East Bay Municipal Utility District

2024 Climate Action Plan Update

EBMUD

Contents

EBMUD – the Next 100 Years

In 2023, the East Bay Municipal Utility District (EBMUD) celebrated its 100-year anniversary. Since its founding in 1923, EBMUD has grown to an organization that provides clean water to over 1.4 million people in 35 cities and communities in Alameda and Contra Costa Counties, and a wastewater treatment system that protects San Francisco Bay and serves 740,000 customers. EBMUD manages 50,000 acres of habitat in the East Bay and Sierra foothills and supports an important fishery on the Mokelumne River.

In its first hundred years, EBMUD faced numerous challenges – two pandemics, a World War, the Great Depression, and the Great Recession. The population of the East Bay has grown and changed over the past century, as have regulatory requirements and public expectations. The organization is also keenly aware of issues around diversity, equity, and access. Increasingly stringent regulations and required infrastructure renewal add costs to our water and wastewater services, at a time when many customers struggle to pay their bills.

Figure 1. Oakland skyline with the San Francisco Bay in the background.

Perhaps the most significant challenge facing EBMUD – and the planet – is the threat of climate change. The increasing release of greenhouse gases (GHG) has led to changes in the Earth's climate that are already manifesting and are likely to become more severe.

The purpose of this Climate Action Plan (Plan) is to document all EBMUD's activities related to climate change and highlight our most significant near-term efforts that will help meet EBMUD's emissions goal. A more aggressive goal – to be carbon neutral by 20230 - was adopted by the Board in 2023. This Plan includes ***mitigation*** actions to reduce EBMUD's GHG emissions, as well as ***adaptation*** plans to deal with the inevitable changing conditions in ways that ensure ***resilience*** for our services over time.

Climate change is expected to impact all aspects of EBMUD's business, and this Plan documents EBMUD's strategies to adapt and mitigate these impacts. Table 1 shows a list of potential impacts and EBMUD's responses:

Table 1. Likely Climate Change Impacts and EBMUD Responses

Climate Change Impact	EBMUD Response
More frequent and severe droughts that reduce the reliability of existing supplies	• Development of a diversified water supply portfolio • Reservoir re-operation • Water rights protection

	• Water conservation • Water recycling
Warmer, drier conditions that affect watershed lands and waters	• Fisheries and wildlife management • Forest restoration and fuel reduction in EBMUD watersheds
Potential impacts to water quality from wildfires or algal blooms	• Upgrades to WTPs • MWWTP upgrades to reduce nutrient loading to San Francisco Bay
Extreme wet weather impacts on sewers	• Rehabilitation of public and private collection system infrastructure
Sea level rise	• Upgrades and planning at MWWTP • Corrosion control to protect distribution pipelines
Increased risk of wildfire leading to power shutoffs	• MWWTP Electrical Resiliency Master Plan and backup power generation
Increased risk of flooding from extreme precipitation events, rapid snowmelt, or rain on snow events	• Mokelumne Aqueduct Resiliency Project • Dam Safety Program
New fleet regulations	• Development of Zero Emission Vehicle charging infrastructure at EBMUD facilities
Impacts on long-term financial stability	• Drought surcharges • Green bonds • Investment policies • Cross-sector collaboration
Emergency situations (e.g., wildfire, extreme heat events)	• Emergency Operations Plan and Business Continuity Plan
Disproportionate impacts on disadvantaged communities	• Customer Assistance Program • DEI Strategic Plan
Heat events and wildfire smoke that affect worker safety	• EBMUD Required Safety Practices 4300 (Heat Illness Prevention) and 5900 (Wildfire Smoke Protection)
Need for a skilled workforce to address challenges of climate change and implement programs	• Workforce development

Some important near-terms actions include:

- Continue transitioning EBMUD's fleet to zero emissions vehicles
- Continue implementing nutrient removal at the Main Wastewater Treatment Plant
- Complete the Electrical Resilience Plan for the wastewater system
- Update the Recycled Water Strategic Plan
- Implementation of the "Making Conservation a California Way of Life" framework
- Upgrades to the Water Treatment Plants (WTPs) to provide more resilience
- Establishment of an "Office of Innovation" within EBMUD to address the climate challenge

Climate change affects every aspect of EBMUD's work: from the resilience of our water supply to the health of the watershed lands we manage, to our financial stability, and the development of our workforce. It also affects how we engage with the communities in our service area. We are acutely aware that climate change will likely have disproportionate impacts on disadvantaged communities.

The activities, research, and partnerships outlined in this Plan will help EBMUD to be resilient in the face of a changing climate. As we look back on our first century, it is heartening to think of the courage of our predecessors as they faced their own many and varied challenges. May the same commitments to innovation and public service guide us into the next hundred years.

1 Introduction

1.1 Purpose

EBMUD has a long history of studying, planning for, mitigating, and adapting to climate change. EBMUD incorporated climate change actions into its Strategic Plan in 2008. Over the years since, EBMUD has published numerous studies and plans related to climate change mitigation and adaptation, including:

- Climate Change: Charting a Water Course in an Uncertain Future (2008, published in the Journal of the American Water Works Association)
- Climate Change Vulnerability Assessments: A Review of Water Utility Practices, Office of Water, Environmental Protection Agency (EPA, 2010)
- Climate Change Vulnerability Assessments: Four Case Studies of Water Utility Practices, EPA (2011)
- Climate Change Monitoring and Response Plan (2008, 2010, 2011, 2014)
- Wastewater Climate Change Plan (2020)
- Climate Action Plan (2021)

In addition, EBMUD participated in the EPA's Climate Ready Water Utilities Working Group, which led to the development of the EPA's Climate Resilience Evaluation and Awareness Tool (CREAT). In 2023, the Board updated its Energy Policy (Policy 7.07) to be carbon neutral for GHG emissions from *both* the water and wastewater systems by 2030. Previously, the 2030 goal had only applied to the water system, and this update accelerated the goal or the wastewater system by a decade. The purpose of the 2024 Plan is to centralize information on EBMUD's activities related to climate change, covering EBMUD's water and wastewater systems as well as its natural resources management.

Chapter 1 provides an introduction to EBMUD's policies related to climate change and describes notable accomplishments. Chapter 2 summarizes the state of the science, providing a high-level overview of findings from the Intergovernmental Panel on Climate Changes (IPCC) Sixth Synthesis Report and other recent reports. Chapter 3 discusses EBMUD's efforts to reduce its own GHG emissions. Chapter 4 covers EBMUD's plans to adapt to climate change, organized according to EBMUD's six Strategic Plan goals. Chapter 5 discusses collaboration and community participation, including EBMUD's involvement in research. Lastly. Chapter 6 presents a "call to action" and summarizes key near-term actions.

1.2 EBMUD Policies

Important drivers of this Plan are several EBMUD Policies, adopted by its Board of Directors, that provide guidance related to climate change, energy use, and sustainability and resilience. Progressive leadership by the State of California and the Biden Administration greatly facilitates implementation of EBMUD policies. These policies create a framework for EBMUD's development of programs to mitigate and adapt to climate change.

First, Policy 7.05, "Sustainability and Resilience," describes EBMUD's approach to those topics at a high level. It sets the agency's intention to provide services "through sustainable and resilient planning, design, and construction, operations, maintenance, rehabilitation, and disposal activities that manage

long-term economic, environmental, and human resource benefits, with the goal of attaining equitable outcomes for the communities served by the District." The Policy goes on to outline how EBMUD will consider the triple bottom line – environmental, social, and economic impacts – in its decision making.

