Authority
Pier 9, Suite #111, The Embarcadero, San Francisco, CA 94111
ph: 415.364.1745 fx: 415.291.3388

WETA

2016 HAZARD MITIGATION PLAN PROJECT
SECOND PLANNING MEETING

MEETING PURPOSE

This document is an overview to prepare for the Water Emergency Transportation Authority (WETA) Hazard Mitigation Plan (HMP) project second planning meeting. This informal meeting will allow the WETA planning team to be briefed on the current status and next steps of the planning process in the WETA HMP project.

During this planning meeting, we will accomplish the following objectives:

1. Update the planning team members on current status of the project and review the project timeline
2. Review identified hazards and confirm their application to WETA properties
3. Identify past occurrences of confirmed hazards
4. Risk assessment
    - Identify facilities with previous and potential hazards
    - Identify frequency of previous impacts from hazards
    - Prioritize structures based on criticality
    - Identify level of loss per structure
    - Identify costs associated with previous hazards and replacement value
    - Identify opportunities for mitigation
5. Identify capabilities based on core capabilities
6. Review current and identify future stakeholder and public outreach

DEFINING AND PRIORITIZING HAZARD VULNERABILITY AND RISK

According to the International Organization for Standardization (ISO), Risk Management, risk is defined as the potential losses associated with a hazard, defined in terms of expected probability and frequency, exposure, and consequences. Risk is the combination of the probability of an event and its consequences, where: probability is the extent to which an event is likely to occur, event is the occurrence of a particular set of circumstances, and consequences are the outcome of an event.

Once hazards are identified, previous and potential losses are used to prioritize risk based on the hazard. To correlate hazards with risk the following tools are used: level of loss, geographic extent, frequency and return periods, and mitigation potential.

Level of loss includes injury or death to people, costs of loss to structures and property and impact to the environment. Geographic extent includes identifying how many WETA

properties are impacted from a hazardous event. Frequency and return periods refers to how often a hazard occurs in a specified timeframe. Mitigation potential prioritizes structures or projects that are already integrated into the WETA planning process either through hazard mitigation or other planning mechanisms. The mitigation effort can be integrated into other planning processed in many ways but WETA has the opportunity to account for those projects as hazard mitigation projects.

FEMA MISSION AREAS AND CORE CAPABILITIES ANALYSIS

Mission areas, as identified by FEMA, are prevention, protection, mitigation, response and recovery. To address mitigation, we focus on mitigation and response. The State HMP uses the mitigation mission area to further define mitigation core capabilities that focus on:

- Community resilience
- Long-term vulnerability reduction
- Risk and disaster resilience
- Assessment of threats and hazards identification

The State HMP additionally considers response core capabilities that include:

- Critical transportation
- Infrastructure systems
- Mass search and rescue operations
- Operational communications
- Public and private services and resources along with several others.

WETA's mission and services are directly related to these core capabilities. WETA can use these as the framework to define WETA-specific capabilities. Defining WETA capabilities is the outline for identifying mitigation actions. WETA can use the State of California's capability priorities as well as other county and local jurisdictional priorities to align WETA priorities. Integration of these priorities can help both WETA and partner agencies obtain funding and to implement a broader mitigation strategy.

WETA can review the National Flood Insurance Program and work with local agencies to identify structures within FIRMs. WETA can potentially assist other local communities with their community rating system, if applicable.
WETA previously identified expanding service at the port as a capability.

PRJOECT STAKEHOLDERS AND THE PUBLIC

Additional potential stakeholders such as Bay Area Conservation and Development Commission and Golden Gate Ferry were identified.
The outreach strategy included reaching out to ridership, Port staff, the Masters Mates and Pilots Union and BCDC

In addition, posting an LHMP page, planning documents, and an opportunity for comment on the WETA website was completed. Tweets and Facebook posts will be posted for each update in the LHMP process.

NEXT STEPS

The next step is to identify mitigation actions. Once identified, we will begin formulating how to achieve mitigation actions and integrate them into general planning efforts. Once that's complete, we'll finalize the HMP.

WETA
Capability Analysis and Risk Assessment

ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))

Hazard Identification and Risk Assessment

B1. Hazard identification by *type, location, extent*

- Align hazards with identified facility jurisdictions

2016 EOP	General Plan Elements (Cities)	Other Hazard Potential
• Tsunami • Major earthquake • Winter storm/flood • Bomb/bomb threat or terrorist event • Active shooter or hostage situation on a ferry or at a facility • Vessel Fire • Accidental death of an employee or passenger • Oil spill/hazardous material release	• Geologic and Seismicity • Tsunami • Severe Storm • Flood Control • Hazardous Materials • Urban and Wildland Fires	• Petroleum storage • Pipeline – oil spills • Climate change • Air pollution • Energy shortage – energy resiliency • Cyber threats

B2. Hazard identification by *previous occurrences* and *probability of future events*

