



Annex to 2010 Association of Bay
Area Governments
Local Hazard Mitigation Plan
Taming Natural Disasters

East Bay Municipal
Utility District

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Background

Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards. Hazard mitigation is most effective when a long-term plan is developed before a disaster occurs. A hazard mitigation plan identifies the hazards a community or region faces, assesses their vulnerability to the hazards and identifies specific actions that can be taken to reduce the risk from the hazards. The Federal Disaster Mitigation Act of 2000 (DMA 2000) outlines a process which cities, counties, and special districts can follow to develop a Local Hazard Mitigation Plan. Development of this plan is a requirement for certain benefits from CalEMA and FEMA.

The regulations governing the mitigation planning requirements for local mitigation plans are published under 44 CFR §201.6. Under 44 CFR §201.6, local governments must have a FEMA-approved Local Hazard Mitigation Plan in order to apply for and/or receive project grants under the following hazard mitigation assistance programs:

- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)
- Severe Repetitive Loss (SRL)

FEMA may also require a plan under the Repetitive Flood Claims (RFC) program.

To assist local governments in meeting this requirement, ABAG is the lead agency on the multi-jurisdictional Local Hazard Mitigation Plan (MJ-LHMP) for the San Francisco Bay Area. Cities, counties, and special districts can adopt and use all or part of this multi-jurisdictional plan in lieu of preparing all or part of a Local Hazard Mitigation Plan themselves. However, they need to have participated in the development of the multi-jurisdictional plan to adopt it. The plan was originally adopted in 2005. The 2010 plan has been adopted by ABAG and local jurisdictions are in the process of updating their annexes. This document is an Annex to the Bay Area MJ-LHMP specifying actions planned or taken by the East Bay Municipal Utility District.

Introduction

The East Bay Municipal Utility District (EBMUD) is a water and wastewater utility. EBMUD's water system services approximately 1.3 million people in a 331-square-mile area extending from Crockett on the north, southward to San Lorenzo (encompassing the major cities of Oakland and Berkeley), eastward from San Francisco Bay to Walnut Creek, and south through the San Ramon Valley. EBMUD's wastewater system serves approximately 650,000 people in an 88-square-mile area of Alameda and Contra Costa counties along the Bay's east shore, extending from Richmond on the north, southward to San Leandro. (See Exhibits A and B at the end of this Annex.)

The District is a publicly-owned utility formed under the Municipal Utility District (MUD) Act passed by the state legislature in 1921. The Act permits the formation of multi-purpose government agencies to provide needed services on a regional basis. In 1923, voters in the East San Francisco Bay Area created EBMUD to provide water service. The MUD Act was amended in 1941 to enable the formation of special districts. In 1944, voters in six East Bay cities elected to form the EBMUD Special District No. 1 to treat wastewater before being released into San Francisco Bay. Wastewater treatment began in 1951.

EBMUD is governed by a seven-member Board of Directors elected from wards within its service area.

The Water System Operating Budget (including debt service) for Fiscal Year 2010 is \$342 million, while the Wastewater System Operating Budget (including debt service) for FY 2010 is \$86.4 million. The Capital Improvement Program (CIP) budget for Fiscal Years 2010-2014 CIP includes estimated cash flow spending of \$1.0 billion on water and wastewater system capital projects, as noted in the following table.

**Water System Major Capital Projects
Five-Year CIP
(\$ millions)**

Project	FY12-16 Appropriations	FY12-16 Cash Flow
Pipeline Infrastructure Renewals	123.8	104.4
Service Lateral Replacements - Polybutylene	57.7	57.7
New Service Installations	54.1	54.1
Pipeline System Extensions	43.8	40.6
Reservoir Rehabilitation/Maintenance	36.9	40.8
Raw Water Studies and Improvements	27.0	29.6
Pumping Plant Rehabilitation	24.8	58.3

**Wastewater System Major Capital Projects
Five-Year CIP
(\$millions)**

Project	FY12-16 Appropriations	FY12-16 Cash Flow
Infiltration/Inflow Control Project	26.6	25.2
3 rd Street Sewer Interceptor Rehabilitation	22.9	11.2
SD1 Concrete Rehabilitation	15.0	14.3
Treatment Plant Infrastructure	14.6	15.8
Digester Upgrade	6.5	18.8
Wood Street Sewer Interceptor	8.0	16.3

The Regional Planning Process

EBMUD has participated in various Association of Bay Area Governments (ABAG) workshops and meetings, including providing comments on the ABAG Multi-Jurisdictional Local Hazard Mitigation Plan (MJ-LHMP) work products including reviewing draft priorities and providing input for reaching consensus on priorities for mitigation. In particular, EBMUD staff participated by:

- Attending and participating in the March 25, 2009 workshop on water supply hazards and mitigation efforts
- Attending and participating in the Lifeline and Hazards Review Committee meetings in May and September 2009 when the development of the ABAG-led multi-jurisdictional plan was under development, and
- Commenting on draft versions of that plan.

For more information on these meetings and for rosters of attendees, please see Appendix A and H in the ABAG 2010 MJ-LHMP. In addition, EBMUD has provided information on facilities that are defined as “critical” to ABAG.

The Local Planning Process

The East Bay Municipal Utility District staff met to identify and prioritize appropriate mitigation strategies. Personnel involved in these meetings included the EBMUD Manager of Security and Emergency Preparedness, the Manager of Regulatory Compliance, the Manager of Water Treatment and Distribution, the Associate Civil Engineer – Specialty Design and Senior Civil Engineer – Specialty Design (both involved in the Seismic Improvement Program), the Manager of Wastewater Engineering, and the Senior Civil Engineer in Wastewater Engineering. At the meeting, items identified included general priorities, mitigation strategies, prioritization of said strategies, appropriate departments for implementation of strategies, and review of preliminary budgets and potential funding sources for strategies needing additional funding related to EBMUD-owned-and-operated facilities. Typically, each person at the meeting was responsible for communicating existing efforts and thoughts on appropriate future action in their area of expertise. For example, the Wastewater Engineering representatives were most familiar with the needed mitigation actions for critical wastewater facilities. Two additional meetings were held to review versions of this Annex and finalize the specific “Existing Priority – Underfunded” tasks to be highlighted. Finally, EBMUD staff participated with the City of Oakland, Alameda County, and Contra Costa County in the development of their LHMPs.

Review and Incorporation of Existing Information

This process involved consideration of both the hazard and the risk information developed by ABAG and discussed in the overall multi-jurisdictional Local Hazard Mitigation Plan, as well as the hazard and risk assessments contained in EBMUD’s internal evaluations as described on pages 5-12.

Process for Updating Plan Sections

EBMUD did not participate in the 2005 multi-jurisdictional Local Hazard Mitigation Plan. Thus, none of the sections in this Annex are updates of a prior Annex.

Public Meetings

The public had two opportunities to comment on the draft Annex.

- (1) The District provided an opportunity for public comments on the DRAFT mitigation strategies at a public meeting of the East Bay Municipal Utility District Board of Directors Planning Committee held on October 11, 2011 at 9:30 a.m. at the District offices located at 375 11th Street in Oakland, California. The meeting and agenda item was advertised on the EBMUD website (www.ebmud.com) and through the public noticing of all EBMUD meetings. No public comments were received at this meeting, and thus no changes were made between the draft and FINAL version of this Annex prior to adoption by the EBMUD Board.
- (2) The draft mitigation strategies were also published on the EBMUD website (www.ebmud.com) for public viewing. Again, no public comments were received at this meeting, and thus no changes were made between the draft and FINAL version of this Annex prior to adoption by the EBMUD Board.

The District Board of Directors adopted the plan in a public meeting via an official Resolution at their October 25, 2011 meeting. This FINAL annex, along with the resolution adopted by the Board, is being submitted to FEMA for final approval. The mitigation strategies will be integrated into the Seismic Improvement Program, Emergency Operations Plan and Water and Wastewater Capital Improvement Programs.

Because EBMUD is committed to continually providing public oversight of its planning process, EBMUD will consider writing letters to the editor of local newspapers in its service area, the customer newsletter, and/or other innovative strategies to promote wider public knowledge of the process when this Annex is updated.

Hazards and Risk Assessment

The ABAG multi-jurisdictional Local Hazard Mitigation Plan, to which this is an Annex, lists nine hazards that impact the Bay Area, five related to earthquakes (faulting, shaking, earthquake-induced landslides, liquefaction, and tsunamis) and four related to weather (flooding, landslides, wildfires, and drought). In addition, Delta levee failure is of concern. Maps of these hazards and risks are shown on the ABAG website at <http://quake.abag.ca.gov/mitigation/>. All of these impact EBMUD's planning region. Finally, EBMUD faces similar hazards outside of the nine-county San Francisco Bay Area covered by the ABAG multi-jurisdictional plan in association with Pardee and Camanche Reservoirs, as well as the Mokelumne Aqueducts.