The Policy also includes a statement on Environmental Justice, committing EBMUD to conducting business "in a manner that that promotes equity and affords fair treatment, accessibility, and protection for all people, regardless of race, age, culture, income, or geographic location."

Policy 7.15, "Climate Action," refines the commitment to sustainability and resilience with a specific focus on climate change, stating that it is EBMUD's policy to "consider the impacts of climate change and take appropriate action to understand, mitigate and adapt to those impacts through sustainable activities that manage long-term economic, environmental and human resource benefits." Through this Policy EBMUD recognizes that climate change will have impacts worldwide, with potentially disproportionate impacts on historically marginalized populations, and acknowledges that rising sea levels, reduced snowpack, increased climate variability, and impacts to ecosystems will impact water and wastewater service.

Lastly, EBMUD's Energy Policy (Policy 7.07) provides guidance for many of the mitigation activities described in Chapter 3. It promotes energy efficiency, minimized reliance on fossil fuels, diversification of energy sources, and reducing energy costs. The Energy Policy was updated in 2023 to set a goal (discussed in more detail in Section 3.2) of reducing EBMUD's GHG emissions to achieve carbon neutrality by 2030.

1.3 Accomplishments

EBMUD has already made significant strides in its response to climate change, both in mitigation and adaptation.

In terms of mitigation, EBMUD has constructed and operates numerous renewable energy projects. These include hydropower plants at Camanche and Pardee dams, and eleven photovoltaic (PV) projects at EBMUD facilities. Three additional PV projects are under construction, including a 5 megawatt facility in Orinda expected to be online in early 2024. In 2012, EBMUD's MWWTP in Oakland became the first wastewater treatment plant in North America to produce more energy than it uses through an innovative Resource Recovery program. The plant accepts a variety of organic wastes, including food scraps and grease from local restaurants, winery wastes, and poultry farm wastes; these materials are processed in the plant's digesters to produce biogas that is then used to generate renewable energy. In total, EBMUD's biogas and hydropower facilities produce enough energy for all the water and wastewater operations. EBMUD has also taken steps to "green" its vehicle fleet. It converted all fleet vehicles to hybrid or electric and switched to renewable diesel.

The diversification of EBMUD's water supply portfolio is an important component of its long-term water supply resilience. EBMUD's recycled water program currently has capacity to provide 9 million gallons per day (MGD) of recycled water to irrigation, industrial, and commercial customers. EBMUD has also invested significantly in conservation to help reduce water demand and respond to droughts; from 1994 to 2018, EBMUD's customers achieved 46 MGD of water conservation.

Increasing water storage will become increasingly important as climate change leads to more extreme weather events. EBMUD's pilot groundwater banking projects in San Joaquin County, the Demonstration Recharge, Extraction and Aquifer Management – or DREAM Project – allows for the storage of wet year water supplies in local groundwater aquifers that can then be extracted in dry years and conveyed to EBMUD customers. The DREAM Pilot Project reached a significant milestone in 2023 when EBMUD extracted banked groundwater for the first time.

EBMUD has also invested in upgrading its WTPs to ensure water quality and treat drought supplies from the Sacramento River. Recently EBMUD completed $58 million in ozone treatment system upgrades.

Recognizing that rising sea level could impact sewer pipes by raising groundwater levels, EBMUD is rehabilitating its sewer mains. EBMUD invested $17 million to rehabilitate over 5,280 feet of its nine-foot diameter 3rd Street Interceptor in Oakland.

EBMUD has also made significant achievements in protecting the ecosystems and watersheds it manages. Since 1998, EBMUD has worked with its Joint Settlement Agreement partners to improve fish returns on the Mokelumne River by meeting instream flow requirements, investing in habitat restoration, and managing Pardee and Camanche reservoirs to maintain cold water pool. As a result, the Mokelumne River is the only river in California that is currently at or near the salmon doubling goal set by the Central Valley Project Improvement Act. Although the Mokelumne River contributes only 2.5% of total Delta outflow, it accounted for 19% of commercial and 22% of recreational total California off-coast catch over the past ten years.

On the watershed, EBMUD partners with other local agencies to conduct regular fuel reduction activities to reduce the risk of wildfire. The Upper Mokelumne River Watershed Authority (UMRWA), of which EBMUD is a member, has received $11.4 million in funding from Cal Fire for forest restoration work in the upper Mokelumne River watershed.

2 State of the Science

The scientific consensus is that climate change is occurring, and that it is caused by human activity. The main uncertainties revolve around the *pace* of global warming and whether and to what extent it can be slowed or reversed. In addition, taking high level climate models and applying them to specific geographic areas (like the EBMUD service area or upcountry watershed) comes with its own uncertainty.

The Paris Agreement was adopted at the United Nations Climate Change Conference in 2015. The agreement's overarching goal was to hold the increase in global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels. To achieve this goal, GHG emissions need to peak before 2025 at the latest and decrease by 43 percent by 2030.

The following is a discussion of several recent reports from national and international institutions that document the best available science regarding climate change and its impacts. Sections 2.4 and 2.5 discuss the impacts of climate change to EBMUD, including current observations and EBMUD's own forecast of potential climate change impacts.

2.1 IPCC 6th Synthesis Report

The Intergovernmental Panel on Climate Change (IPCC) released its 6th Assessment Report (AR6) Synthesis Report in March 2023, an 8-year effort that synthesized the findings and reports of three working groups: 1) Physical Science Basis; 2) Impacts, Adaptation, and Vulnerabilities; and 3) Mitigation of Climate Change. The AR6 provided updated scientific findings and recommendations since the AR5 was released in 2014.

Among the most significant findings, the AR6 Synthesis Report identified that human activities have "unequivocally" caused global warming, with global surface temperatures reaching 1.1°C above 1850–1900 levels in 2011–2020, and likely to reach 1.5°C in the near term. GHG emissions in 2020 as forecasted make it "likely that warming will exceed 1.5°C during the 21st century and make it harder to limit warning below 2°C."

The AR6 reported that net zero CO_2 emissions are required to limited global warming. The cumulative carbon emissions before net zero is reached, and the level of GHG emissions this decade, will largely determine whether the warming can be limited to 1.5°C or 2°C.

The AR6 described widespread impacts to the atmosphere, ocean, cryosphere, and biosphere with resulting adverse impacts on nature and people, with vulnerable communities disproportionately impacted. Some of these changes are irreversible, and abrupt changes due to tipping points (like rapid Antarctic ice sheet melt and forest dieback) are possible. The severity of climate related risks identified in AR6 was higher than was assessed in AR5. Additionally, one change in AR6 was the explicit linking of climate change to increasingly severe extreme weather like heat events, droughts, and heavy precipitation events.

For near term responses, the AR6 cited the need for "near-term integrated climate action with adaptation and mitigation and increased international cooperation." Mitigation and adaptation across all

sectors are needed. The AR6 stressed the importance of prioritizing equity, climate justice, social justice, inclusion, and just transition processes.

2.2 Federal Climate Assessment

At the federal level, the Global Change Research Act of 1990 mandated that the US Global Change Research Program deliver a report to Congress and the President every four years. The Fifth national Climate Assessment (NCA5) was released in November 2023.

Compared to the previous assessment (the NCA4), the NCA5 showed reduced uncertainty regarding the potential impacts of climate change based on new observations and improved modeling. The Report found that the estimated range of global warming expected from a doubling of CO_2 in the atmosphere was between 2.5° to 4.0° C.