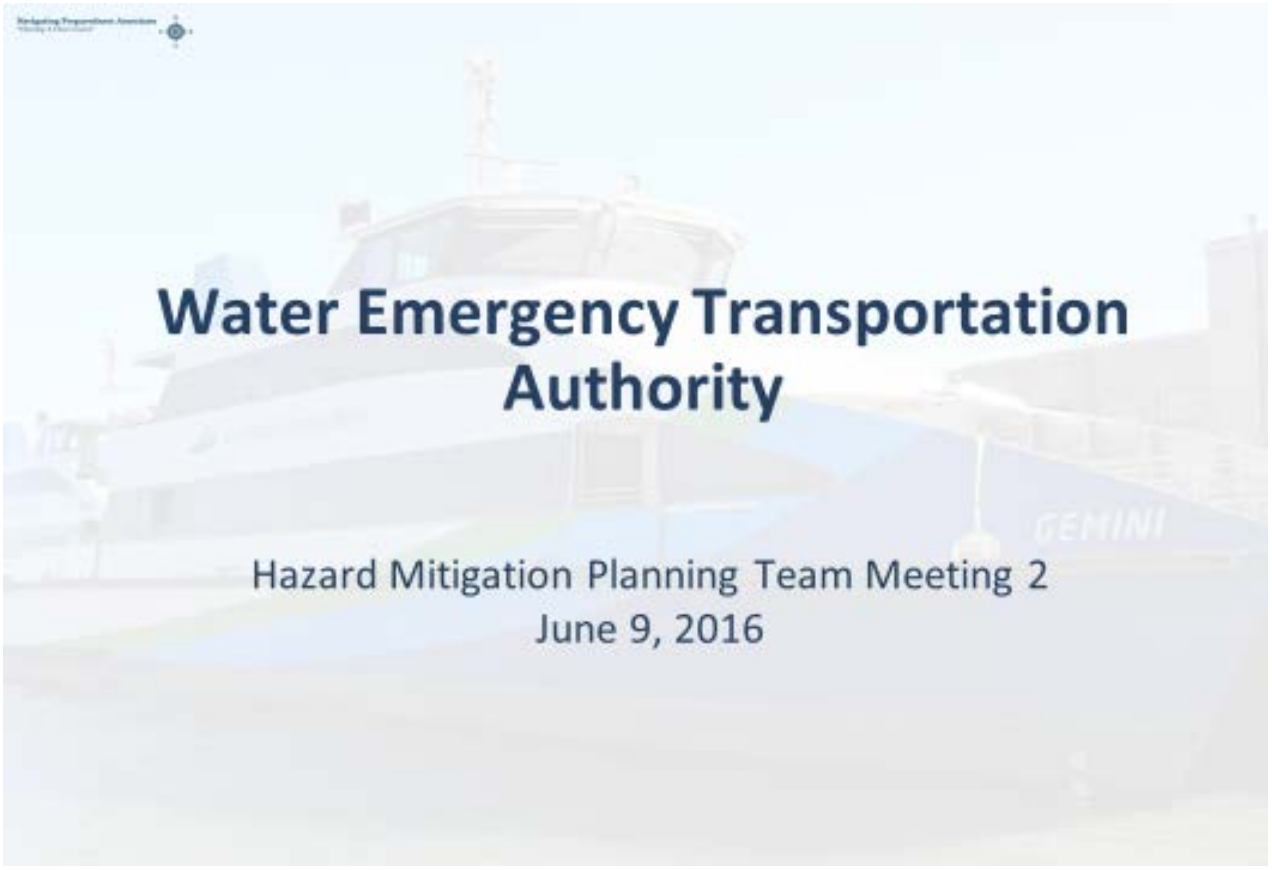
- Document previous hazard events for facilities in each jurisdiction and estimate probability of future events using past data

B3. Hazard identification by impact on community and vulnerability

- Calculated Priority Risk Index, population at risk, buildings at risk – critical facilities, cultural and natural resources inventory, existing land use – percent acreage, risk assessment and potential loss – quantitative assessment of loss

B4 NFIP insurance – current structures identified

- Are any structures exposed to flood risk? Work with risk manager or insurance to identify current status. Work with local agencies to determine the desire to improve their community rating


Water Emergency Transportation Authority
Hazard Mitigation Planning Team Meeting 2
June 9, 2016

June 14, 2016

To: Chad Mason
From: Lee Rosenberg

The Water Emergency Transportation Authority (WETA) hosted a meeting with Navigating Preparedness Associates (NPA) on June 9, 2016 to continue the process of creating/updating a local hazard mitigation plan for the authority including members of the project's Planning Team.

Attendees

Attendee	Organization/Division
Chad Mason	WETA
Edie Schaffer	San Francisco DEM
Emma Reed	Michael Baker International
Lee Rosenberg	Navigating Preparedness

Summary of Discussion

1. The group discussed the initial draft of the LHMP including hazard profiles and potential mitigation actions.
    - Current hazards we are profiling include:
        - Earthquake
        - Severe Storms
        - Tsunami
        - Civil Unrest
        - Terrorism
    - Correction to draft: 54 tsunamis since 1850, not 53 (this includes recent tsunami caused by Chilean earthquake)
    - Should add in more detailed tsunami inundation maps (GIS)
    - Chad will gather data on severe storms that have caused ferry service suspension
    - Chad will gather data on terrorist-related activities (i.e., suspicious package threat events)
    - Lee/Emma will take a look at FEMA flood maps to check if any WETA facilities are located in flood zones
    - Next LHMP draft will include mitigation goals/actions for review by Planning Team/stakeholders
    - Next meeting: Discuss mitigation goals and actions
    - Next Planning Team meeting to take place in late July
    - The hope is to deliver a draft to FEMA/Cal OES in August
2. The group discussed additional potential implementation steps for a public outreach strategy.
    - Outreach strategy to include:
        - Ridership
        - Port staff

    - MMP
    - BCDC
- Will create a ridership survey to be taken on vessels at end of June
    - Survey will also be included on the LHMP website
    - Tweets and Facebook posts will notify people of the availability of the survey

3. The group discussed WETA Board Chairperson's interest in the HMP and a desire to be included in the Plan review and approval process.

Action Items

Action Item	Responsible Party	Due Date	Status
Take a look at FEMA flood maps to check if WETA facilities are in FEMA flood zones	Lee & Emma	ASAP	
Gather data on terrorist/ suspicious package threat events	Chad	Next 2-3 weeks	
Gather data on severe storms that caused ferry service suspension	Chad	Next 2-3 weeks	
Place copies of ridership survey on vessels	Chad/Keith	End of June	

Points of Contact

For concerns or questions regarding these notes, please contact:
Lee Rosenberg, (925) 381-0583 or lee.rosenberg@navigatingpreparedness.com or Chad Mason/Keith Stahnke.

On August 18, 2016 a third and final planning team meeting was conducted at WETA headquarters, Pier 9, The Embarcadero. The meeting invitation, presentation cover page and notes follow:

From: Chad Mason
Sent: Friday, July 22, 2016 10:20 AM
To: Chad Mason; Keith Stahnke; soliver@alamedaca.gov ; mblagg@bart.gov; ken.anderson@ssf.net; gpastor-cohen@oaklandnet.com; lee.rosenberg@navigatingpreparedness.com; Emma Reed (emma.reed@mbakerintl.com); bijan.karimi@sfgov.org; edie.schaffer@sfgov.org; ceide@oaklandnet.com; ddemoss@portoakland.com; heidingrow@gmail.com; andrea.ouse@cityofvallejo.net; diana.r.vanderburg@sfport.com; Bartram, Diana (PRT); Lee Rosenberg; Lauren DuranGularte
Subject: WETA Hazard Mitigation Planning Meeting No. 3 - Draft Hazard Mitigation Plan Review
When: Thursday, August 18, 2016 9:00 AM-11:00 AM (UTC-08:00) Pacific Time (US & Canada).
Where: WETA Office, Pier 9, Suite 111, The Embarcadero, San Francisco, CA 94111

Hi,

We are scheduling Hazard Mitigation Planning Meeting No. 3 for Thursday, August 18 from 9:00 am to 11:00 am.

