Earthquake Readiness

Protecting Life Safety and Public Health

The San Francisco Bay Area has more ground movement along tectonic plates than any other urban area in the United States. Earthquakes can temporarily disrupt water and sewer service. Reliable water supplies are essential to both the routine of daily lives and the health of the regional economy. EBMUD continuously works to protect public health and safety from water service disruptions by strengthening facilities and practicing strategies for quickly recovering water and wastewater services after a major earthquake.

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There are several major earthquake faults that intersect or are located near the EBMUD service area. The most significant seismic risk to the East Bay, the Hayward Fault, crosses major water distribution facilities. Additional seismic risks threaten EBMUD's water transmission lines in the Delta. There also is a smaller risk of damage to EBMUD water supply and flood control reservoirs located in the central Sierra.

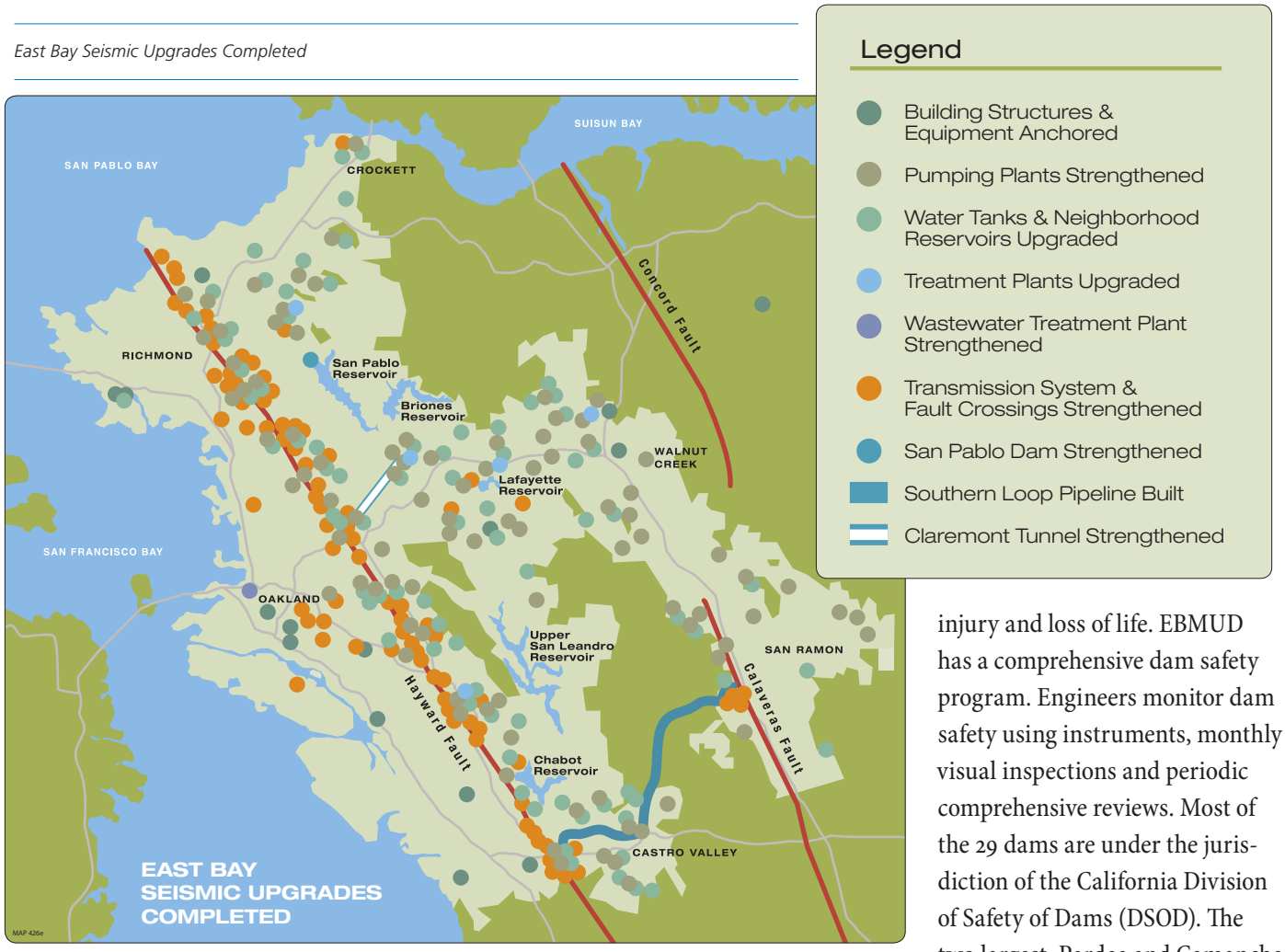
EBMUD is internationally recognized for its proactive seismic improvement program. Since the last major quake that hit the Bay Area, the Loma Prieta in 1989, EBMUD has invested more than $350 million in seismic safety. EBMUD was the first United States water utility to comprehensively retrofit its service area facilities. In the Delta, EBMUD has strengthened the most vulnerable sections of water transmission lines. Sierra reservoirs were studied; those facilities are prepared to withstand anticipated seismic risks.