The NCA5 also attempted to quantify the costs of climate change and the benefits of action. It estimated that each metric ton of CO_2 reduction brings health benefits to the U.S. valued between $8 to $430. These health benefits outweigh the costs of many GHG mitigation measures; currently, carbon offsets can be purchased for as little as $5 - $50 per metric ton of CO_2 depending on the standard used to classify the offset and co-benefits of the project.

The NCA5 included more information on the disproportionate impacts of climate change on disadvantaged communities, particularly people of color, indigenous people, sexual and gender minorities, and people with disabilities. The report included more discussion on how social sciences are increasing understanding of how people experience climate change, and it discussed indigenous knowledge and provides more examples of adaptation practices like green infrastructure and nature-based solutions.

Similar to the AR6, the NCA5 showed greater confidence in the link between climate change and severe weather events. The NCA5 found that climate change will continue to cause profound changes to the water cycle, with heavier rainfall events expected to increase, warmer temperatures leading to increased evaporation and plant water use, and decreased snow cover and earlier melt. It noted that increasing aridity, declining groundwater levels, declining snow cover, and drought threaten freshwater supplies. Impacts to the ecosystem were also described, such as species change and biodiversity loss.

2.3 Recent Observations of Climate Change at EBMUD

Recent trends of alternating extremes of drought conditions and precipitation events are the most obvious indicators of climate change in California and at EBMUD. There is also evidence of climate change impacts such as extreme heat events and increased wildfire in EBMUD watersheds, though there is not sufficient data to *definitively* link these events to climate change.

Climate change is also increasing water supply variability. Figure 2 shows the Mokelumne River historic water supply variability, and the recent whiplash between the drought cycle of 2012-2015 to the maximum Mokelumne watershed flow in 2017. This was followed by return to drought conditions in 2020, with the driest January through June on record occurring in 2022. High precipitation in water year 2023 – which led to flooding in some parts of the State – ended the most recent drought.

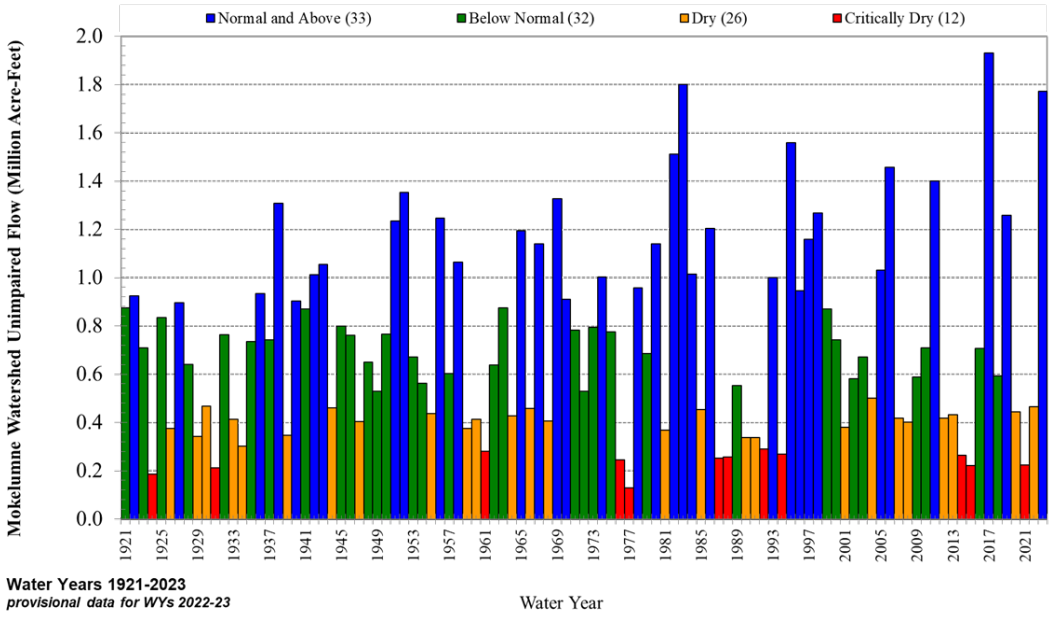


Figure 2. Mokelumne River Historic Water Supply Variability.

Climate scientists have also predicted that climate change could lead to changes in the snow water content (SWC) of Sierra snowpack and the timing of spring runoff. This could impact EBMUD's water supply by decreasing runoff or shifting it to earlier in the year. Figure 3 shows the April to July Mokelumne River flows as a fraction of the total water year. The trendline in Figure 3 suggests that over

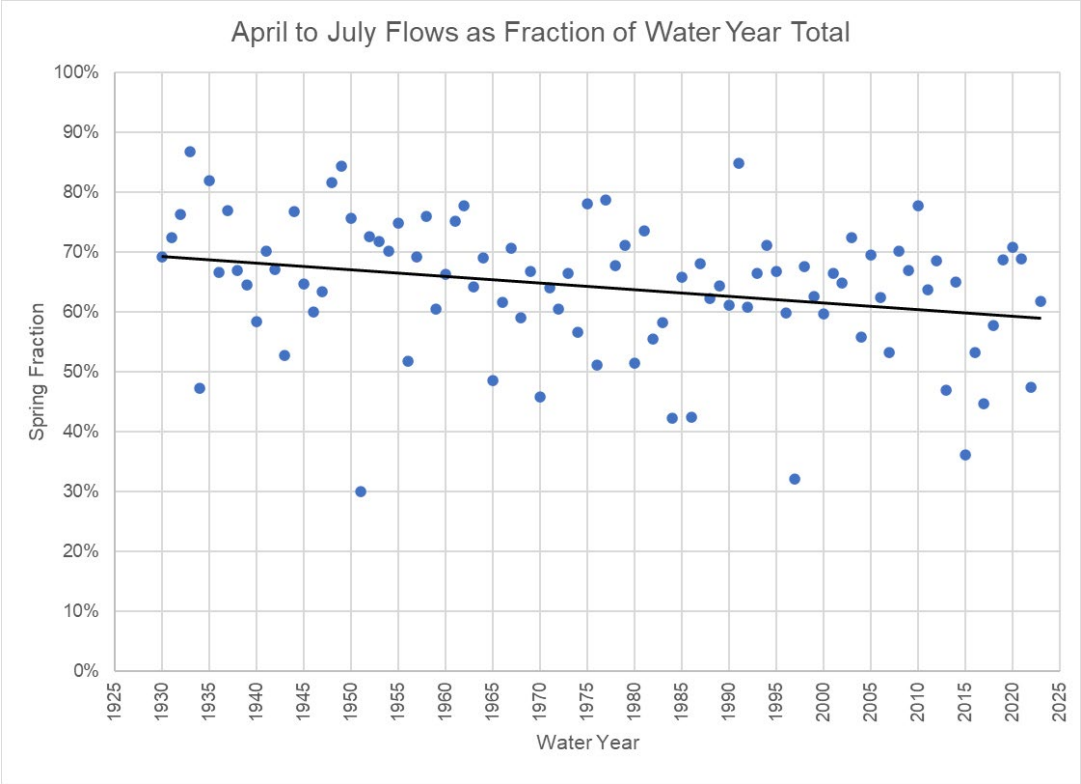


Figure 3. April to July Mokelumne River Flows as a fraction of total water year.

the past nine decades, the fraction of April to July Flows has decreased by approximately 10 percent, indicating a shift in the timing of the spring snowmelt runoff.

Figure 4 shows the timing of peak snow water content for the Mokelumne watershed. The trendline suggests that over the past three decades, the peak SWC for the Mokelumne 4-station index has shifted earlier from the historical average peak of April 1 by approximately 10 days.