We will distribute the draft HMP for review prior to the meeting.
Thank you for your participation.
Chad

Chad Mason
Senior Planner | Planning and Development
San Francisco Bay Area Water Emergency Transportation Authority
Pier 9, Suite #111, The Embarcadero, San Francisco, CA 94111
ph: 415.364.1745 fx: 415.291.3388

WETA

Hazard Mitigation Plan

Planning Team Meeting Nr. 3 Presentation

August 18, 2016

August 22, 2016

To: **Chad Mason**

From: **Lee Rosenberg**

The Water Emergency Transportation Authority (WETA) hosted a meeting with Navigating Preparedness Associates (NPA) on August 18, 2016 to continue the process of creating/ updating a local hazard mitigation plan for the authority including members of the project's Planning Team.

Attendees

Attendee	Organization/Division
Desmond DeMoss	Port of Oakland
Chad Mason	WETA
Edie Schaffer	San Francisco OEM
Keith Stahnke	WETA
Lee Rosenberg	Navigating Preparedness

Summary of Discussion

4. The group reviewed WETA's mitigation strategies and the corresponding mitigation activities. The consensus was that the identified strategies and mitigations actions are appropriate and represent an ambitious but achievable approach
5. The group reviewed the WETA HMP survey which has now been posted on the website. The questions need to be made non-mandatory to facilitate an easier response by participants. Once the survey has been posted for two weeks, the planning team will review and analyze the results and include the documentation in the HMP
6. The group discussed items to add or expand upon to complete the HMP. These include:
    - Include a listing and description of completed facility projects that have reduced the likelihood of damage due to the identified hazards
    - Adding the ferry vessels and their values to the list of WETA owned infrastructure, and including them in the Assets at Risk to Specific Hazard analysis
    - Adding the WETA Short Range Transit Plan (SRTP) and Strategic Plan to the list of capabilities

- Adding monthly and annual facility inspections to the list of capabilities

7. The group discussed WETA Board Chairperson's interest in the HMP and a desire to be included in the Plan review and approval process.

Action Items

Action Item	Responsible Party	Due Date	Status
Add ferry vessels to the asset inventory	Keith Stahnke/Lee Rosenberg	August 25, 2016	Complete
Add titles and dates of the SRTP and Strategic Plan to capabilities	Chad Mason/Lee Rosenberg	August 25, 2016	In progress
Add monthly and annual facility inspections to the list of capabilities	Lee Rosenberg	August 25, 2016	Complete
Add results of the survey to the public outreach section of the HMP and document all public outreach efforts in the appendix	Chad Mason/Lee Rosenberg	September 5, 2016	In progress
Format final draft HMP	Lee Rosenberg	September 15, 2016	In progress

Points of Contact

For concerns or questions regarding these notes, please contact:

Lee Rosenberg, (925) 381-0583 or lee.rosenberg@navigatingpreparedness.com or Chad Mason/Keith Stahnke.

Appendix D: Appendix D: Community Engagement Documentation

Appendix D contains documentation of the planning process including meetings, presentations held for the stakeholders and public, and other stakeholder/public outreach efforts. The engagement material is presented in chronological order along with a brief explanation of its contents.

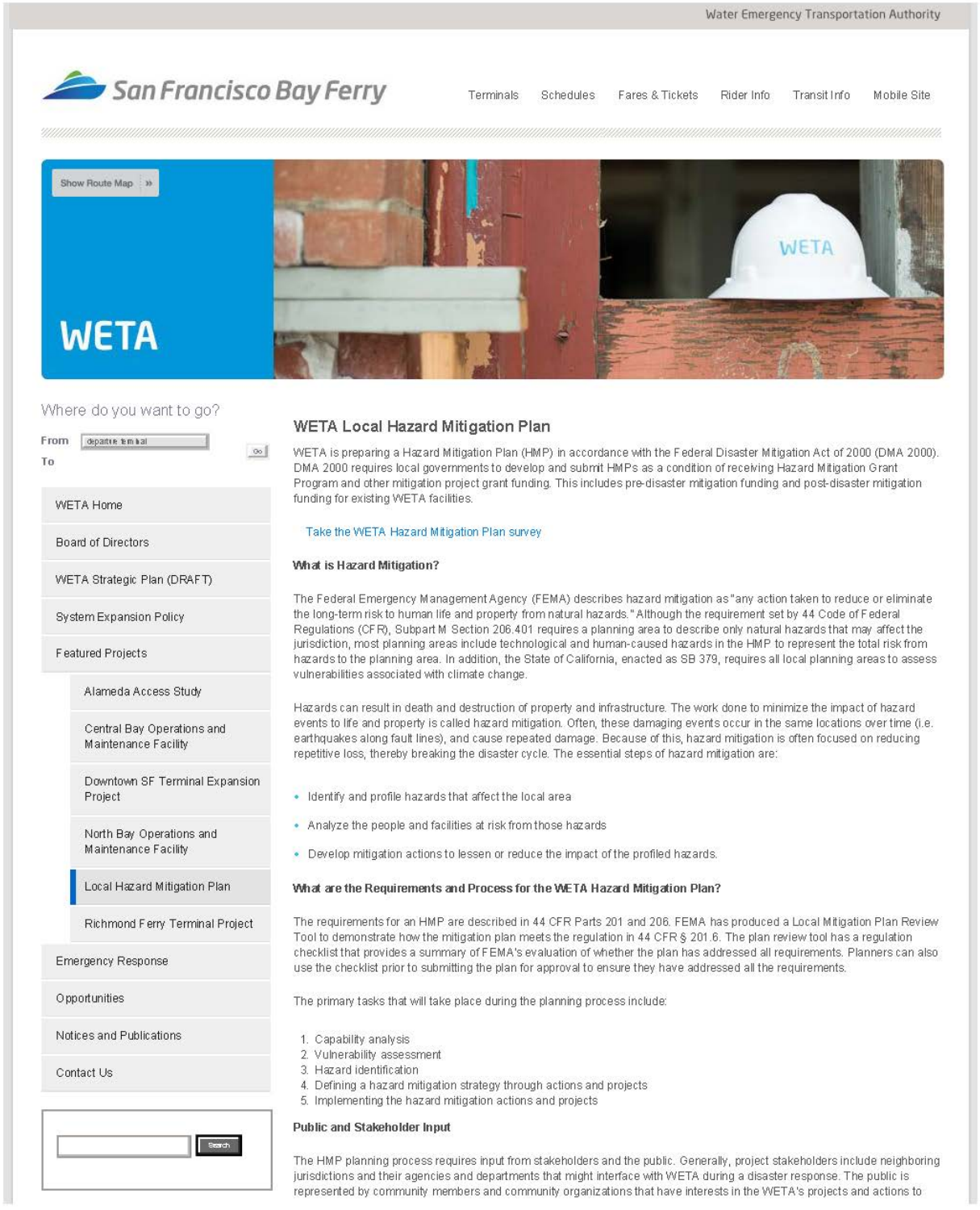
1. May 2, 2016: WETA staff posted information about the HMP planning process on the Authority website, Facebook page and Twitter account and solicited feedback.