In addition to examining the maps and information on the ABAG website <http://quake.abag.ca.gov/mitigation/>, EBMUD has conducted a number of studies identifying hazards and risks associated with its system completed since the initiation of its Seismic Improvement Program in 1994. These studies include the following:

1. Seismic Evaluation Program Final Report, January 1994, Revised December 23, 1994, R10.5, Revision 1, G&E Engineering Systems, Inc.
2. Seismic Evaluation Program Final Report, Appendix A, April 1, 1994, R10.04.01 Revision 1, G&E Engineering Systems, Inc.
3. Buried Pipe Performance in Scenario Earthquakes, January 1994, R10.4, Revision 0, G&E Engineering Systems, Inc.
4. Restoration of Water Supply after Earthquakes, May 24, 1996, R30.03.01 Revision A, G&E Engineering Systems, Inc.
5. Emergency Response and Recovery, Final Technical Report, November 4, 1997, R19.06.04 Revision 0, G&E Engineering Systems, Inc.
6. Fault Crossing Evaluation and Conceptual Design, December 1994, R21.04.01, G&E Engineering Systems, Inc.
7. Strategic Transmission Plan Final Report, July 30, 1997, R19.06.02, G&E Engineering Systems, Inc.
8. Strategy for Protecting the Aqueducts in the Delta, Summary Report, October 5, 2007
9. Strategy for Protecting the Aqueducts in the Delta, Technical Memorandum No. 1 Alternative Identification, September 2007
10. Strategy for Protecting the Aqueducts in the Delta, Technical Memorandum No. 2 Preliminary Cost Estimates
11. Strategy for Protecting the Aqueducts in the Delta, Technical Memorandum No. 3 Risk Evaluation, August 2007
12. Strategy for Protecting the Aqueducts in the Delta, Technical Memorandum No. 4 Acceptable Risk Determination, September 2007
13. Indirect Loss Estimation: Fire Following Earthquake, March 1994, R10.04.02 Revision A, G&E Engineering Systems, Inc.
14. Economic Impacts of Scenario Earthquakes on the EBMUD Service Area Final Report, April 1, 1994, Goettel & Horner, Inc.
15. EBMUD Biennial Budget for FY 2012-2013, Volume 1 – Executive Summary, Strategic Plan Priorities and Operating Budget
16. EBMUD Biennial Budget for FY2012-2013, Volume 2 – Capital Improvement Program
17. Urban Water Master Plan 2010 (UWMP2010), EBMUD, June 2011
18. Seismic Evaluation of Selected East Bay Municipal Utility District Wastewater Facilities, July 1991, EQE Engineering
19. Seismic Evaluation Program East Bay Municipal Utility District Wastewater Facilities, March 1994, EQE Engineering
20. Seismic Conceptual Retrofit of Selected East Bay Municipal Utility District Wastewater Facilities, November 1996, EQE Engineering



District Facility Exposure to Hazards Within the Bay Area

EBMUD owns 1,154 facilities within the nine-county San Francisco Bay Area that it considers critical, including takeoffs, bypasses, regulators, booster stations, pumping plants, monitoring facilities, reservoirs, water and wastewater treatment plant facilities, water tanks, and control and administration facilities. Since the water and sewer systems are infrastructure networks, a higher percentage of its facilities are critical than for a typical city.

Earthquake Surface Rupture of Faults: Of these facilities, 86 are in an Alquist-Priolo Fault Rupture Study Zone. Of these, 33 are associated with the Northern Hayward fault, 51 with the Southern Hayward fault, and two with the Northern Calaveras fault. However, this initial mapping does not mean that they are located astride a fault. Significantly, Berryman Reservoir is located astride the Hayward, and has had additional design to accommodate expected fault displacement.

Earthquake Shaking: For the EBMUD water and wastewater system facilities, 87% (999 of 1154 facilities) are exposed to extremely high ground shaking levels (peak accelerations of greater than 60% g with a 10% chance of being exceeded in the next 50 years), and an additional 19% (218 of 1154 facilities) are exposed to high ground shaking levels (peak accelerations of greater than 50% g), while 1% (15 of 1154 facilities) are exposed to peak accelerations of greater than 40% g. Only 3% (33 of 1154 facilities) are exposed to moderate shaking (peak accelerations of greater than 30% g).

Earthquake-Generated Liquefaction: While 165 of the District's facilities are in areas mapped as study zones for earthquake-induced liquefaction by the California Geological Survey, and 359 are outside of these areas, the remaining facilities are in areas that have not been mapped. There is a significant correlation with the areas of moderate-to-very high liquefaction mapped by the U.S. Geological Survey. Based on that mapping, 97 are in areas mapped as having "Very High" susceptibility to liquefaction, four are in areas mapped as having "High" susceptibility to liquefaction, and 223 are in areas mapped as having "Moderate" susceptibility to liquefaction. Thus, roughly 25-30% of EBMUD's facilities should be expected to be subject to this hazard. The majority of wastewater facilities, including the main wastewater treatment plant and wet weather facilities are located in this area.

Earthquake-Generated Landsliding: While 53 of the District's facilities are in areas mapped as study zones for earthquake-induced landslides by the California Geological Survey, and 471 are outside of these areas, the remaining facilities are in areas that have not been mapped. There is limited correlation with the areas of rainfall-induced landsliding mapped by the U.S. Geological Survey (described below). Thus, roughly 10-15% of EBMUD's facilities should be expected to be subject to this hazard.

Tsunami: The December 2009 version of the CalEMA tsunami evacuation planning maps indicated that 74 of the EBMUD facilities are in this area. While the maps are conservative because they are intended for emergency evacuations, they are a first step in a hazard evaluation. Most of the facilities in the mapped area are in Oakland, but a few are in Alameda, San Leandro,

and in one case each, in Albany and Richmond. EBMUD is in the process of working with CalEMA on developing appropriate evacuation planning that is specific to various impacted facilities, particularly the Main Wastewater Treatment Plant.

Flooding: 23 of the EBMUD facilities are subject to a 100-year flood plain as mapped by FEMA, including one with a water velocity issue, an additional 33 are subject to a 500-year flood, and two have an undetermined hazard. The remaining 1097 are not subject to flooding.

Landsliding: 15% (178 of 1154) of the EBMUD facilities are in an area mapped as having significant existing landslides.

Wildfire: 8% (94 of 1154) of the EBMUD facilities are in an area mapped as subject to high wildfire threat, 7% (84 of 1154) are in an area mapped as subject to very high wildfire threat, and none are mapped as subject to an extreme wildfire threat. In addition, 73% (839 of 1154) of the facilities are within the area mapped by CalFIRE as within the wildland-urban-interface fire threat area.

Dam Failure Inundation: 26% of these facilities (298 of 1154) are in an area subject to dam inundation – 19 facilities are subject to inundation from any of three dams, 51 from 2 dams, and 228 from a single dam.

Delta Levee Failures: While EBMUD facilities in the San Francisco Bay Area are not in an area protected by Delta levees, facilities associated with EBMUD Mokelumne Aqueducts are on Jones Island, as well as other islands, in the Delta. More on this issue is described in the section on impacts of past disasters.

Drought: To the extent that operations of EBMUD are impacted by drought conditions, plans for this contingency are covered by the Urban Water Master Plan 2010 and a drought response plan.

Sea Level Rise: Four of the EBMUD facilities are in areas that would be inundated by 16 inches of sea level rise, while an additional 32 facilities would be inundated with 55 inches of sea level rise.

District Facility Exposure to Hazards Outside the Bay Area

EBMUD owns two reservoirs and a raw water conveyance system (including three aqueducts and associated facilities) to deliver water to the Bay Area. Finally, there are maintenance facilities outside the Bay Area. In general, these facilities are exposed to similar hazard to those within the San Francisco Bay Area. However, the issues of earthquake and Delta Levee Failure are most significant.

Earthquake: EBMUD facilities located outside of the nine-county Bay Area are also subject to damage from earthquake. For example, the Pardee Dam is located within three miles of the Bear

Mountain Fault Zone. In addition, the Mokelumne Aqueducts were not designed to resist earthquake forces in the Delta. As a result, severe damage may occur, resulting in a complete outage of the Mokelumne water supply for an extended period.

Flooding and Delta Levee Failures: The Mokelumne Aqueducts were not designed to resist flooding, as noted with the earthquake hazard, severe damage may occur, resulting in a complete outage of the Mokelumne water supply for an extended period. These levees and aqueducts are also vulnerable to failure due to inadequate support structure of the aqueducts, and soil conditions in the Delta. Most of EBMUD's system levees were built between 1870 and 1975 at a height of 4 to 6 feet. Today, to maintain the same elevation against flooding, the height of the levees ranges from 5 to more than 25 feet. This is necessary as the island floors are continually settling while levees have been built up to prevent overtopping of Delta water. Delta islands are subsiding (up to 3 inches per year) due to the loss of peat deposits caused by oxidation, farming, erosion, and burning. The subsidence of the Delta islands has increased the risk of levee failures. While EBMUD has no direct authority over the Delta levees, the District voluntarily monitors and regularly inspects levees protecting the aqueducts, especially during periods of high tidal stages or flood flows. To reduce the risks of levee failure on the islands along or adjacent to the aqueduct alignment, the District has given financial assistance to the reclamation districts on Woodward Island, Orwood Tract, and Upper Jones Tract to widen and raise the level crest. The District also stockpiles aqueduct pipes for minor repairs.