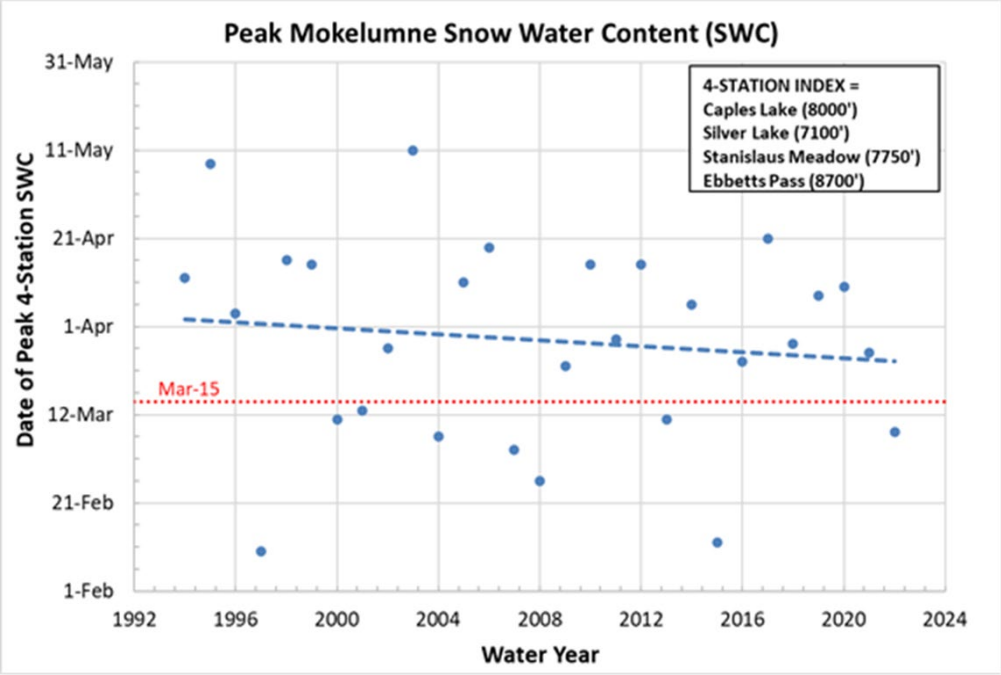


Figure 4. Peak Mokelumne Snow Water Content by Water Year.

2.4 Future Climate Change Projections

EBMUD's review of the available science and its own modeling and analysis show potential future impacts of climate change. Much of EBMUD's work to model potential water supply impacts of climate change are documented in the 2015 and 2020 Urban Water Management Plans (UWMPs), which build on work done as part of the Water Supply Management Plan 2040.

Most significantly, climate change will reduce the robustness of the water supply available to EBMUD from its primary water source, the Mokelumne watershed. Climate change is expected to increase the frequency and severity of droughts, which will further reduce water supplies available from the Mokelumne watershed and impact the reliability of supplemental supplies from Freeport. At the same time, warmer weather could also lead to increases in customer demand, as more water is needed for irrigating landscapes and operating building and industrial cooling systems.

The 2020 UWMP assessed EBMUD's long-term supply and demand and considered the potential impacts of climate change. The demand model looked at two climate variables, rainfall and air temperature, to forecast changes in consumption. Modeling conducted as part of the Water Shortage Contingency Plan considered several scenarios related to climate change, including an "Extreme Drought" scenario and a five-year historical dry period. A high water demand scenario that considered effects of warmer climate

on customer demand was also studied. Results demonstrated an increased need for water due to the high demand and extreme drought scenarios.

An increase in average air temperature is predicted to shift the timing of runoff, as snowpack melts earlier in the year, or as more precipitation falls as rain instead of snow. However, EBMUD's modeling shows that this impact is likely to be attenuated by upstream storage. Reservoirs upstream of Pardee would act to regulate runoff by collecting and storing it, then releasing it in a timeline similar to what EBMUD experiences now.

Climate change will continue to create warmer weather patterns and longer wildfire seasons, which will increase the potential for wildfires on and adjacent to EBMUD watersheds, which could impact watershed health and potentially affect water quality.

Both extreme precipitation events and reduced runoff could impact EBMUD's ability to develop and maintain the cold water pool during the summer and fall months for fish hatchery and river spawning temperature management.

Lastly, sea level rise due to climate change is expected to increase. Warmer conditions will cause more glaciers and ice sheets to melt and will also cause the volume of the Earth's oceans to expand.

2.5 Impacts of Climate Change on EBMUD

Climate change is expected to impact all aspects of EBMUD's mission. The following is a discussion of the likely impacts of climate change, organized according to the six goals of EBMUD's Strategic Plan. Chapter 4 describes actions EBMUD is taking to prepare for and respond to these impacts.

Long-Term Water Supply

Climate change is likely to impact the reliability of EBMUD's primary water supply, the Mokelumne River, by increasing the frequency and severity of droughts. If larger portions of the state's precipitation is comprised of rain and less as snow, EBMUD's and the state's water storage capacities will be reduced. Droughts may also impact other water supplies; for example, EBMUD's ability to obtain water from the Central Valley Project may be reduced. The availability of water transfers may decrease as other rivers face similar challenges and competition for supplies increases.

Water Quality and Environmental Protection

Climate change will affect habitat in lands and waterways that EBMUD manages. Changes in precipitation including droughts or extreme precipitation events may impact freshwater and terrestrial species. In addition, warmer temperatures can also impact which species are able to live in particular zones. Anadromous fish are particularly sensitive to water temperature during certain life stages. EBMUD's ability to maintain cool temperatures in the lower Mokelumne River may be impacted by changes in precipitation patterns and increased air temperatures.

Warmer, drier conditions also increase the risk of wildfire in EBMUD's watersheds. Such wildfires could damage infrastructure or lead to significant water quality impacts as debris, organic carbon and sediment runoff into the reservoirs.

Warmer conditions may lead to more frequent and serious formation of harmful algal blooms. This could affect water quality and may also increase regulatory pressure to reduce nutrient loading from the MWWTP.

Extreme wet weather events can also have impacts. In particular, extreme storms may lead to higher turbidity in raw water (affecting treated water quality and treatment capacity) and increased runoff that affects sewers and wastewater treatment.

Long-Term Infrastructure Investment

The above-mentioned impacts will require upgrades to EBMUD infrastructure EBMUD including water and wastewater treatment plants, pipelines, aqueducts, facilities, and dams.

Warmer, drier conditions could lead to wildfires or algal blooms that impact water quality, requiring additional treatment beyond what is currently required for normally pristine Mokelumne river water. Upgrades to EBMUD's WTPs may be needed to ensure that EBMUD can reliably provide high quality water to its customers.

Sea level rise also poses a threat to infrastructure. For EBMUD, the main concern is wastewater infrastructure located adjacent to the San Francisco Bay shoreline that may be susceptible to sea level rise and/or flooding during high tide events. Sea level rise can also raise groundwater levels, which can impact pipelines in the water distribution system by making soils more saline and creating a more corrosive environment.

Extreme storm events with heavy precipitation could threaten Delta levees and EBMUD's Mokelumne Aqueducts. Without proper planning and mitigation, extreme precipitation events and rain on snow events can lead to an increased risk of rapid reservoir filling and potential structural or operational failure.

Long-Term Financial Stability

The impacts of climate change could also affect EBMUD's finances. During droughts, EBMUD generally asks customers to reduce their water use to help manage limited supplies; this can lead to reduced revenue. Higher costs will also decrease the ability to pay for certain customers.