http://sanfranciscobayferry.com/weta/weta-local-hazard-mitigation-plan

https://www.facebook.com/sanfranciscobayferry

https://twitter.com/SFBayFerry

Screenshots are provided below.



Water Emergency Transportation Authority

San Francisco Bay Ferry

Terminals Schedules Fares & Tickets Rider Info Transit Info Mobile Site

Show Route Map

WETA

Where do you want to go?

From departure terminal

To

- WETA Home
- Board of Directors
- WETA Strategic Plan (DRAFT)
- System Expansion Policy
- Featured Projects
  - Alameda Access Study
  - Central Bay Operations and Maintenance Facility
  - Downtown SF Terminal Expansion Project
  - North Bay Operations and Maintenance Facility
  - Local Hazard Mitigation Plan
  - Richmond Ferry Terminal Project
- Emergency Response
- Opportunities
- Notices and Publications
- Contact Us

Search

WETA Local Hazard Mitigation Plan

WETA is preparing a Hazard Mitigation Plan (HMP) in accordance with the Federal Disaster Mitigation Act of 2000 (DMA 2000). DMA 2000 requires local governments to develop and submit HMPs as a condition of receiving Hazard Mitigation Grant Program and other mitigation project grant funding. This includes pre-disaster mitigation funding and post-disaster mitigation funding for existing WETA facilities.

Take the WETA Hazard Mitigation Plan survey

What is Hazard Mitigation?

The Federal Emergency Management Agency (FEMA) describes hazard mitigation as "any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards." Although the requirement set by 44 Code of Federal Regulations (CFR), Subpart M Section 206.401 requires a planning area to describe only natural hazards that may affect the jurisdiction, most planning areas include technological and human-caused hazards in the HMP to represent the total risk from hazards to the planning area. In addition, the State of California, enacted as SB 379, requires all local planning areas to assess vulnerabilities associated with climate change.

Hazards can result in death and destruction of property and infrastructure. The work done to minimize the impact of hazard events to life and property is called hazard mitigation. Often, these damaging events occur in the same locations over time (i.e. earthquakes along fault lines), and cause repeated damage. Because of this, hazard mitigation is often focused on reducing repetitive loss, thereby breaking the disaster cycle. The essential steps of hazard mitigation are:

- Identify and profile hazards that affect the local area
- Analyze the people and facilities at risk from those hazards
- Develop mitigation actions to lessen or reduce the impact of the profiled hazards.

What are the Requirements and Process for the WETA Hazard Mitigation Plan?

The requirements for an HMP are described in 44 CFR Parts 201 and 206. FEMA has produced a Local Mitigation Plan Review Tool to demonstrate how the mitigation plan meets the regulation in 44 CFR § 201.6. The plan review tool has a regulation checklist that provides a summary of FEMA's evaluation of whether the plan has addressed all requirements. Planners can also use the checklist prior to submitting the plan for approval to ensure they have addressed all the requirements.

The primary tasks that will take place during the planning process include:

1. Capability analysis
2. Vulnerability assessment
3. Hazard identification
4. Defining a hazard mitigation strategy through actions and projects
5. Implementing the hazard mitigation actions and projects

Public and Stakeholder Input

The HMP planning process requires input from stakeholders and the public. Generally, project stakeholders include neighboring jurisdictions and their agencies and departments that might interface with WETA during a disaster response. The public is represented by community members and community organizations that have interests in the WETA's projects and actions to

mitigate hazards and save lives and property.

WETA will continue to update the LHMP website throughout the planning process. Documents will be made available on this webpage. WETA will post updates on social media when documents are available for review.

WETA welcomes the public to review and comment on the LHMP documents as they become available. Please share your comments below.

WATER EMERGENCY TRANSPORTATION AUTHORITY

WETA Hazard Mitigation Plan - Public Comments

Please submit your comments below or scroll down for other ways to submit feedback.

* Required

First Name *

Last Name *

Organization/Affiliation

Email Address *

Phone Number

Your Comments on the WETA Local Hazard Mitigation Plan

Thanks for letting us know what you think. You may also submit comments in writing to:

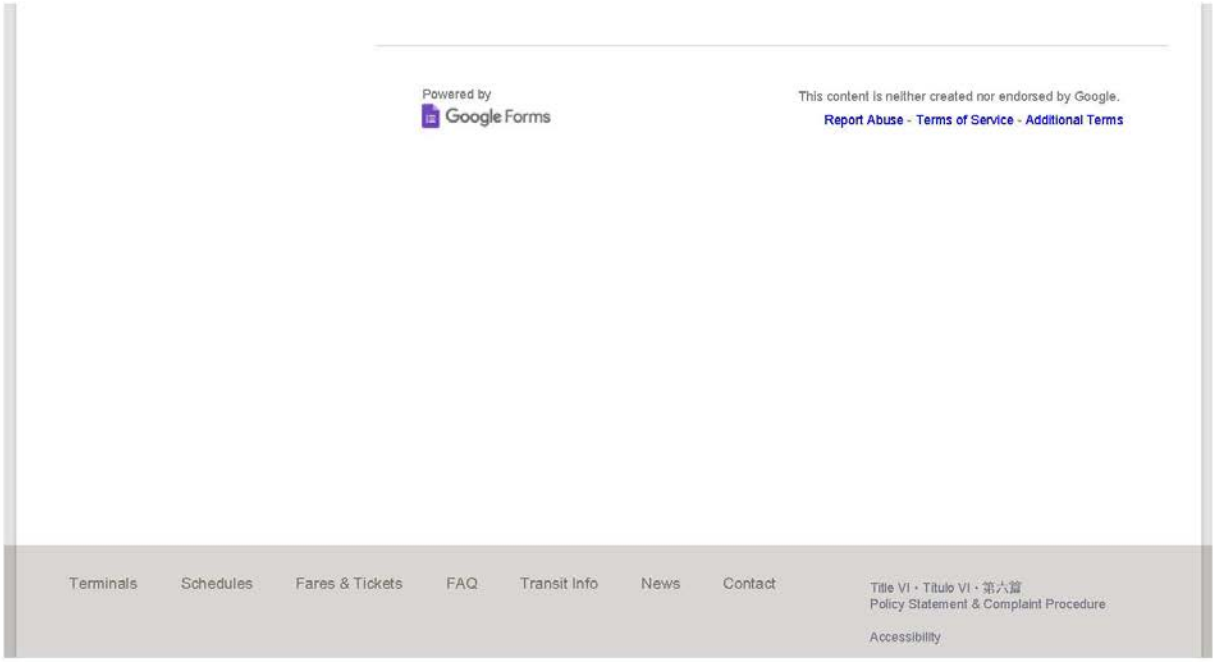
Chad Mason, Senior Planner
c/o WETA
Pier 9, Suite 111
San Francisco, CA 94111

mason@watertransit.org

Fax: 415-291-3388

Submit

Never submit passwords through Google Forms.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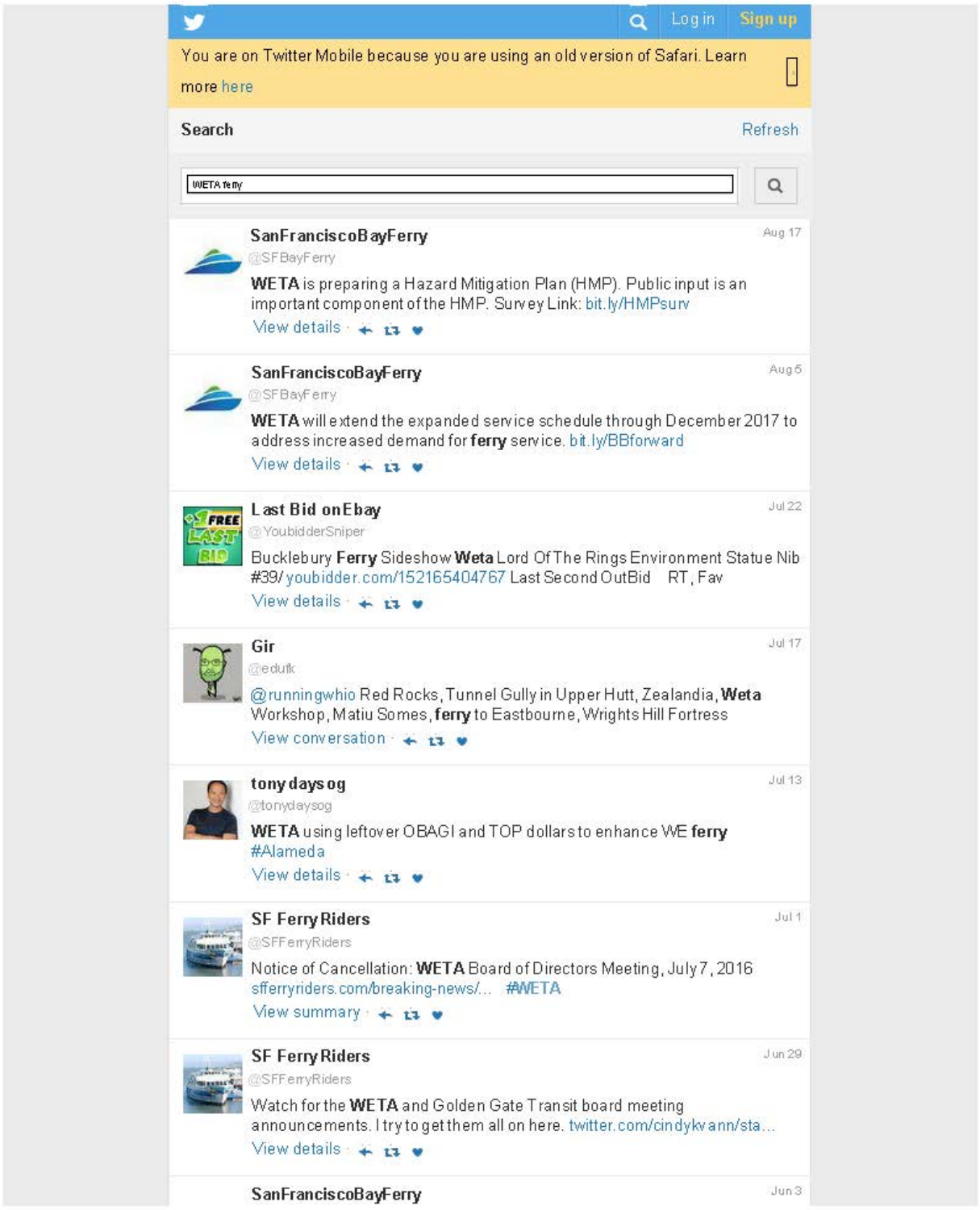
Terminals
Schedules
Fares & Tickets
FAQ
Transit Info
News
Contact
Title VI · Título VI · 第六篇
Policy Statement & Complaint Procedure
Accessibility