Wildland Fire: The Mokelumne Aqueducts cross the Sacramento-San Joaquin Delta which is comprised largely of peat type surficial soils. Peat soil is flammable and burns underground, sometimes for months once ignited. The Mokelumne Aqueduct is supported by timber piles at 30' intervals with timber supported temperature anchors every ½ mile. A fire occurring in the peat materials at this aqueduct could result in a complete loss of support of the aqueduct in the burned area. This could disrupt 25% of the total water supply from EBMUD's main water source, Pardee Reservoir.

Pipeline Exposure to Hazards Both Within and Outside the Bay Area

EBMUD operates approximately 4,200 miles of water pipelines, as well as 29 miles of large diameter sewer interceptor lines and appurtenances. These pipelines are EBMUD's biggest exposure to hazards.

Earthquake: The 1994 Seismic Improvement Program identified 235 pipes which cross the Hayward or Calaveras *Faults*. Of these pipelines, 30 are large diameter pipe that are very critical to water supply and 205 are smaller diameter that serve more localized areas. In addition, most are in the highest tier of earthquake *shaking* potential. While shaking will not damage pipelines in the same manner as buildings, the ground waves associated with shaking will damage those pipelines and cause ground failures. Approximately 20-30% of these pipelines are in areas of significant *liquefaction* susceptibility and 10-15% of pipelines are estimated to be in areas of significant earthquake-induced *landslide* hazard. In addition, the majority of EBMUD's wastewater interceptors are located in areas subject to liquefaction.

Tsunami: As underground facilities, pipelines are not in a position to be subject to long-term impacts of tsunami inundation.

Flooding: None of the distribution pipelines are in the areas expected to be flooded for extended periods of time that could develop the type of sedimentation problem that occurred during the long-term flooding of New Orleans. However, *outside the Bay Area*, significant exposure to flooding in the above ground portions of the Mokelumne Aqueducts between Holt and Bixler (San Joaquin County) in the Sacramento-San Joaquin Delta are subject to such flooding. In fact, since 1980, areas of Jones Tract have flooded for extended periods (6 months or more) twice with damage to the pipelines in both occurrences. The flooding hazard is the result of failure of levees holding back the San Joaquin, Old and Middle Rivers as well as perimeter channels.

Landsliding: Approximately 10-20% of EBMUD pipelines are in areas mapped by the U.S. Geological Survey as having significant existing landslides.

Wildfire: As underground facilities, pipelines are not in a position to be subject to long-term impacts of wildfire.

Dam Failure Inundation: As underground facilities, pipelines are not in a position to be subject to long-term impacts of dam inundation.

Delta Levee Failures: While EBMUD facilities in the San Francisco Bay Area are not in an area protected by Delta levees, the EBMUD Mokelumne Aqueducts *outside the Bay Area* cross Jones Island, as well as other islands, in the Delta. More on this issue is described in the section on impacts of past disasters.

Drought: To the extent that operations of EBMUD are impacted by drought conditions, plans for this contingency are covered by the Urban Water Master Plan 2010 and a drought response plan.

Risk Assessment

The earthquake hazard information described above, together with more detailed information on materials and design of these facilities, and pipeline materials and connections associated with EBMUD, were used to estimate the problems associated with District facilities in a 1994 study. At that time, EBMUD estimated, that, should a earthquake occur on the Hayward fault EBMUD customers could have expected:

- Water cut off immediately to 63 percent of customers, including hospitals and disaster centers;
- Loss of water for fire hydrants and increased fire risk;
- Over 5,500 pipelines serving homes and businesses to break;
- A likelihood of untreated drinking water due to damage to four of six treatment plants;



- EBMUD's most critical water conduit, the Claremont Tunnel, to be cut off west of the Oakland/Berkeley hills – affecting 70 percent of EBMUD customers;
- Major damage to 65 water reservoirs and about 87 pumping plants that would require months, or even years, to repair;
- An estimated impact of \$1.2 billion (in 1994 dollars) to the regional economy due to fire damage and lack of water; and
- Weeks after an earthquake, with some customers lacking service as long as six months.

While a large number of facilities are in areas mapped as being in the wildland-urban-interface fire threat area, EBMUD facilities are either underground or, if structures, have asphalt shingles, tile, or metal roofs.

As a result of the 1994 water system study, EBMUD developed a \$189 million Capital Improvement program that, between 1995 and 2007, resulted in a system-wide mitigation of these impacts with the goal of providing an improved post-earthquake functional water system with no redundancies.

A number of wastewater system seismic evaluations in the 1990s noted the risk of major damage to the Main Wastewater Treatment Plant, wet weather facilities, and pipelines and pumps stations that transport wastewater flows to the Main Wastewater Treatment Plant. A number of buildings with life safety risks have been seismically upgraded, including the Sludge Dewatering and Oxygen Plant Control Buildings and the Operations Center. In addition, portable equipment, such as pumps, hoses and generators, required to maintain operations following a disaster, has been procured. A number of other facilities still require seismic upgrades. In addition, the seismic codes have been updated since the last seismic evaluation was completed. So, additional seismic improvements are likely required.

In a 2007 study, the District identified risk of failure to the Mokelumne Aqueducts in the Sacramento-San Joaquin Delta due to high stream flow flooding, “sunny day” failures and in particular, damage due to seismic events. The Benjamin study prepared for the California Department of Water Resources identifies a potential for 30 to 50 levee failures due to a credible seismic event. Such failures would significantly increase the duration of flooding and repair times required to restore the Mokelumne Aqueducts, if damaged, to service.

Finally, roadway and building damage in EBMUD's service area may result in delays in recovery that may necessitate on-going communication with service vehicles to ensure that repairs to pipelines and critical facilities are completed in a timely manner.

The District plans to continue to work with ABAG to develop specific information about the kind and level of damage to buildings, infrastructure, and critical facilities which might result from any of the hazards previously noted.

Hazards Conclusion

The East Bay Municipal Utility District has reviewed the hazards identified and ranked the hazards based on past disasters and expected future impacts. The conclusion is that earthquakes



(including fault rupture, shaking, and ground failure due to landslides or liquefaction), Delta levee failures, and, to a lesser extent, wildland-urban-interface fire threats, wildfire, landsliding, flooding, sea level rise, and tsunamis pose a risk for potential loss. The risk to water pipelines and wastewater interceptors is particularly high.

Repetitive Loss Properties

The EBMUD facilities are not repetitive loss properties for flooding.

Past Occurrences of Disasters (natural and human-induced)

The Loma Prieta Earthquake of 1989 is an example of the kind of large-scale disaster which can strike the Bay Area. It killed 63 persons, injured 3,757, and displaced over 12,000 persons. With over 20,000 homes and businesses damaged and over 1,100 destroyed, this quake caused approximately \$6 Billion of damage. Reconstruction continues some two decades later as the replacement for Oakland-Bay Bridge is still several years from completion.

More information on State and Federally declared disasters in Alameda and Contra Costa counties and the EBMUD service area can be found at

<http://quake.abag.ca.gov/mitigation/ThePlan-D-Version-August10.pdf>

The EBMUD service area has experienced a number of different disasters over the last 50 years, including numerous earthquakes, floods, droughts, wildfires, energy shortages, landslides, and severe storms. In addition to the declared disasters noted in Appendix D, the two most locally significant incidents that have impacted EBMUD in the last several years include:

- The Loma Prieta Earthquake in October 1989 was a magnitude 6.9 earthquake whose most spectacular result near the EBMUD service area were numerous main breaks attributed to ground shaking. As a result of that earthquake, EBMUD repaired damage to 123 water mains and 22 customer services directly attributable to the earthquake. This does not include service leaks and breakage on the customer side of the meter for which the customer is responsible. One of the leaks was on the large raw water line supplying the Sobrante Water Treatment Plant. This resulted in significant disruptions to the biological treatment process; it took weeks to re-establish the biological organisms needed for the process.
- The Oakland-Berkeley East Bay Hills firestorm in 1991 resulted in failure of water supply due to disruption of power lines and fire damage to District facilities. As the result, local fire agencies did not have water to fight fires in critical areas. Since the firestorm, EBMUD has taken measures to provide quick connects to allow rapid restoration of power using portable generators, installation of hydrants to provide emergency service across pressure zone boundaries and worked with local and state agencies to develop consistency of fire department connections and protocols for delivery of emergency water supplies.



- The Jones Tract Levee Failures of 1980 and 2004. Repairs to the Burlington Northern Santa Fe Railroad on Jones Tract following the 1980 failure has actually increased the risk of aqueduct failure by concentrating the flow, and thus producing additional scour, on one section of the aqueducts. Both failures were due to non-seismic events. Failure of levees protecting lands the aqueducts cross during a seismic event will be substantially greater as discussed above.
- The Drought of the mid-1970s produced significant need for rationing scarce water supplies. Since then, EBMUD has developed more sophisticated drought forecasting tools, secured availability of its authorize American river supply by construction of treatment, pumping, transmission and storage capabilities to use this source for drought supply and has begun pilot testing of groundwater storage within the District's Service Area through the Bayside project.

National Flood Insurance Program

As a special district, EBMUD is not eligible to participate in the National Flood Insurance Program (NFIP).