EBMUD's seismic programs focus on life safety, public health and secure water service. The work will restore partial water service within 30 days following a large earthquake, and emergency planning will assure temporary supplies to neighborhoods in the interim.

EBMUD's comprehensive seismic safety program is funded primarily by bonds that are being repaid through a seismic surcharge on the water bill. The surcharge is just over a dollar a month for single-family residential homes. Without these investments, the prolonged water service interruption following a major earthquake could have had a financial impact in the EBMUD service area as great as $3 billion, including business-related losses.

To ensure essential water delivery for 800,000 customers, EBMUD built an earthquake-ready bypass around the most vulnerable portion of the Claremont Tunnel, a massive water pipe crossing the Hayward Fault.

East Bay Seismic Upgrades Completed



Local Seismic Safety

Shortly after the Loma Prieta earthquake, EBMUD reviewed its entire water distribution network, including the major transmission pipes critical to water delivery, 4,100 miles of distribution system pipes, 140 pumping plants, 170 neighborhood reservoirs (tanks storing treated drinking water), and five treatment plants.

EBMUD created a bypass for the Claremont Tunnel, the water transmission pipe that crosses the Hayward Fault Zone to bring water to approximately 800,000 customers, and an alternate transmission route at the southern end of the service area. More than 300 critical facilities were upgraded and retrofitted to better survive earthquakes (see map). Many of the upgrades used new technology such as flexible joints and flexible hoses that will minimize pipe ruptures and make it easier to reroute water around broken pipes.

EBMUD also studied how the Hayward Fault could affect wastewater infrastructure and made structural improvements to reduce the possibility of significant damage to critical facilities at the wastewater treatment plant located in Oakland at the foot of the Bay Bridge.

Dam Safety

EBMUD manages 29 dams that store water for customers. Dam failure can result in property damage, personal injury and loss of life. EBMUD has a comprehensive dam safety program. Engineers monitor dam safety using instruments, monthly visual inspections and periodic comprehensive reviews. Most of the 29 dams are under the jurisdiction of the California Division of Safety of Dams (DSOD). The two largest, Pardee and Camanche, also are under Federal Energy Regulatory Commission jurisdiction because they produce hydropower. EBMUD's monitoring is supplemented by independent annual inspections by these regulatory agencies.

EBMUD's main water supply comes from Pardee Reservoir in the central Sierra. South of Pardee is Camanche Reservoir, which stores water for flood control and for downstream users. Seismic studies completed in 2008 showed these dams need no seismic improvements at this time.

In the East Bay, water is held in five local water supply reservoirs and 22 reservoirs that were built by constructing earthen

dams. These open-cut reservoirs have dams that range from 10 feet to 360 feet tall and were built from the late 1800s to the late 1960s. Upgrades are made when studies show they are needed. EBMUD seismically retrofitted San Pablo Reservoir's dam, located in El Sobrante, in 2010. Work to retrofit Chabot Reservoir's dam in Castro Valley will start by 2015. The dams at Lafayette Reservoir and Upper San Leandro Reservoir are seismically adequate, although their outlet towers may require upgrades (EBMUD is working with DSOD to identify appropriate measures). Briones, located in Orinda, has no seismic issues.

Over time, water tanks will replace some open-cut reservoirs to improve water quality and reduce maintenance costs. In 2011, water tank installment projects are underway at Berryman Reservoir (Berkeley), Estates Reservoir (Oakland), Schapiro Reservoir (El Sobrante), South Reservoir (Castro Valley) and Summit Reservoir (Berkeley and Kensington).

Delta Crossings Safety

EBMUD has three aqueducts that move water supplies across the Delta to the East Bay. In the Delta, the aqueducts cross levees constructed in the late 1800s that are prone to failure during seismic and flood events. The aqueducts are buried for most of their length, which provides some protection. However, for about ten miles the aqueducts are above-ground, supported on timber, reinforced concrete or steel as they cross Delta islands.