EBMUD must also consider climate change as it plans for rates and issues bonds to finance capital work. Climate change has led to changes in the broader financial system, such as the potential for issuing green bonds. EBMUD is also aware of environmental factors in its own investment processes.

Customer and Community Services

Customer service is the core of EBMUD's mission. Water and sanitation are among the most fundamental, basic human needs, so EBMUD need to ensure the reliability of its systems. Climate change could lead to a number of different emergency situations – wildfires, heat events, extreme precipitation – that require EBMUD to respond rapidly to ensure that customers maintain access to essential services.

In addition, climate change will also have impacts on the customers and communities that EBMUD serves. These impacts will disproportionately affect disadvantaged communities and low-income customers.

Workforce Planning and Development

The adaptation and mitigation strategies outlined in this document required a skilled workforce that can implement them. Long-term resilience requires EBMUD to think about how it recruits, trains, and keeps the employees needed to operate its systems and plan for the future. In addition, climate change can lead to situations that threaten worker safety, like high heat events or wildfires that create significant smoke,

3 Mitigation

Mitigation actions are those that are meant to slow or reduce the impacts of climate change. As discussed in Chapter 2, the state of the science is conclusive that a certain level of warming is now unavoidable, but actions taken today can still prevent higher levels of warming and reduce the impacts of climate change in the future.

3.1 Policy and Regulatory Drivers

For water and wastewater agencies in California, some actions taken to address Climate Change are voluntary but increasingly, more actions are directly or indirectly mandated through regulation.

In 2006, the Legislature passed the California Global Warming Solutions Act of 2006 [Assembly Bill 32 (AB 32)], which created a comprehensive, multi-year program to reduce GHG emissions in California. AB 32 required the California Air Resources Board (CARB) to develop a Scoping Plan that describes the approach California will take to reduce GHGs to achieve the goal of reducing emissions to 1990 levels by 2020. The 2022 Scoping Plan for Achieving Carbon Neutrality (2022 Scoping Plan) lays out a path to achieve targets for carbon neutrality and reduce anthropogenic greenhouse gas emissions by 85 percent below 1990 levels no later than 2045, as directed by Assembly Bill 1279 (2022). The actions and outcomes in the plan are intended to achieve significant reductions in fossil fuel combustion by deploying clean technologies and fuels; further reductions in short-lived climate pollutants; support for sustainable development; increased action on natural and working lands to reduce emissions and sequester carbon; and the capture and storage of carbon.

In 2018, California accelerated its goals to convert to renewable sources of energy. Senate Bill 100 requires that at least 60% of electricity be generated by 2030 from “eligible renewable energy resources” (solar, wind, geothermal, biomass, small hydro, renewable methane, ocean wave or thermal, or fuel cells using renewable fuels). Senate Bill 100 (SB 100) also established a goal for California that all retail electricity sold must come from renewable and zero carbon sources. Just as significant, in 2023, CARB promulgated several regulations requiring the transition to zero emission vehicles. The Advanced Clean Fleet regulation requires fleet owners operating vehicles for private services and state, local, and federal fleets to transition toward zero emissions vehicles; more information on EBMUD’s plans for fleet conversation is provided in Section 3.3.4. CARB also adopted a rule requiring truck manufacturers to transition from diesel trucks and vans to electric, zero emissions trucks beginning in 2024.

At the federal level, some major sources are directly regulated by the United States Environmental Protection Agency (USEPA) via the GHG Reporting Program, and to a limited extent, the Clean Air Act, to meet, report, and reduce GHGs. However, the USEPA exempts biogenic emissions from reporting and this exemption removes most water and wastewater agencies from federally mandated reporting. At the state level, reporting of GHG emissions by major sources, including the MWWTP, is required by AB 32 since biogenic emissions are not exempted. EBMUD’s biogenic emissions are, however, exempted from California’s Cap and Trade program.

Requirements to submit climate change and adaptation information in National Pollution Discharge Elimination System (NPDES) permits and/or permit applications have been included in recent permit

renewals. The SWRCB has adopted resolutions encouraging the review of GHG emissions and climate change adaptation in NPDES permitting, recycled water projects, and other areas. Increased integration of climate change requirements and NPDES permitting is expected over time.

Each of these regulations drives the state towards de-carbonization with an aggressive timeline. EBMUD's goals were adopted to accelerate its own transition from fossil fuels even faster.

On the adaptation side, the state has actively developed policies, legislation and regulations to improve the stability of electrical grid and energy supply, improve protection for workers from heat events, support forestry management, and improve air pollution exposure in low-income communities. The state also integrated adaptation strategies into the California Water Supply Strategy.

3.2 District Goals and Policies

EBMUD is committed to addressing climate change. This commitment is outlined in Policy 7.15 Climate Action; Policy 7.07 Energy; and Policy 7.05 Sustainability and Resilience.

Policy 7.15: Climate Action directs EBMUD to consider the impacts of climate change and take appropriate action to understand, mitigate, and adapt to those impacts. Some of the policy objectives include monitoring climate science; using best available science to identify risks and consider mitigations; performing GHG inventories; collaborating with external stakeholders on sustainable solutions; educating communities and employees on the impacts of climate change; and taking a leadership role in addressing climate change.

Policy 7.07: Energy promotes energy efficient practices within EBMUD's water and wastewater systems, service area, and watersheds, minimizing reliance on fossil fuels, diversifying energy sources, and achieving the EBMUD goal to be carbon neutral by 2030. EBMUD's GHG reduction goal is to achieve carbon neutrality for indirect and direct GHG emissions by 2030 for the water and wastewater systems, prioritizing actual emissions reductions and applying emissions credits to residual emissions that cannot be eliminated or are outside of EBMUD's control. Emerging GHG issues, such as process emissions related to wastewater treatment and discharge, are estimated and reported based on the most recent methodology available but not included in EBMUD's goals. The policy includes several required actions that EBMUD will implement to achieve the stated objectives, including but not limited to energy conservation; scientific studies; increased use to renewable energy where feasible; and expansion of ZEV technology.

The policy was amended by the Board in 2023 directs staff to prioritize purchase of low and zero emissions energy before purchasing California Renewable Portfolio Standard Compliant Renewable Energy Credits (RECs) or carbon credits to meet EBMUD's indirect emissions goals. Carbon credits would only be purchased to meet EBMUD's indirect GHG emissions goals only if cost competitive with RECs.

7.05: Sustainability and Resiliency directs EBMUD to provide reliable, high-quality drinking water and wastewater service through sustainable and resilient planning, design and construction, operations, maintenance, rehabilitation, and disposal activities that manage long-term economic, environmental,

and human resource benefits, with the goal of attaining equitable outcomes for the communities EBMUD serves.

3.3 Implementation of GHG Reduction Plan

To understand greenhouse gas (GHG) emissions from EBMUD sources and evaluate the effect of mitigation measures, an accurate inventory of EBMUD emissions is needed. EBMUD has conducted inventories of GHG emissions annually since 2005 and the results have been presented to the EBMUD Board of Directors annually. Staff has evaluated the inventory annually to understand where EBMUD GHG emissions are originating and have made mitigation efforts documented below to meet goals. Details on inventory practices and GHG mitigation measures are outlined below.

3.3.1 Inventory

The annual GHG inventory is conducted using the Water-Energy Nexus (WEN) protocol, published by The Climate Registry. Of available inventories for voluntary use by organizations, the WEN best aligns with EBMUD operations and activities. The WEN is the most detailed, directly related protocol to EBMUD operations available and is the foundation of the annual EBMUD GHG inventory. EBMUD voluntarily took a leadership role in development of the Water Energy Nexus (WEN) Protocol that was published by The Climate Registry in 2019. The Climate Registry received sponsorship and funding by California Environmental Protection Agency to develop a water and energy specific protocol.