Mitigation Goals and Objectives

The goal of the ABAG MJ-LHMP is to maintain and enhance a disaster-resistant region by reducing the potential for loss of life, property damage, and environmental degradation from natural disasters, while accelerating economic recovery from those disasters. This goal is unchanged from the 2005 plan and is the goal of the East Bay Municipal Utility District in designing its mitigation program.

The specific goals of the Seismic Improvement Program have been:

- **Life Safety:** *Prevent the loss of life due to the failure of any EBMUD facility.*
- **Fire Service:** *Improve water service in all areas, especially high fire danger zones.*
- **Customer Service:** *Restore water service quickly.*
- **Water Quality and Public Health:** *Guarantee that all water entering the distribution system is fully treated.*

Mitigation Activities and Priorities

Existing Mitigation Activities

EBMUD was not a participant in the 2005 ABAG-led Local Hazard Mitigation Plan. However, EBMUD has been committed to hazard mitigation for many years. The 10-year \$189 million Seismic Improvement Program initiated in 1995 and completed in 2007 included the following:



- 13 building structures and over 130 equipment anchorage projects have been seismically retrofitted for the protection of the public and staff.
- 70 storage reservoirs have been upgraded or demolished.
- 130 pumping plants have been upgraded and emergency backup equipment added.
- 5 water treatment plants have been upgraded to improve post-earthquake operations by upgrading control buildings, filter gallery roofs, chemical tanks and pipelines, and pumps and valves.
- 56 pipeline fault crossings, 18 upgrades in areas of landslides and liquefaction, and 8 transmission system upgrades have been completed to improve flexibility for transmitting water in the distribution system and to mitigate landslide hazards for key pipes. Portable above ground high pressure hose (8", 10" and 12" diameters) has been procured and stored strategically around the Service Area and hydrant taps and isolation valves to temporarily bridge breaks at pipe fault crossings have been installed
- The Southern Loop Pipeline has been completed to provide redundancy in the water system on both east and west sides of the EBMUD's service area.
- The Claremont Tunnel Seismic Upgrade Project, completed in 2007, provides a reliable source of water to customers west of the Berkeley Hills. This innovative project has drawn interest from the U. S., Japan and Italy as method to deal with water tunnels crossing faults.

In 2010, EBMUD completed the retrofit of the District Emergency Operations Center to better serve the District's Emergency Response effort and completed the establishment of an Alternative Emergency Operations Center in the Walnut Creek Area to provide redundancy in response capabilities and to provide widely spaced EOCs to ensure continuous operations due to damage near either center.

In 2011, EBMUD completed the retrofit of the San Pablo Dam and Reservoir.

EBMUD put its seismic protections in place before other water agencies and departments in the region had started, and provided a model program for the rest of the country to follow. EBMUD continues to receive recognition for its forward-thinking and proactive approach to strengthen, reinforce and upgrade its water distribution system on such a comprehensive scale.

As a leader among water and wastewater agencies, EBMUD is on the Board of Directors of the California Utilities Emergency Association (CUEA) and chairs the Water and Wastewater Committee which focuses on water and wastewater strategic emergency response and coordination.

These and additional existing mitigation strategies, including those that are fully funded, and are underfunded, are listed on pages 16-27.

Future Mitigation Actions and Priorities

As a participant in the 2010 ABAG multi-jurisdictional planning process, the staff of EBMUD helped in the development and review of the comprehensive list of mitigation strategies in the overall multi-jurisdictional plan. The decision on priority for specific mitigation strategies for EBMUD was made based on a variety of criteria, not simply on an economic cost-benefit analysis. These criteria include being technically and administratively feasible, politically acceptable, socially appropriate, legal, economically sound, and not harmful to the environment or our heritage.

Following public comment, these draft priorities were submitted to EBMUD management, the Planning Committee and the Board of Directors for review. The draft priorities will be provided to the EBMUD Board of Directors for adoption pending approval of this LHMP by FEMA.

The District planning team also prioritized specific mitigation tasks for the next 5-15 years. This list includes implementation process, funding strategy, responsible agency, and approximate time frame. The full list of mitigation strategies is included as an attachment to this Annex. This list includes implementation process, funding strategy, and responsible agency.

Based on the hazard exposure information described above, the principal capital outlays will be associated with implementing mitigation strategies GOVT- a-4, as well as INFR-a-1, a-4 and b-4 with a priority of “Existing Program, Underfunded.” Specifically, the following activities have been identified:

- Replace, relocate or mitigate pipelines in fault and liquefaction zones including, but not limited to: Dingee Reservoir pipeline from Claremont Center to Broadway Terrace to avoid Hayward Fault Zone (\$7.5 million); Webster/Alice Street pipeline which is in high liquefaction probability zone (\$5.4 million); MacArthur/Davenport replacement in the Hayward Fault zone (\$7.4 million); San Pablo area pipeline (Pipe Extension E-19538-A/B) in the Hayward Fault Zone (\$5.5 million). Strategy: INFR-a-4 and b-4. Department in Charge: Operations and Maintenance as well as Engineering and Construction. Overall Budget: \$25.8 million.
- Install intertie valve stations on east and west sides of the delta to mitigate potential failures of the Mokelumne Aqueducts due to seismic events and flooding. Strategy INFR-a-4 and b-4. Department in Charge Operations and Maintenance with Engineering as well as Construction. Estimated Budget: \$10.7 million.
- Develop mitigations to prevent flooding of the filter beds at Orinda water treatment plant from off-site surface waters. Strategy: INFR a-4. Department in Charge: Operations and Maintenance with Engineering as well as Construction. Estimated Budget: \$1.5 million.
- Prepare a planning-level study to develop a mitigation plan for susceptible wastewater infrastructure, such as the Dechlorination Facility, to address impacts from a tsunami. The study is required because the mitigation costs could be, at the low end, under \$2 million or over \$30 million if the existing facility were abandoned and replaced with an alternative disinfection process. Strategy GOVT-a-1 and INFR a-1. Department in Charge Wastewater. Estimated Budget \$100,000.



- Prepare a planning-level study to identify impacts, vulnerabilities and adaptation strategies to mitigate potential flooding associated with sea level rise at EBMUD's wastewater facilities, including the interceptor system and pump stations, transition structures, Dechlorination Facility, wet weather facility and the Main Wastewater Treatment Plant. The study is required because mitigation costs need to be better defined. Mitigation costs could range from \$2 to \$5 million, or over \$20 million. Strategy GOVT-a-1 and INFR a-1. Department in Charge Wastewater. Estimated Budget \$200,000.

Such improvements are in the process of being integrated into the District's Water and Wastewater Capital Improvement Programs for the next 15 years, but additional grant funding will be sought to do additional work, as well as to speed up critical improvements.

On-Going Funded and Underfunded Mitigation Strategy Programs

EBMUD has many on-going mitigation programs that help create a more disaster-resistant region and utility systems. Collaboratively working with numerous other agencies at the federal, state and local levels, the District has implemented institutional as well as physical infrastructure improvements. The following list highlights those programs identified as *Existing Programs* in the mitigation strategy spreadsheet, as well as the department in charge and, in some cases, additional comments.

- Clarify to workers in critical facilities and emergency personnel, as well as to elected officials and the public, the extent to which the facilities are expected to perform only at a life safety level (allowing for the safe evacuation of personnel) or are expected to remain functional following an earthquake. (GOVT-a-3) - Agency-wide; Some critical distribution facilities have been designed for immediate use
- 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. (GOVT-a-5) - Operations and Maintenance
- Coordinate with the State Division of Safety of Dams to ensure that cities and counties are aware of the timeline for the maintenance and inspection of dams whose failure would impact their jurisdiction. (GOVT-a-8) - Operations and Maintenance; Engineering and Construction; Public Affairs
- Ensure that new government-owned facilities comply with and are subject to the same or more stringent regulations as imposed on privately-owned development. (GOVT-a-10) - Agency-wide
- 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. (GOVT-a-11) - Agency-wide
- 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. (GOVT-a-12) - Real Estate; Engineering and Construction; Wastewater