Log in
Sign up
You are on Twitter Mobile because you are using an old version of Safari. Learn more here
Search
Refresh
WETA ferry
SanFranciscoBayFerry
Aug 17
@SFBayFerry
WETA is preparing a Hazard Mitigation Plan (HMP). Public input is an important component of the HMP. Survey Link: bit.ly/HMPsurv
View details
SanFranciscoBayFerry
Aug 5
@SFBayFerry
WETA will extend the expanded service schedule through December 2017 to address increased demand for ferry service. bit.ly/BBforward
View details
Last Bid on Ebay
Jul 22
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Bucklebury Ferry Sideshow Weta Lord Of The Rings Environment Statue Nib #39/ youbidder.com/152165404767 Last Second OutBid RT, Fav
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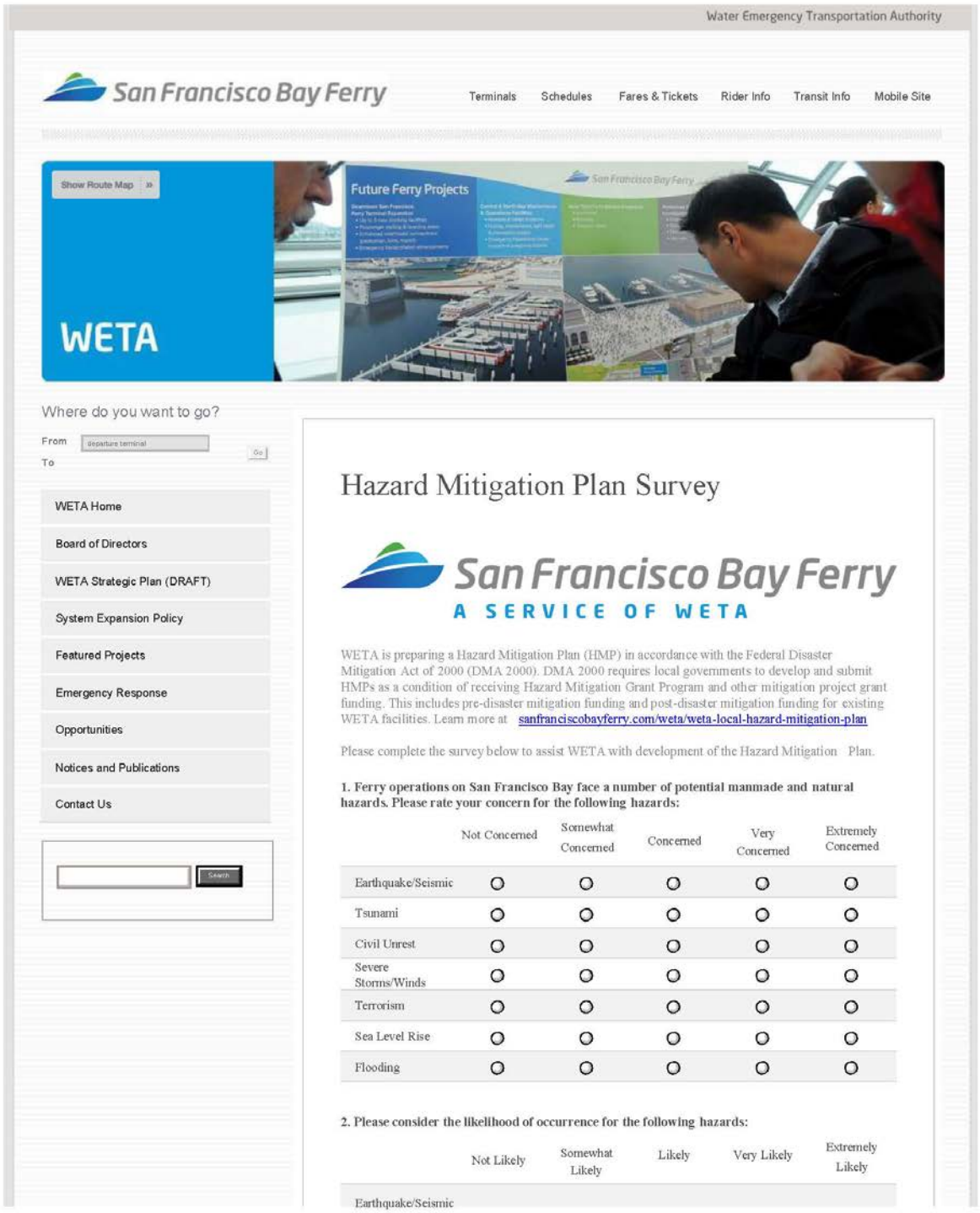
@runningwhio Red Rocks, Tunnel Gully in Upper Hutt, Zealandia, Weta Workshop, Matiu Somes, ferry to Eastbourne, Wrights Hill Fortress
View conversation
tony daysog
Jul 13
@tonydaysog
WETA using leftover OBAGI and TOP dollars to enhance WE ferry #Alameda
View details
SF Ferry Riders
Jul 1
@SFFerryRiders
Notice of Cancellation: WETA Board of Directors Meeting, July 7, 2016 sfferryriders.com/breaking-news/... #WETA
View summary
SF Ferry Riders
Jun 29
@SFFerryRiders
Watch for the WETA and Golden Gate Transit board meeting announcements. I try to get them all on here. twitter.com/cindykvann/sta...
View details
SanFranciscoBayFerry
Jun 3

2. Survey and results: WETA posted a survey to solicit rider input on the HMP on August 14, 2016. A copy of the survey form is included below. Survey results follow. Key information gathered from the survey was tabulated with the following results:

Local Hazard Mitigation Plan Survey | San Francisco Bay Ferry



Hazard Mitigation Plan Survey

San Francisco Bay Ferry
A SERVICE OF WETA

WETA is preparing a Hazard Mitigation Plan (HMP) in accordance with the Federal Disaster Mitigation Act of 2000 (DMA 2000). DMA 2000 requires local governments to develop and submit HMPs as a condition of receiving Hazard Mitigation Grant Program and other mitigation project grant funding. This includes pre-disaster mitigation funding and post-disaster mitigation funding for existing WETA facilities. Learn more at sanfranciscobayferry.com/weta/weta-local-hazard-mitigation-plan

Please complete the survey below to assist WETA with development of the Hazard Mitigation Plan.