Further updates to EBMUD GHG goals are likely as *more clarification of* terms like *"*carbon neutral*"* and *"*net zero*"* are published and become recognized nationally or internationally. The types of emissions inventoried and how they relate to EBMUD operations are briefly described below.

Scope 1 (Direct) Emissions

Scope 1 emissions are emissions directly released to the atmosphere from EBMUD operations. Scope 1 emissions result from fuel combustion at both stationary and mobile sources (e.g., buildings and fleet) and fugitive emissions from refrigerant leaks. EBMUD gathers fuel consumption data for gasoline, diesel, propane, natural gas, and other fuels (if used) annually to determine the related emissions. Refrigerant emissions are estimated annually by updating the inventory of equipment with refrigerants and determining refrigerant losses.

Scope 2 (Indirect) Emissions

Scope 2 emissions are emissions from acquired energy, including electricity, heat, and steam. At EBMUD, like most organizations, Scope 2 emissions are solely from the acquisition of electricity. EBMUD determines all electricity acquisitions and supplier emission factors on an annual basis to determine Scope 2 emissions. EBMUD carefully manages energy purchases and usage to balance cost, GHG emissions, and operational needs.

EBMUD imports supplemental raw water from the Sacramento River to EBMUD-operated facilities during drought years. This operation requires significant energy use. Over time, emissions associated with the electrical energy will decrease as state law requires electrical retailers to use 100 percent renewable energy and zero-carbon resources by 2045.

Scope 3 Emissions

Scope 3 emissions are considered optional for reporting and typically involve emissions upstream or downstream of a reporting entity's operations. Examples of Scope 3 emissions include fuel used for employee commuting, emissions related to purchased goods (supply chain), employee travel, and emissions related to disposal of wastes. EBMUD does not report on Scope 3 emissions currently but analyzes employee commuting for other purposes.

Process Emissions

Process emissions result from EBMUD activities such as wastewater treatment, wastewater discharge, and water storage in reservoirs (e.g., Camanche, Pardee). These processes generate GHGs, most notably methane and nitrous oxide, which are potent GHGs. The science and research into process emissions is evolving and estimation methods are not universally recognized nor adopted. Per Policy 7.07, EBMUD is estimating and reporting process emissions and reporting them as a separate category in its inventory due to the uncertainties in this area. As the science and accounting of process emissions become more precise and consistent, it is possible that these will be accounted for as Scope 1 emissions.

3.3.2 Goal Setting and Tracking

The current goals are for the water system and wastewater system to be carbon neutral by 2030. Process emissions are exempted from EBMUD goals. Carbon neutrality is achieved when an organization's emissions are balanced by absorption or removal of carbon. EBMUD goals are recommended by staff and adopted by the Board of Directors. Figure 5 below shows annual emissions along with the goal and baseline year (2000). Over time, the Board has modified the emissions goals which results in a varying-slope trend line.

EBMUD's goal in 2022 was 24,611 metric tons of carbon dioxide equivalent (MT CO_2e) and the actual GHG emissions totaled 23,968 MT CO_2e. The 2022 GHG emissions were one percent lower than the prior year. Overall, emissions from 2022 were impacted by residual use of supplemental water. Preliminary calculations of 2023 emissions indicate EBMUD's goal will be met without mitigation. Beginning in 2024, EBMUD may need to purchase a higher percentage of emissions-free power or pursue other mitigation even assuming supplemental water is not needed.

Figure 6 shows EBMUD's emissions by major operational sector. The largest contribution to emissions is attributed to electrical use within pumping plants and treatment plants.