- Ensure that any regulations imposed on private-owned businesses related to repair and reconstruction are enforced and imposed on local government's own buildings and structures. (GOVT-a-13) - Wastewater
- Establish a framework and process for pre-event planning for post-event recovery that specifies roles, priorities, and responsibilities of various departments within the local government organization, and that outlines a structure and process for policy-making involving elected officials and appointed advisory committees. (GOVT-b-1) - Operations and Maintenance with Engineering and Construction, and Wastewater
- Establish a goal for the resumption of local government services that may vary from function to function. (GOVT-b-3) - Agency-wide
- 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. (GOVT-b-4) - Agency-wide
- Develop a plan for short-term and intermediate-term sheltering of your employees. (GOVT-c-1) - Operations and Maintenance; Wastewater
- Encourage your employees to have a family disaster plan. (GOVT-c-2) - Agency-wide
- Periodically assess the need for new or relocated fire or police stations and other emergency facilities. (GOVT-c-4) - Operations and Maintenance; Wastewater
- Periodically assess the need for changes in staffing levels, as well as for additional or updated supplies, equipment, technologies, and in-service training classes. (GOVT-c-5) - Agency-wide
- Purchase command vehicles for use as mobile command/EOC vehicles if current vehicles are unsuitable or inadequate. (GOVT-c-9) - Operations and Maintenance
- Expand or participate in expanding traditional disaster exercises involving city and county emergency personnel to include airport and port personnel, transit and infrastructure providers, hospitals, schools, park districts, and major employers. (GOVT-c-11) - Operations and Maintenance; Wastewater.
- Maintain and update as necessary the local government's Standardized Emergency Management System (SEMS) Plan and the National Incident Management System (NIMS) Plan, and submit an appropriate NIMSCAST report. (GOVT-c-12) - Operations and Maintenance, Wastewater
- Continue to participate not only in general mutual-aid agreements, but also in agreements with adjoining jurisdictions for cooperative response to fires, floods, earthquakes, and other disasters. (GOVT-c-13) - Operations and Maintenance.
- Conduct periodic tests of the alerting and warning system. (GOVT-c-15) - Operations and Maintenance
- Monitor weather during times of high fire risk using, for example, weather stations tied into police and fire dispatch centers. (GOVT-c-17) - Operations and Maintenance
- Establish regional protocols on how to respond to the NOAA Monterey weather forecasts, such as the identifying types of closures, limits on work that could cause ignitions, and prepositioning of suppression forces. A multi-agency coordination of response also helps provide unified messages to the public about how they should respond to these periods of increased fire danger. Response should also be modified



based on knowledge of local micro-climates. Local agencies with less risk then may be available for mutual aid. (GOVT-c-18) - Operations and Maintenance

- Increase local patrolling during periods of high fire weather. (GOVT-c-19) - Water and Natural Resources, Operations and Maintenance
- Create and maintain an automated system of rain and flood gauges that is web enabled and publicly-accessible. Work toward creating a coordinated regional system. (GOVT-c-20) - Operations and Maintenance
- Review and update, as necessary, procedures pursuant to the State Dam Safety Act for the emergency evacuation of areas located below major water-storage facilities. (GOVT-c-22) - Engineering and Construction; Coordinate on an as-requested basis, but evacuation is a city and/or county responsibility
- Improve coordination among cities, counties, and dam owners so that cities and counties can better plan for evacuation of areas that could be inundated if a dam failed, impacting their jurisdiction. (GOVT-c-23) - Engineering and Construction; Coordinate on an as-requested basis, but evacuation is a city and/or county responsibility
- Develop procedures for the emergency evacuation of areas identified on tsunami evacuation maps as these maps become available. (GOVT-c-24) - Wastewater; Operations and Maintenance
- Support and encourage planning and identification of facilities for the coordination of distribution of water, food, blankets, and other supplies, coordinating this effort with the American Red Cross. (GOVT-c-25) - Operations and Maintenance
- Promote information sharing among overlapping and neighboring local governments, including cities, counties, and special districts, as well as utilities. (GOVT-d-1) - Operations and Maintenance; Public Affairs
- Recognize that emergency services is more than the coordination of police and fire response; it also includes planning activities with providers of water, food, energy, transportation, financial, information, and public health services. (GOVT-d-2) - Agency-wide
- Recognize that a multi-agency approach is needed to mitigate flooding by having flood control districts, cities, counties, and utilities meet at least annually to jointly discuss their capital improvement programs for most effectively reducing the threat of flooding. Work toward making this process more formal to insure that flooding is considered at existing joint-agency meetings. (GOVT-d-3) - Agency-wide
- Participate in multi-agency efforts to mitigate fire threat, such as the Hills Emergency Forum (in the East Bay), various FireSafe Council programs, and city-utility task forces. Such participation increases a jurisdiction's competitiveness in obtaining grants. (GOVT-d-6) - Engineering and Construction, Operations and Maintenance, Water and Natural Resources
- Work with major employers and agencies that handle hazardous materials to coordinate mitigation efforts for the possible release of these materials due to a natural disaster such as an earthquake, flood, fire, or landslide. (GOVT-d-7) - Agency-wide; Work with Contractors to EBMUD
- Encourage staff to participate in efforts by professional organizations to mitigate earthquake and landslide disaster losses, such as the efforts of the Northern California Chapter of the Earthquake Engineering Research Institute, the East Bay-Peninsula



Chapter of the International Code Council, the Structural Engineers Association of Northern California, and the American Society of Grading Officials. (GOVT-d-8) - Engineering and Construction; Operations and Maintenance; Wastewater

- Cooperate with researchers working on government-funded projects to refine information on hazards, for example, by expediting the permit and approval process for installation of seismic arrays, gravity survey instruments, borehole drilling, fault trenching, landslide mapping, flood modeling, and/or damage data collection. (GOVT-d-10) - Engineering and Construction; Operations and Maintenance; Wastewater
- If a dam owner, comply with State of California and federal requirements to assess the vulnerability of dams to damage from earthquakes, seiches, landslides, liquefaction, or security threats. (INFR-a-2) - Water and Natural Resources with Engineering and Construction, and Operations and Maintenance
- Encourage the cooperation of utility system providers and cities, counties, and special districts, and PG&E to develop strong and effective mitigation strategies for infrastructure systems and facilities. (INFR-a-3) - Operations and Maintenance, Engineering, and Wastewater; EBMUD belongs to the California Utility Emergency Association
- Support and encourage efforts of other (lifeline infrastructure) agencies as they plan for and arrange financing for seismic retrofits and other disaster mitigation strategies. (For example, a city might pass a resolution in support of a transit agency's retrofit program.) (INFR-a-7) - Engineering and Maintenance; Wastewater
- Develop unused or new pedestrian rights-of-way as walkways to serve as additional evacuation routes (such as fire roads in park lands). (INFR-a-10) - Water and Natural Resources
- Minimize the likelihood that power interruptions will adversely impact lifeline utility systems or critical facilities by ensuring that they have adequate back-up power. (INFR-a-11) - Engineering and Construction; Wastewater
- Encourage replacing above ground electric and phone wires and other structures with underground facilities, and use the planning-approval process to ensure that all new phone and electrical utility lines are installed underground. (INFR-a-12) - Engineering and Construction; Wastewater
- If you own a dam, coordinate with the State Division of Safety of Dams to ensure an adequate timeline for the maintenance and inspection of dams, as required of dam owners by State law, and communicate this information to local governments and the public. (INFR-a-13) - Engineering and Construction
- Encourage communication between State Emergency Management Agency (CalEMA), FEMA, and utilities related to emergencies occurring outside of the Bay Area that can affect service delivery in the region. (INFR-a-14) - Operations and Maintenance
- Coordinate with other critical infrastructure facilities to establish plans for delivery of water and wastewater treatment chemicals. (INFR-a-19) - Operations and Maintenance with Wastewater
- As an infrastructure operator, designate a back-up Emergency Operations Center with redundant communications systems. (INFR-a-21) - Operations and Maintenance



- Install earthquake-resistant connections when pipes enter and exit bridges and work with bridge owners to encourage retrofit of these structures. (INFR-b-7) - Engineering and Construction; Wastewater
- 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 infrastructure facilities. (INFR-b-8) - Agency-wide
- Clarify to workers in critical facilities and emergency personnel, as well as to elected officials and the public, the extent to which the facilities are expected to perform only at a life safety level (allowing for the safe evacuation of personnel) or are expected to remain functional following an earthquake. (INFR-b-9) - Agency-wide; Some critical distribution facilities have been designed for immediate use
- Develop a coordinated approach between fire jurisdictions and water supply agencies to identify needed improvements to the water distribution system, initially focusing on areas of highest wildfire hazard (including wildfire threat areas and in wildland-urban-interface areas). (INFR-c-2) - Engineering and Construction EBMUD participates in the Hillside Emergency Forum
- Develop a defensible space vegetation program that includes the clearing or thinning of (a) non-fire resistive vegetation within 30 feet of access and evacuation roads and routes to critical facilities, or (b) all non-native species (such as eucalyptus and pine, but not necessarily oaks) within 30 feet of access and evacuation roads and routes to critical facilities. (INFR-c-3) - Operations and Maintenance; Water and Natural Resources
- Develop procedures for performing a watershed analysis to examine the impact of development on flooding potential downstream, including communities outside of the jurisdiction of proposed projects. (INFR-d-2) - Engineering and Construction; Limited to facilities owned by EBMUD
- Assist, support, and/or encourage the U.S. Army Corp of Engineers, various Flood Control and Water Conservation Districts, and other responsible agencies to locate and maintain funding for the development of flood control projects that have high cost-benefit ratios (such as through the writing of letters of support and/or passing resolutions in support of these efforts). (INFR-d-4) - Engineering and Construction
- Ensure that utility systems in new developments are constructed in ways that reduce or eliminate flood damage. (INFR-d-13) - Engineering and Construction; Wastewater
- Work for better cooperation among the patchwork of agencies managing flood control issues. (INFR-d-16) - Engineering and Construction; Water and Natural Resources
- Include “areas subject to ground failure” in the list of criteria used for determining a replacement schedule (along with importance, age, type of construction material, size, condition, and maintenance or repair history) for pipelines. (INFR-e-1) - Engineering and Construction
- Ensure that critical buildings owned or leased by special districts or private utility companies participate in a program similar to San Francisco’s Building Occupancy Resumption Program (BORP). The BORP program permits owners of buildings to hire qualified engineers to create facility-specific post-disaster inspection plans and allows these engineers to become automatically deputized as City/County inspectors for these buildings in the event of an earthquake or other disaster. This program allows rapid



reoccupancy of the buildings. (INFR-f-1) - Engineering and Construction; Wastewater. EBMUD currently trains, staffs, and maintains certified engineering and inspection teams to conduct post-disaster structural evaluations of its facilities.