1. Ferry operations on San Francisco Bay face a number of potential manmade and natural hazards. Please rate your concern for the following hazards:

	Not Concerned	Somewhat Concerned	Concerned	Very Concerned	Extremely Concerned
Earthquake/Seismic	O	O	O	O	O
Tsunami	O	O	O	O	O
Civil Unrest	O	O	O	O	O
Severe Storms/Winds	O	O	O	O	O
Terrorism	O	O	O	O	O
Sea Level Rise	O	O	O	O	O
Flooding	O	O	O	O	O

2. Please consider the likelihood of occurrence for the following hazards:

	Not Likely	Somewhat Likely	Likely	Very Likely	Extremely Likely
Earthquake/Seismic					

http://sanfranciscobayferry.com/weta/local-hazard-mitigation-plan-survey[8/26/2016 1:14:57 PM]

	○	○	○	○	○
Tsunami	○	○	○	○	○
Civil Unrest	○	○	○	○	○
Severe Storms/Winds	○	○	○	○	○
Terrorism	○	○	○	○	○
Sea Level Rise	○	○	○	○	○
Flooding	○	○	○	○	○

3. Which of the following sources of information do you use to receive hazard information when planning a trip by ferry? Check all that apply:

- ☐ Bay Area 511 Website
- ☐ San Francisco Ferry/WETA Website
- ☐ National Weather Service Website
- ☐ Other Website (please specify under "Other" below)
- ☐ San Francisco Ferry/WETA Facebook Site
- ☐ San Francisco Ferry/WETA Twitter Site
- ☐ Other Social Media, Please Specify
- ☐ Radio
- ☐ Television
- ☐ Other Source (please specify under "Other" below)
- ☐ Other:

4. What types of projects should the San Francisco Bay Ferry/WETA consider to reduce the potential risks from the hazards listed in questions 1 and 2? Check all that apply:

- ☐ Planning for sea level rise at maintenance facilities and ferry terminals
- ☐ Increased training for ferry vessel crews
- ☐ Increased security at terminals
- ☐ Increased information for riders on activities to take to minimize hazards
- ☐ Other:

5. Please indicate how you feel about the following statement: It is the responsibility of transportation agencies to provide education and promote actions that will reduce exposure to the risks associated with hazards:

- ○ Strongly Disagree
- ○ Somewhat Disagree
- ○ Neutral
- ○ Somewhat Agree
- ○ Strongly Agree

6. Please indicate how you feel about the following statement: It is my responsibility to be educated and understand actions that will reduce exposure to the risk associated with hazards:

- ○ Strongly Disagree
- ○ Somewhat Disagree
- ○ Neutral
- ○ Somewhat Agree
- ○ Strongly Agree

7. Please indicate how you feel about the following statement: I feel safe from the risks associated with hazards when I use the San Francisco Bay Ferry. Please consider parking, time at the terminal and the ferry vessel ride:

- ○ Strongly Disagree
- ○ Somewhat Disagree
- ○ Neutral
- ○ Somewhat Agree

Strongly Agree

8. If you selected either strongly disagree (or somewhat disagree?) in question #7, where do you feel at risk? Select all that apply:

- In the parking lot
- At the ferry terminal
- Boarding or disembarking the ferry vessel
- Underway on the ferry vessel
- Other:

9. Please provide any suggestions you may have to reduce the exposure to risks while using the San Francisco Bay Ferry service:

Submit

Never submit passwords through Google Forms.

100%: You made it.

The WETA HMP Survey was posted on the Authority website and advertised on the Facebook and Twitter accounts. During the period August 17 through September 7, 2016, 14 surveys were completed. The results from questions one and two are represented in Tables D-1 and D-2 below:

Table D-1: Rank of Concern for Hazards						
Hazard/Ranking of Concern						
Earthquake	**Tsunami**	**Civil Unrest**	**Severe Storms**	**Terrorism**	**Sea Level Rise**	**Flooding**
1	1	1	1	1	3	1
4	2	5	3	5	3	2
5	3	5	3	3	2	2
1	2	1	2	1	1	1
3	1	1	4	3	3	1
4	4	1	3	4	5	1
4	2	1	1	1	2	2
5	3	2	4	4	4	4
4	5	2	2	1	3	3
5	4	1	2	2	3	2
5	5	5	5	6	5	1
5	3	3	3	5	4	2
4	4	3	3	3	3	3
5	5	5	5	3	3	5
3.93	**3.14**	**2.57**	**2.93**	**3.00**	**3.14**	**2.14**

1 = Not concerned, 2 = Somewhat concerned, 3 = Concerned, 4 = Very concerned, 5 = Extremely concerned

Table D-2: Rank of Likelihood of Hazard						
Hazard/Ranking of Likelihood						
Earthquake	**Tsunami**	**Civil Unrest**	**Storms**	**Terrorism**	**Sea Level Rise**	**Flooding**
5	1	1	1	1	5	1
4	2	4	3	5	3	2
5	2	5	4	3	2	2
4	2	2	4	3	3	2
4	1	1	3	2	3	1
5	2	2	3	2	5	3
5	2	1	2	1	3	3
5	2	2	3	2	4	4
3	3	2	3	1	4	3
5	2	1	2	1	4	3
5	2	5	4	5	4	2
5	2	5	5	4	5	2
3	2	2	4	3	3	3
5	5	5	3	2	5	4
4.50	**2.14**	**2.71**	**3.14**	**2.50**	**3.79**	**2.50**

1 = Not likely, 2 = Somewhat likely, 3 = Likely, 4 = Very likely, 5 = Extremely likely

In response to question three, WETA passenger received potential hazard information when planning trip from the following sources and frequency.

- WETA Web 50%
- 511 21%
- NWS 21%
- Bay Alert Texts 7%

In response to **question four**, what types of projects should the San Francisco Bay Ferry/WETA consider to reduce the potential risks, responder provided the following results:

- Increased training for ferry vessel crews 64%
- Increased security at terminals 57%
- Planning for sea level rise at maintenance facilities and ferry terminals 57%
- Increased information for riders on activities to take to minimize hazards 43%
- Other; More ferries, Rider awareness campaign on vessels

Note percentages total more the 100 percent due to selecting multiple choices

In response to **question five** (how strongly do you agree the it is theresponsibility of transportation agencies to provide education and promote actions that will reduce exposure to the risks associated with hazards), the mean score was **3.21** based on a scale of 1=strongly disagree and 5=strongly agree.