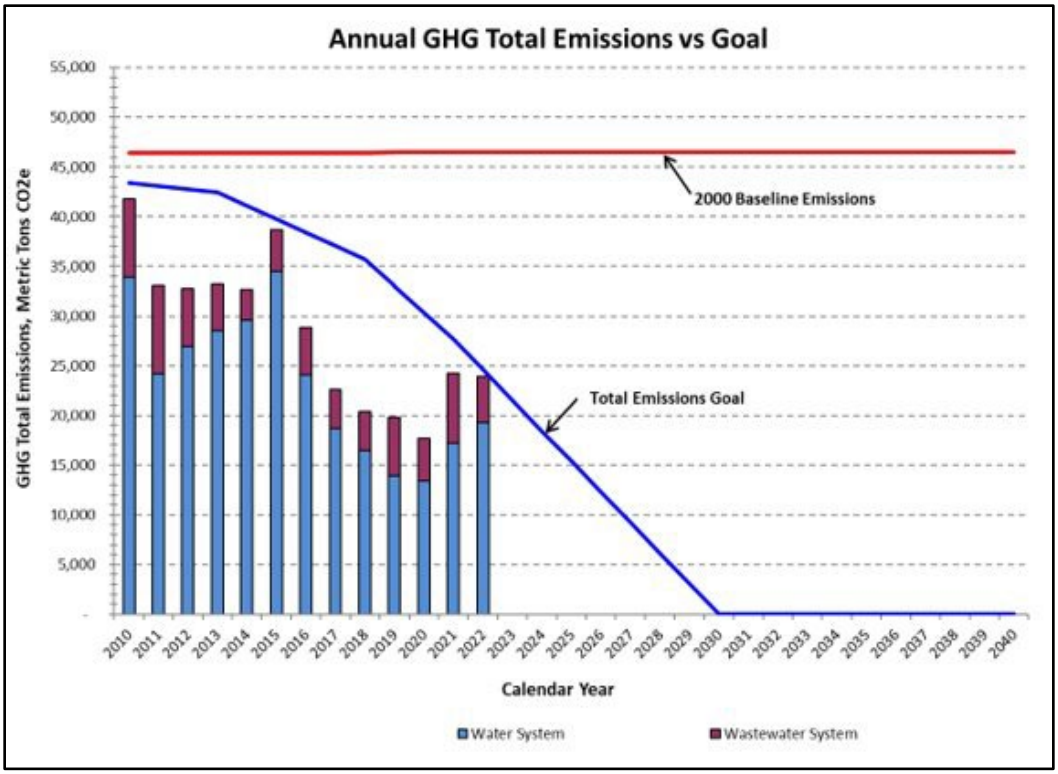


Figure 5. Annual GHG Emissions vs. Goal

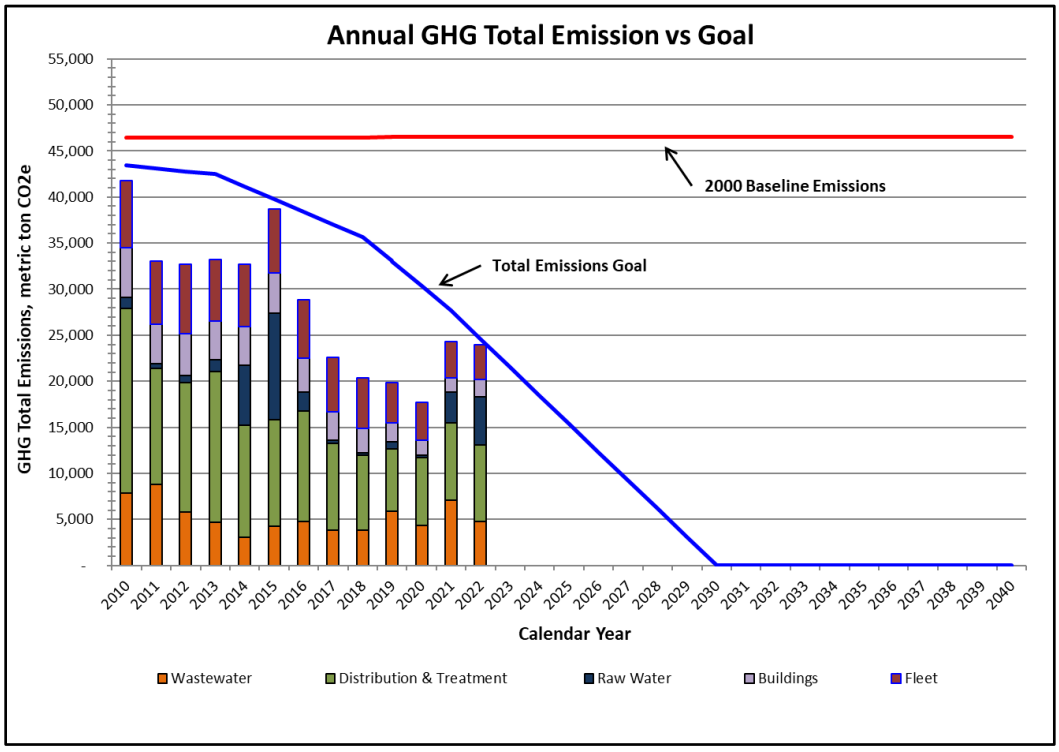
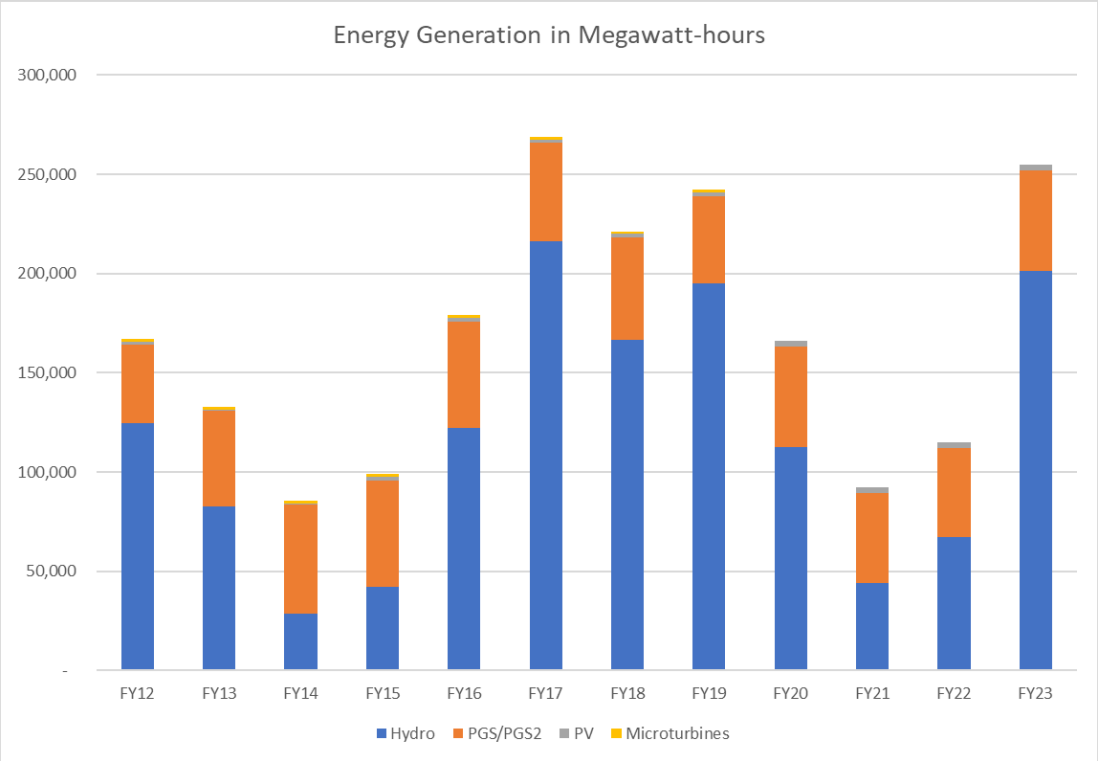


Figure 6. Annual GHG Emissions vs. Goal, by Operational Sector.

3.3.3 EBMUD Renewable Energy Generation

EBMUD also mitigates its GHG emissions through the implementation of renewable energy projects that provide energy directly to EBMUD facilities. Several of EBMUD's renewable generation projects both serve EBMUD's electric load *and* sell excess generation into the wholesale energy markets. EBMUD's renewable energy portfolio currently includes 40 Megawatts (MWs) of hydropower at Pardee and Camanche dams and eleven photovoltaic (PV) projects totaling nearly 2 MW scattered throughout EBMUD's service territory and in proximity of Camanche Reservoir. In addition, the MWWTP in Oakland has 11 MW biogas generation that predominately serves onsite electric load. Three additional PV projects are under or entering construction with a combined capacity of approximately 5 MW. EBMUD is also exploring an energy storage project that would provide an additional revenue stream and support the State's goal to be carbon-free by 2045. Figure 7 shows annual production for EBMUD energy generating facilities from FY12 to FY22.



* Microturbines in AMC and AB were decommissioned in FY2013 and FY2020, respectively. ** Includes PPA PV production from FY2015 and on.

Figure 7. FY12 to FY22 energy production at EBMUD facilities.

Hydropower

EBMUD generates hydropower at its two dams in the Mokelumne River watershed, Pardee and Camanche. Pardee Power Plant was put into service in 1930 and has a nominal capacity of 30 MW. Camanche Power Plant was put in service in 1983 and has a capacity of about 10 MW. The certified renewable energy and capacity provided by these plants is sold into the wholesale energy markets through a contract that expires in 2025. The renewable energy and credits are assigned to these

counterparties accordingly (and not claimed by EBMUD). The self-serving option will be revisited as the expiration date of these wholesale contracts approaches. Self-serving energy to EBMUD from its own renewable sources may not result in emissions reduction as zero-emission energy will eventually be the only option in California. Self-serving EBMUD's electrical needs with EBMUD generation may not be economical either.

In FY2023, Pardee and Camanche Power Plants generated 158,036 Megawatt-hours (MWh) and 43,419 MWh of net delivered energy, respectively. Total revenue for energy, including Renewable Energy Credits and capacity, was $20,005,347.

EBMUD is also pilot testing a 30 Kilowatt (KW) in-conduit hydropower project in the water distribution system parallel to the Piedmont Regulator in Piedmont. In-conduit hydropower uses existing water conveyance systems like pipelines or aqueducts fitted with a small turbine and generator to produce electricity. Following a two-year pilot, the system will be evaluated for economic viability.

PV Projects

Since 2003, EBMUD has developed 11 PV projects under various contractual arrangements that provide nearly 2MW of PV capacity. Collectively, these projects offset approximately two percent of EBMUD's annual energy consumption.

Currently EBMUD is developing its largest PV project, the five MW Duffel Project located on twenty acres of EBMUD watershed land in Orinda. The project is being developed through a Power Purchase Agreement and would utilize PG&E's Renewable Energy Self-Generation Bill Credit Transfer (RES-BCT) program which credits generation directly to up to 50 EBMUD retail electric accounts. Under current tariff rates through the RES-BCT program, the project's net present value is estimated at $18 million. The project is expected to generate over 10,000 MWh annually, equivalent to nearly eight percent of EBMUD's current total electrical load, and to offset approximately 2,000 metric-tons of GHG emissions. The project is scheduled to be complete in June 2024.