- Provide materials to the public related to coping with reductions in water supply or contamination of that supply BEYOND regulatory notification requirements. (INFR-g-3) - Operations and Maintenance; Public Affairs
- Provide materials to the public related to coping with disrupted storm drains, sewage lines, and wastewater treatment (such as materials developed by ABAG's Sewer Smart Program). (INFR-g-4) - Wastewater and Public Affairs
- Facilitate and/or coordinate the distribution of emergency preparedness or mitigation materials that are prepared by others, such as by making the use of the internet or other electronic means, or placing materials on community access channels or in city or utility newsletters, as appropriate. (INFR-g-5) - Agency-wide
- Sponsor the formation and training of Community Emergency Response Teams (CERT) for the employees of your agency. (INFR-g-6) - Operations and Maintenance; Wastewater
- Develop and distribute culturally appropriate materials related to disaster mitigation and preparedness, such as those on the <http://www.preparenow.org> website related to infrastructure issues. (INFR-g-7) - Operations and Maintenance; Wastewater; Public Affairs

- Continue to enforce State-mandated requirements, such as the *California Environmental Quality Act*, to ensure that mitigation activities for hazards, such as seismic retrofits and vegetation clearance programs for fire threat, are conducted in a way that reduces environmental degradation such as air quality impacts, noise during construction, and loss of sensitive habitats and species, while respecting the community value of historic preservation. (ENVI-a-1) - Engineering and Construction; Wastewater
- Encourage regulatory agencies to work collaboratively with safety professionals to develop creative mitigation strategies that effectively balance environmental and safety needs, particularly to meet critical wildfire, flood, and earthquake safety levels. (ENVI-a-2) - Operations and Maintenance; Wastewater
- Continue to enforce and/or comply with State-mandated requirements, such as the *California Environmental Quality Act* and environmental regulations to ensure that urban development is conducted in a way to minimize air pollution. For example, air pollution levels can lead to global warming, and then to drought, increased vegetation susceptibility to disease (such as pine bark beetle infestations), and associated increased fire hazard. (ENVI-a-3) - Engineering and Construction; Wastewater
- Develop and implement a comprehensive program for watershed management optimizing ecosystem health with water yield to balance water supply, flooding, fire, and erosion concerns. (ENVI-a-4) - Water and Natural Resources
- Balance the need for the smooth flow of storm waters versus the need to maintain wildlife habitat by developing and implementing a comprehensive Streambed Vegetation Management Plan that ensures the efficacy of flood control efforts, mitigates wildfires and maintains the viability of living rivers. (ENVI-a-5) - Operations and Maintenance; Water and Natural Resources



- Comply with applicable performance standards of any *National Pollutant Discharge Elimination System* municipal stormwater permit that seeks to manage increases in stormwater run-off flows from new development and redevelopment construction projects. (ENVI-a-6) - Operations and Maintenance; Wastewater
- Enforce and/or comply with the grading, erosion, and sedimentation requirements by prohibiting the discharge of concentrated stormwater flows by other than approved methods that seek to minimize associated pollution. (ENVI-a-7) - Engineering and Construction; Wastewater
- Explore ways to require that hazardous materials stored in the flood zone be elevated or otherwise protected from flood waters. (ENVI-a-8) - Operations and Maintenance; Wastewater
- Enforce and/or comply with the hazardous materials requirements of the State of California Certified Unified Program Agency (CUPA). (ENVI-a-9) - Operations and Maintenance
- Provide information on hazardous waste disposal and/or drop off locations. (ENVI-a-10) - Wastewater
- When remodeling existing government and infrastructure buildings and facilities, remove asbestos to speed up clean up of buildings so that they can be reoccupied more quickly. (ENVI-a-11) - Engineering and Construction, Operations and Maintenance, Wastewater
- 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. (ENVI-b-1) - Engineering and Construction; Operations and Maintenance; Wastewater
- Increase the use of clean, alternative energy by, for example, investing in “green tags”, advocating for the development of renewable energy resources, recovering landfill methane for energy production, and supporting the use of waste to energy technology. (ENVI-b-4) - Administration, Water and Natural Resources, Wastewater; Incentives for employee commuting and hiking/biking trails on watershed lands

The following are on-going programs that are currently underfunded or partially funded by other agencies. It is the District’s priority to find additional funding to sustain these on-going programs over time. This list contains the mitigation strategy, as well as the department in charge and, in some cases, additional comments.

- Assess the vulnerability of critical facilities (such as city halls, fire stations, operations and communications headquarters, community service centers, seaports, and airports) to damage in natural disasters and make recommendations for appropriate mitigation. (GOVT-a-1) - Agency-wide, with Engineering and Construction; Operations and Maintenance, and Wastewater
- Retrofit or replace critical facilities that are shown to be vulnerable to damage in natural disasters. (GOVT-a-2) - Operations and Maintenance; Engineering and Construction; Wastewater



- Conduct comprehensive programs to identify and mitigate problems with facility contents, architectural components, and equipment that will prevent critical buildings from being functional after major natural disasters. Such contents and equipment includes computers and servers, phones, files, and other tools used by staff to conduct daily business. (GOVT-a-4) - Engineering and Construction; Operations and Maintenance; Wastewater
- When installing micro and/or surveillance cameras around critical public assets tied to web-based software, and developing a surveillance protocol to monitor these cameras, investigate the possibility of using the cameras for the secondary purpose of post-disaster damage assessment. (GOVT-a-6) - Operations and Maintenance
- Identify and undertake cost-effective retrofit measures related to security on critical facilities (such as moving and redesigning air intake vents and installing blast-resistant features) when these buildings undergo major renovations related to other natural hazards. (GOVT-a-7) - Engineering and Construction; Operations and Maintenance; Wastewater
- As a secondary focus, assess the vulnerability of non-critical facilities to damage in natural disasters based on occupancy and structural type, make recommendations on priorities for structural improvements or occupancy reductions, and identify potential funding mechanisms. (GOVT-a-9) - Engineering and Construction; Operations and Maintenance; Wastewater
- Prepare a basic Recovery Plan that outlines the major issues and tasks that are likely to be the key elements of community recovery, as well as integrate this planning into response planning (such as with continuity of operations plans). (GOVT-b-2) - Operations and Maintenance with Engineering and Construction, and Wastewater
- Plan for the emergency relocation of government-owned facilities critical to recovery, as well as any facilities with known structural deficiencies or in hazardous areas. (GOVT-b-5) - Operations and Maintenance
- Offer CERT/NERT-type training to your employees. (GOVT-c-3) - Agency-wide
- Ensure that fire, police, and other emergency personnel have adequate radios, breathing apparatuses, protective gear, and other equipment to respond to a major disaster. (GOVT-c-6) - Operations and Maintenance; Wastewater
- Participate in developing and maintaining a system of interoperable communications for first responders from cities, counties, special districts, state, and federal agencies. (GOVT-c-7) - Operations and Maintenance; Wastewater; Information Systems
- Harden emergency response communications, including, for example, building redundant capacity into public safety alerting and/or answering points, replacing or hardening microwave and simulcast systems, adding digital encryption for programmable radios, and ensuring a plug-and-play capability for amateur radio. (GOVT-c-8) - Operations and Maintenance; Wastewater; Information Systems
- Maintain the local government's emergency operations center in a fully functional state of readiness. (GOVT-c-10) - Operations and Maintenance
- Install alert and warning systems for rapid evacuation or shelter-in-place. Such systems include outdoor sirens and/or reverse-911 calling systems. (GOVT-c-14) - Operations and Maintenance, Wastewater



- Place remote sensors in strategic locations for early warning of hazmat releases or use of weapons of mass destruction, understanding that the appropriate early warning strategy depends on the type of problem. (GOVT-c-21) - Operations and Maintenance, Wastewater
- 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 earthquake, wildfire, flood, and landslide hazards. (GOVT-d-9) - Engineering and Construction; Operations and Maintenance; Wastewater
- Assess the vulnerability of critical facilities owned by infrastructure operators subject to damage in natural disasters or security threats, including fuel tanks and facilities owned outside of the Bay Area that can impact service delivery within the region. (INFR-a-1) - Agency-wide, with Engineering and Construction; Operations and Maintenance, and Wastewater
- Retrofit or replace critical lifeline infrastructure facilities and/or their backup facilities that are shown to be vulnerable to damage in natural disasters. (INFR-a-4) - Operations and Maintenance; Engineering and Construction; Wastewater
- Develop a plan for speeding the repair and functional restoration of water and wastewater systems through stockpiling of shoring materials, temporary pumps, surface pipelines, portable hydrants, and other supplies, such as those available through the Water /Wastewater Agency Response Network (WARN). Communicate that plan to local governments and critical facility operators. (INFR-a-6) - Operations and Maintenance; Engineering and Construction; Wastewater
- Pre-position emergency power generation capacity (or have rental/lease agreements for these generators) in critical buildings of cities, counties, and special districts to maintain continuity of government and services. (INFR-a-8) - Operations and Maintenance; Wastewater
- Establish plans for delivery of fuel to critical infrastructure providers. (INFR-a-20) - Operations and Maintenance with Wastewater
- Monitor scientific studies of the Sacramento-San Joaquin Delta and policy decisions related to the long-term disaster resistance of that Delta system to ensure that decisions are made based on comprehensive analysis and in a scientifically-defensible manner. Levee failure due to earthquakes, flooding, and climate change (including sea level rise and more frequent and more severe flooding) are all of concern. The long-term health of the Delta area is critical to the Bay Area's water supply, is essential for the San Francisco Bay and estuary's environmental health, provides recreation opportunities for Bay Area residents, and provides the long-term sustainability of Delta communities. While only part of the Delta is within the nine Bay Area counties covered by this multi-jurisdictional LHMP, the Delta is tied to the infrastructure, water supply, and economy of the Bay Area. (INFR-a-22) - Engineering and Construction, Water and Natural Resources, Operations and Maintenance
- Expedite the funding and retrofit of seismically-deficient city- and county-owned bridges and road structures by working with Caltrans and other appropriate governmental agencies. (INFR-b-1) - Operations and Maintenance; Engineering and Construction