Local reservoirs store six months worth of water supplies. Seismic improvements ensure water can be moved through the aqueducts to replenish local supplies within six months after a major earthquake. For the largest capacity and most frequently used aqueduct, EBMUD strengthened levees at aqueduct crossings and pipe foundations at river crossings, reinforced pipe joints on buried portions of the pipe, and strengthened pipe support structures on elevated portions of the aqueduct. On two of the aqueducts, EBMUD reinforced elevated sections by replacing bolts with stronger ones that can better withstand movement.

EBMUD is now designing aqueduct interconnections. The connections will create bypasses around damaged aqueduct segments after a levee failure or earthquake, so EBMUD can continue delivering water until permanent repairs are made. This work is being funded by a $10 million grant from the California Department of Water Resources.

Continuous Improvement

EBMUD routinely tracks and analyzes progress in geotechnical, structural and earthquake engineering that follows all major earthquakes internationally. The safety of each dam and key structure is reevaluated with each advance, and lessons learned are incorporated into EBMUD plans for improving and strengthening the water and wastewater systems.

Safety Through Emergency Preparedness

Robust emergency plans protect lives and ensure an orderly approach to disaster recovery. EBMUD prepares for emergencies by proactively monitoring and improving its facilities, conducting emergency training exercises, maintaining business continuity plans to recover critical functions quickly and coordinating emergency preparedness with other agencies.

Over the last decade, EBMUD's water system has been connected to those of other water providers, which allows water to be moved around the Bay Area to where it is needed in emergencies. The interties connect EBMUD's system to those of the San Francisco Public Utility Commission to the west and south, the Dublin San Ramon Services District to the east and south, and the Contra Costa Water District to the east and north.

After a major earthquake, cities and counties plan to establish centrally located water distribution sites. Some customers may be without water service at their residence for weeks or months. EBMUD will be working with the cities and counties to support their disaster recovery efforts, while focusing on infrastructure repairs so water service can be restored as quickly as possible.

EBMUD has a proud history of providing high-quality drinking water for 1.3 million customers in Alameda and Contra Costa counties. The District's award-winning wastewater treatment protects San Francisco Bay and serves 650,000 customers.

East Bay Municipal Utility District

Toll Free: 1-866-40-EBMUD
www.ebmud.com

Are *You* Earthquake-Ready?

After an earthquake, temporary water and sewer system outages may be unavoidable. Take some simple steps to be prepared.

STORE ENOUGH TAP WATER OR BOTTLED WATER TO LAST THREE TO SEVEN DAYS.

You'll want one to two gallons per person per day of water. Store tap water in clean, airtight food-grade plastic containers and keep it in a dark, cool place. Do not store tap water in used milk containers or in glass. Label each container with the date it was stored and replace your containers every six months.

BE PREPARED TO DISINFECT ADDITIONAL WATER SUPPLIES TO SUPPLEMENT WHAT YOU STORE.

Your emergency/disaster supplies should include a heat source, such as a camping stove, plus a clean pot, measuring spoons or a clean medicine dropper, and a sealed bottle of regular, unscented liquid bleach with no additives. Replace your bottle of bleach every six months.

DISINFECT ANY QUESTIONABLE WATER SUPPLIES.

Properly stored water is safe to drink. Disinfect your stored water if the container is leaking or was not sealed airtight, it has been stored longer than six months, has an unusual odor, or you have other concerns about its safety. Boiling is the preferred method to disinfect water. If you have no power, use a camp stove to disinfect water by boiling it for at least two minutes after it reaches a vigorous rolling boil. If boiling is not possible, add a measured ¼ teaspoon or 16 drops of bleach to each gallon of water and then let stand 30 minutes. A slight chlorine taste and smell is normal.

RESERVE STORED WATER FOR DRINKING AND FOOD PREPARATION.

Depending on the severity of damage following a quake, it may be difficult for public agencies to get emergency water supply distribution locations up and running quickly. Avoid using your personal emergency drinking water supply for washing and cleaning. If you run out of stored drinking water, you can strain and treat water from your water heater. To strain, pour the water through a clean cloth or layers of paper towels. Then disinfect the water as described above. Consider using water from the toilet tank (not the bowl, and do not use water from the tank if it has a blue dye or other cleaner) or perhaps a pool or other outdoor water source for washing and cleaning purposes.

BE PREPARED WITH A SANITATION KIT FOR AN OUTAGE THAT COULD PREVENT TOILETS FROM FLUSHING.

Your kit should include toilet paper, wipes and hand sanitizers, plastic garbage bags, a bucket, and a deodorizing chemical such as lime, bleach, or chemicals sold for camping.

For more information about emergency preparedness, go to www.redcross.org/prepare or www.ready.gov.

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