In response to **questions six** (how strongly do you agree the it is theresponsibility of passengers to be educated and understand actions that will reduce exposure to the risk associated with hazards), the mean score was **4.43** based on a scale of 1=strongly disagree and 5=strongly agree.

In response to **question seven** (please indicate how you feel about the following statement: I feel safe from the risks associated with hazards when I use the San Francisco Bay Ferry. Please consider parking, time at the terminal and the ferry vessel ride), the mean score was 3.86 based on a scale of 1=strongly disagree and 5=strongly agree.

In response to question **eight** (If you selected either strongly disagree (or somewhat disagree?) in question #7, where do you feel at risk?), 50 percent of the survey population provided answers with four feeling unsafe underway, and two each feeling unsafe in the parking lot and at the terminal.

Question nine solicited suggestions. Responses included:

- Crew should make rounds of vessel throughout trip to ensure appropriate behavior. Should address loud and discourteous behavior of the post game drunks who frequent the outdoor aft section of vessel
- More in depth training for crews and more accessible safety information for passengers
- I find it interesting that mechanical failure is not listed as a risk. Lately, it seems there have been a number of maintenance problems and breakdowns. I think the most likely risk is a power loss while underway

Appendix E: Plan Maintenance Documentation

Plan Section	Considerations	Explanation
Planning Process	Should new jurisdictions and/or districts be invited to participate in future plan updates?	
	Have any internal or external agencies been invaluable to the mitigation strategy?	
	Can any procedures (e.g., meeting announcements, plan updates) be done differently or more efficiently?	
	Has the Planning Team undertaken any public outreach activities?	
	How can public participation be improved?	
	Have there been any changes in public support and/or decision- maker priorities related to hazard mitigation?	
Capability Assessment	Have jurisdictions adopted new policies, plans, regulations, or reports that could be incorporated into this plan?	
	Are there different or additional administrative, human, technical, and financial resources available for mitigation planning?	
	Are there different or new education and outreach programs and resources available for mitigation activities?	
	Has NFIP participation changed in the participating jurisdictions?	
Risk Assessment	Has a natural and/or technical or human-caused disaster occurred?	
	Should the list of hazards addressed in the plan be modified?	
	Are there new data sources and/or additional maps and studies available? If so, what are they and what have they revealed? Should the information be incorporated into future plan updates?	
	Do any new critical facilities or infrastructure need to be added to the asset lists?	
	Have any changes in development trends occurred that could create additional risks?	
	Are there repetitive losses and/or severe repetitive losses to document?	

Plan Section	Considerations	Explanation
Mitigation Strategy	Is the mitigation strategy being implemented as anticipated? Were the cost and timeline estimates accurate?	
	Should new mitigation actions be added to the action plan? Should existing mitigation actions be revised or eliminated from the plan?	
	Are there new obstacles that were not anticipated in the plan that will need to be considered in the next plan update?	
	Are there new funding sources to consider?	
	Have elements of the plan been incorporated into other planning mechanisms?	
Plan Maintenance Procedures	Was the plan monitored and evaluated as anticipated?	
	What are needed improvements to the procedures?	

Appendix F: Plan Adoption Resolution

Insert after CalOES/FEMA review

10. Glossary of Terms

ABAG – Association of Bay Area Governments

APTA- American Public Transit Association

ART- Adopting to Rising Tides Subregional Project in Alameda to identify how current and future sea level rise induced flooding will affect communities, infrastructure, ecosystems and economy

BART – Bay Area Rapid Transit

BCDC- the San Francisco Bay Conservation and Development Commission

CalOES – The California Office of Emergency Services

Caltrans – California Department of Transportation

CPRI- Calculated Priority Risk Index. The CPRI examines four criteria for each hazard: probability, magnitude/severity, warning time, and duration.

CSBC – California Standards Building Code

CTA- California Transit Association

CTC – California Transportation Commission

DMA – Disaster Mitigation Act, in this document, the Federal Disaster Mitigation Act of 2000

DOT – Department of Transportation

EOC- Emergency Operations Center

ER- Emergency Relief (funding from FTA)

FAA- Federal Aviation Administration

FEMA – Federal Emergency Management Administration

FEMA 322- The Federal Emergency Management Administration's Public Assistance Guide

FHWA – Federal Highway Administration

FTA- Federal Transit Administration

GIS – geographical information system

HMGP – Hazard Mitigation Grant Program

HMP – Hazard Mitigation Plan

HTF- Highway Trust Fund

IBC – International Building Codes

Liquefaction – a process by which saturated soil will behave in a fluid manner when under stress (such as that imposed by an earthquake)

MMI – Modified Mercalli Intensity scale (used to measure earthquake intensity)

MTC- Bay Area Metropolitan Transportation Commission

NCEI- The National Centers for Environmental Data, which includes the National Climatic Data Center, the National Geophysical Data Center, and the National Oceanographic Data Center (which includes the National Coastal Data Development Center)

NFIP- National Flood Insurance Program

NOAA OCM- The National Oceanic and Atmospheric Administration's Office for Coastal Management

OPSR- California Department of Fish and Wildlife, Office of Spill Prevention and Response

RL- repetitive loss

SF- VMAP - San Francisco Vessel Mutual Assistance Plan

SHELDUS™- The Spatial Hazard Events and Losses Database is a county-level hazard loss data set for the U.S. for 18 different natural hazard events types such thunderstorms, hurricanes, floods, wildfires, and tornados. For each event the database includes the beginning date, location (county and state), property losses, crop losses, injuries, and fatalities that affected each county.

Soft story building- A multi-floor building with many windows, large doors or openings (such as commercial openings at the ground level) that degrade its structural integrity

Stafford Act – The Robert T. Stafford Disaster Relief and Emergency Assistance Act

URM – unreinforced masonry

USGS – United States Geologic Study

WETA - Water Emergency Transportation Authority, specific to this document, the San Francisco Bay Water Transportation Authority

WMD- Weapons of Mass Destruction including incendiary, explosive, chemical, biological, radiological, and nuclear agents, which have the capability to cause mass casualties to a significant number of people