- Include “areas subject to high ground shaking, earthquake-induced ground failure, and surface fault rupture” in the list of criteria used for determining a replacement schedule for pipelines (along with importance, age, type of construction material, size, condition, and maintenance or repair history). (INFR-b-3) - Engineering and Construction; Wastewater
- Install specially-engineered pipelines in areas subject to faulting, liquefaction, earthquake-induced landsliding, or other earthquake hazard. (INFR-b-4) - Engineering and Construction; Wastewater
- Replace or retrofit water-retention structures that are determined to be structurally deficient, including levees, dams, reservoirs and tanks. (INFR-b-5) - Engineering and Construction; Wastewater
- Install portable facilities (such as hoses, pumps, emergency generators, or other equipment) to allow pipelines to bypass failure zones such as fault rupture areas, areas of liquefaction, and other ground failure areas (using a priority scheme if funds are not available for installation at all needed locations). (INFR-b-6) - Operations and Maintenance; Engineering and Construction; Wastewater
- Ensure a reliable source of water for fire suppression (meeting acceptable standards for minimum volume and duration of flow) for existing and new development. (INFR-c-1) - Engineering and Construction; Operations and Maintenance
- Maintain fire roads and/or public right-of-way roads and keep them passable at all times. (INFR-c-8) - Operations and Maintenance; Engineering and Construction, Water and Natural Resources
- Conduct a watershed analysis of runoff and drainage systems to predict areas of insufficient capacity in the storm drain and natural creek system. (INFR-d-1) - Operations and Maintenance; Engineering and Construction
- Pursue funding for the design and construction of storm drainage projects to protect vulnerable properties, including property acquisitions, upstream storage such as detention basins, and channel widening with the associated right-of-way acquisitions, relocations, and environmental mitigations. (INFR-d-5) - Engineering and Construction, Operations and Maintenance
- Continue to repair and make structural improvements to storm drains, pipelines, and/or channels to enable them to perform to their design capacity in handling water flows as part of regular maintenance activities. (This strategy has the secondary benefit of addressing fuel, chemical, and cleaning product issues.) (INFR-d-6) - Agency-wide
- Continue maintenance efforts to keep storm drains and creeks free of obstructions, while retaining vegetation in the channel (as appropriate) to allow for the free flow of water. (INFR-d-7) - Operations and Maintenance; Water and Natural Resources
- Enforce provisions under creek protection, stormwater management, and discharge control ordinances designed to keep watercourses free of obstructions and to protect drainage facilities to conform with the Regional Water Quality Control Board's Best Management Practices. (INFR-d-8) - Operations and Maintenance; Engineering and Construction; Wastewater
- Develop an approach and locations for various watercourse bank protection strategies, including for example, (1) an assessment of banks to inventory areas that appear prone to failure, (2) bank stabilization, including installation of rip rap, or whatever regulatory



agencies allow (3) stream bed depth management using dredging, and (4) removal of out-of-date coffer dams in rivers and tributary streams. (INFR-d-9) - Operations and Maintenance, and Wastewater, with Water and Natural Resources

- Provide or support the mechanism to expedite the repair or replacement of levees that are vulnerable to collapse from earthquake-induced shaking or liquefaction, rodents, and other concerns, particularly those protecting critical infrastructure. (INFR-d-12) - Operations and Maintenance
- Work cooperatively with water agencies, flood control districts, Caltrans, and local transportation agencies to determine appropriate performance criteria for watershed analysis. (INFR-d-15) - Water and Natural Resources
- Improve monitoring of creek and watercourse flows to predict potential for flooding downstream by working cooperatively with land owners and the cities and counties in the watershed. (INFR-d-17) - Engineering and Construction; Water and Natural Resources
- Using criteria developed by EPA for asset management, inventory existing assets, the condition of those assets, and improvements needed to protect and maintain those assets. Capture this information in a Geographic Information System (GIS) and use it to select locations for creek monitoring gauges. (INFR-d-18) - Information Systems

- Develop and implement a program to control invasive and exotic species that contribute to fire and flooding hazards (such as eucalyptus, cattails, and cordgrass). This program could include vegetation removal, thinning, or replacement in hazard areas where there is a direct threat to structures. (ENVI-a-12) - Operations and Maintenance; Water and Natural Resources
- Enforce provisions under creek protection, stormwater management, and discharge control ordinances designed to keep watercourses free of obstructions and to protect drainage facilities to conform with the Regional Water Quality Control Board's Best Management Practices. (ENVI-a-13) - Operations and Maintenance, Water and Natural Resources, Wastewater
- Inventory global warming emissions in your own local government's operations and in the community, set reduction targets and create an action plan. (ENVI-b-2) - Operations and Maintenance
- Increase the use of clean, alternative energy by, for example, investing in “green tags”, advocating for the development of renewable energy resources, recovering landfill methane for energy production, and supporting the use of waste to energy technology. (ENVI-b-5) - Operations and Maintenance; Wastewater
- Make energy efficiency a priority through building code improvements, retrofitting city facilities with energy efficient lighting and urging employees to conserve energy and save money. (ENVI-b-6) - Agency-wide
- Purchase only Energy Star equipment and appliances for local government use. (ENVI-b-7) - Agency-wide
- Practice and promote sustainable building practices using the U.S. Green Building Council's LEED program or a similar system. (ENVI-b-8) - Agency-wide
- Increase the average fuel efficiency of municipal fleet vehicles; reduce the number of vehicles; launch an employee education program including anti-idling messages; convert diesel vehicles to bio-diesel. (ENVI-b-9) - Operations and Maintenance; Wastewater

- Evaluate opportunities to increase pump efficiency in water and wastewater systems; recover wastewater treatment methane for energy production. (ENVI-b-10) - Engineering and Construction; Operations and Maintenance; Wastewater
- Increase recycling rates in local government operations and in the community. (ENVI-b-11) - Wastewater
- Maintain healthy urban forests; promote tree planting to increase shading and to absorb CO₂. (ENVI-b-12) - Water and Natural Resources

Incorporation into Existing Planning Mechanisms

The District has used, and will continue to use, a variety of project-specific mechanisms to ensure that the projects and mitigation strategies identified as existing or having relatively high priorities in this LHMP Annex are implemented.

As shown in the following list of mitigation strategies, most of EBMUD's specific mitigation strategies and priorities are being implemented as part of the Water and Wastewater Capital Improvement Programs. In addition, the strategies are being implemented throughout the District organization. The information in this Annex, including the goals, objectives, and strategies identified, will be incorporated into the District's Capital Improvement Program for prioritizing capital improvements of the District's infrastructure. For example, this Annex supports the need for these mitigation projects as integral to the mission of EBMUD, while the Capital Improvement Plan is the funding mechanism for processing the request. EBMUD is also looking at ways to apply for grants for hazard mitigation priorities identified in the Seismic Improvement Program and Aqueduct Security Program. Specific mitigation strategies are typically the responsibility of EBMUD's Engineering and Construction, Operations and Maintenance, and Wastewater departments, as specified for the individual strategies in the attached Mitigation Strategy Spreadsheet.

This Annex will be made available to Alameda and Contra Costa counties, and cities within those counties for their use in General Plan Safety Element, as appropriate.

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

There are no other planning mechanisms available to District that are appropriate to incorporate this LHMP Annex.

The final strategies and Annex were adopted in the same resolution adopting the overall LHMP by the District Board.

Ongoing integration of the policies and programs identified in this Local Hazard Mitigation Plan will be monitored by District executive management.

Plan Update Process

As required Disaster Mitigation Act of 2000, the East Bay Municipal Utility District will update this plan annex at least once every five years, by participating in a multi-agency effort with ABAG and other agencies to develop a multi-jurisdictional plan.

The Manager of Security and Emergency Preparedness of the District will ensure that monitoring of this Annex will occur. The plan will be monitored on an on-going basis. However, the major disasters affecting our District, legal changes, notices from ABAG as the lead agency in this process, and other triggers will be used. For example, if a structural engineering evaluation shows that a major risk exists at more facilities based on data collected from a future earthquake, the priority associated with upgrading those facilities will be re-evaluated. Finally, the Annex will be a discussion item on the agenda of the meeting of Department leaders at least once a year. At that meeting, the department heads will focus on evaluating the Annex in light of technological and political changes during the past year or other significant events. The Department leaders will be responsible for determining if the plan should be updated.

The District is committed to reviewing and updating this plan annex at least once every five years, as required by the Disaster Mitigation Act of 2000. The Manager of Security and Emergency Preparedness of the District will contact ABAG four years after this plan is approved to ensure that ABAG plans to undertake the plan update process. If so, the District again plans to participate in the multi-jurisdictional plan. If ABAG is unwilling or unable to act as the lead agency in the multi-jurisdictional effort, other agencies will be contacted, including the Contra Costa and Alameda counties' Offices of Emergency Services. Counties should then work together to identify another regional forum for developing a multi-jurisdictional plan.

The District is committed to public participation. All EBMUD Board meetings are open to the public and the public is invited to comment on items on the Board Agenda. The public will continue to be involved whenever the plan is updated and as appropriate during the monitoring and evaluation process. Prior to adoption of updates, the District will provide the opportunity for the public to comment on the updates. A public notice will be posted prior to the meeting to announce the comment period and meeting logistics. The District is committed to improving public participation in the update process over the next five years. To improve this process, EBMUD will consider writing letters to the editor of local newspapers in its service area, publishing articles on this subject in its customer newsletter, and/or instituting additional innovative mechanisms to promote wider public knowledge of the issues related to disaster mitigation and the planning process.

Mitigation Plan Point of Contact

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Exhibit A - EBMUD Water Supply System Map

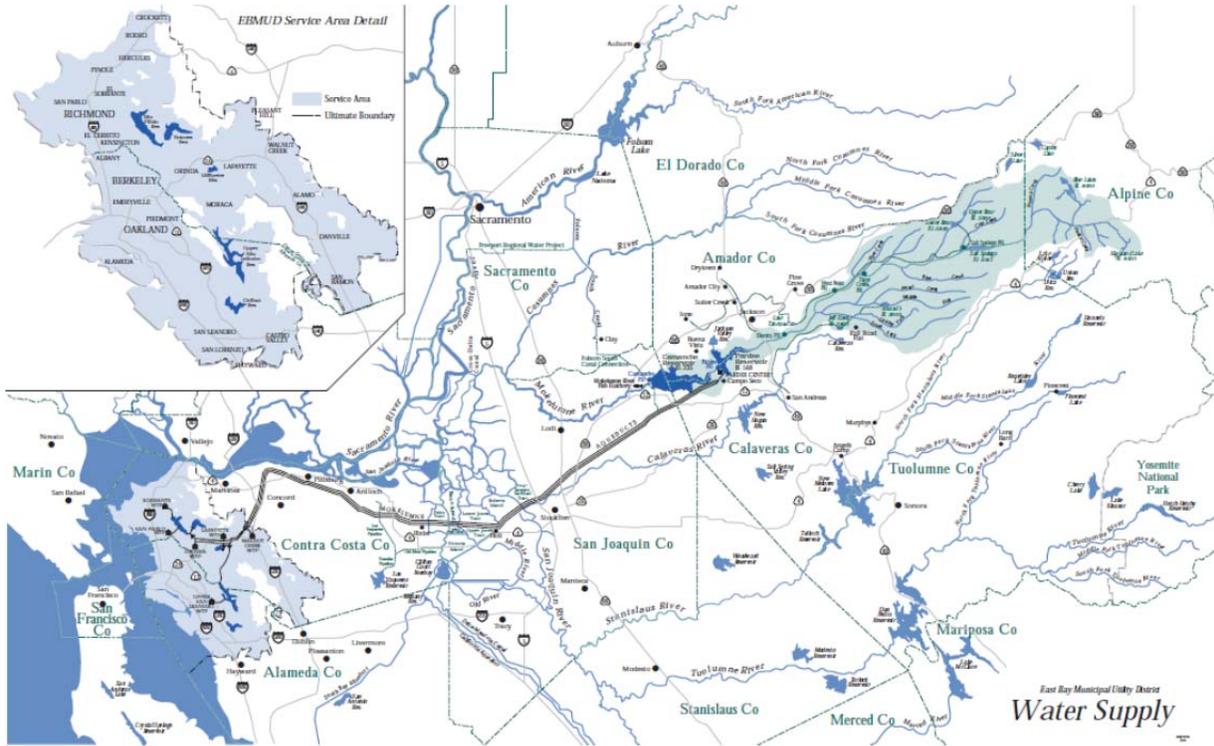
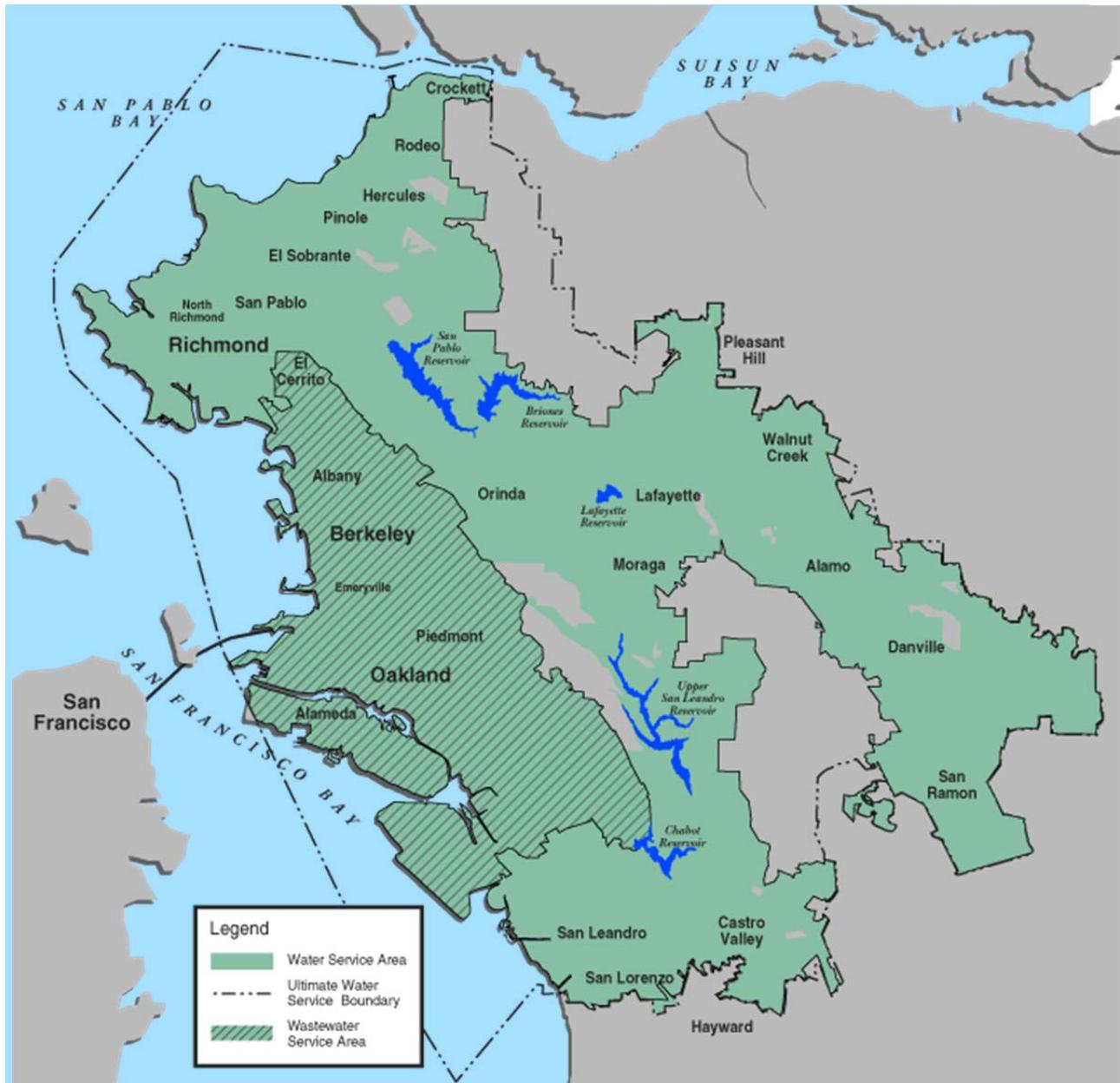


Exhibit B - Map of EBMUD Water and Wastewater Service Area



EBMUD’s water system services approximately 1.3 million people in a 331-square-mile area extending from Crockett on the north, southward to San Lorenzo (encompassing the major cities of Oakland and Berkeley), eastward from San Francisco to Walnut Creek, and south through the San Ramon Valley. EBMUD’s wastewater system serves approximately 650,000 people in an 88-square-mile area of Alameda and Contra Costa counties along the Bay’s east shore, extending from Richmond on the north, southward to San Leandro.

Exhibit C - EBMUD Mitigation Strategy Spreadsheet

[Available on LHMP CD or at <http://www.abag.ca.gov/bayarea/eqmaps/mitigation/strategy.html>]