Figure 8. Duffel PV Project, October 2023.

EBMUD is also developing two smaller PV projects: a 40 kW system at the Stockton maintenance yard and a 170 kW system at the Oakport facility in Oakland. Combined the systems will generate an estimated 360,000 kWh annually and offset about 80 percent of the onsite electrical load.

Biogas Production

EBMUD's MWWTP in West Oakland is also a significant source of renewable energy. Organic materials in sewage are digested by microorganism in large anaerobic digesters, and the resulting biogas is captured and used to generate energy. In addition, organic wastes brought to the plant via the Resource Recovery

program – like food scraps and grease from local restaurants and waste streams from wineries and poultry farms – are also added to the digesters to increase energy production. The treatment plant generates electricity in its Power Generation Station, which includes an energy-efficient, low-emission gas turbine that was installed in 2011.

In 2012, EBMUD became the first wastewater treatment plant in North America to produce more renewable energy onsite that is needed to run the facility. Excess renewable energy is sold back to the electrical grid. In FY2022, the Wastewater Power Generation Station generated 44,961 MWh of electricity of which 42,448 MWh was used on site, with the remainder sold in the wholesale energy market.

3.3.4 Fleet Conversion

In additional to driving the generation of green electrical power, the State has also adopted aggressive targets for transitioning from internal combustion to zero-emission vehicles through several regulations adopted by CARB (California Air Resources Board). Under the Advanced Clean Cars (ACC) regulation in California, zero emission vehicles (ZEVs) include battery electric vehicles (EVs), plug-in hybrid electric vehicles (PHEVs) and fuel cell electric vehicles (FCEV). New vehicles sales for passenger cars in California must be at least 35% ZEV by 2026 and must increase each year until 100% of new car sales are ZEV in 2035. Sedans, pick-up trucks and SUVs are covered under this regulation.

The Advanced Clean Fleets (ACF) regulation applies to medium- and heavy-duty vehicles – vehicles heavier than 8,500 lbs as gross vehicular weight (GVW). State and local government fleets, including city, county, and special district fleets, are subject to the regulation. There are two ways fleet managers can comply. The standard option applies to new purchase requirements. Under this option, 50% of new vehicle purchases above 8,500 GVW need to be zero emission starting in 2024. In 2027, 100% of purchases for vehicles above 8,500 GVW need to be zero emission. Fleet managers have an alternative option for compliance through the “milestone” option. In this option, certain percentages of the fleet must be ZEV by various years with no limitation on year-to-year purchases.

Most fleet managers, including EBMUD, plan to comply under the standard option. There are several exemptions and extensions applicable for certain fleet types and circumstances. Most notably, if ZEVs are not commercially available for a specific function, an organization may seek an exemption. Additionally, new legislation signed by the Governor on October 8, 2023 (AB1594) acknowledges that some public agency vehicles are essential to maintaining reliable water service and further authorizes those public agency utilities to purchase replacements for traditional utility-specialized vehicles that are at the end of life, as determined by the State Air Resources Board in consultation with public agency utilities.

EBMUD Fleet Inventory

As of late 2023, EBMUD owns over 1,300 vehicles that fall into four major categories as shown in Table 2 below. EBMUD also rents numerous vehicles of various types. Leased or rented vehicles are still considered part of the jurisdictional fleet under the ACF regulation. Over the next decade, the number of vehicles owned or leased by EBMUD is not expected to significantly change.

Table 2. EBMUD Fleet Composition

Class	Description	Regulation	Number
Class 1 – 2a	Sedans, small pickups, small vans and SUVs	Advanced Clean Cars	402
Class 2b – 8	Medium and heavy-duty vehicles over 8,500 gvw	Advanced Clean Fleet	559
Trailers	Tow-behind trailers with no engine/motor	NA	123
Construction	Backhoes, loaders, bulldozers, etc. These vehicles are generally not certified for public roadways	None currently	229
		Total	**1,313**

Available Zero Emission Technologies

Currently, the two approved zero emission technologies are electric and hydrogen fuel cell, and manufacturers continue to improve this technology for cars, pickup trucks, vans, large trucks, and construction equipment. EBMUD is evaluating both technologies and will remain flexible with space-planning for future re-fueling infrastructure for each – see section 4.3.7.

Subject to market availability, EBMUD may also choose to transition the fleet faster than regulations require.

EBMUD Fleet Transition

Although the earliest regulations went into effect in January 2024, EBMUD began transitioning the fleet 20 years ago when hybrid vehicles were first purchased to replace passenger sedans. EBMUD's present light duty fleet consists of 402 vehicles including 70 hybrid vehicles and 14 ZEVs (Chevrolet Bolts). The first ZEVs were purchased in 2020. Two EV Ford Transit vans and seven Ford Lightning pickup trucks are on order with expected delivery in 2024. The remainder of the passenger and light duty fleet consist of internal combustion engine (ICE) vehicles. Prior to 2023, no zero-emission SUVs or pickup trucks were purchased due to limitations of the market. Beginning in 2024, hybrid and ICE vehicles will generally be replaced with zero-emission vehicles after exceeding 100,000 miles. As market conditions improve, and yard upgrades are completed, the pace of transition will accelerate. Depending on emergency response needs, EBMUD may retain 20-30 ICE vehicles in the long-term. Use of these vehicles could be minimized day-to-day. This transition is shown in Figure 9.

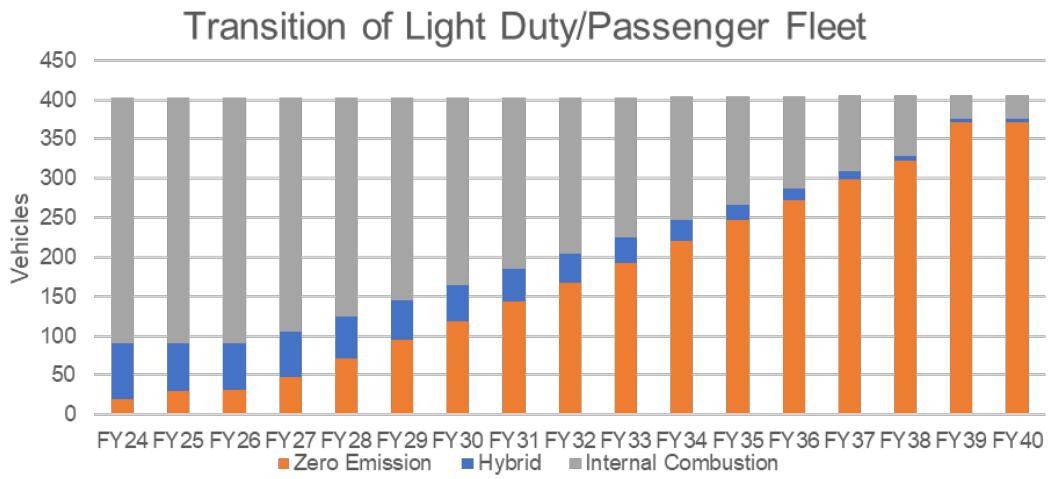


Figure 9. Transition of light duty/passenger fleet.

EBMUD has evaluated the existing 559 Class 2b-8 vehicles that fall under the new ACF mandate. The evaluation projected when vehicles will be replaced based on expected mileage, overall maintenance condition, and availability of zero emission options for lease or purchase.

No new orders of ACF-regulated vehicles are expected in 2024 because of recent orders placed in late 2023. Staff expect to place the first orders regulated under the ACF regulation to begin in 2025 when more vehicle options will exist. In the interim, staff will pilot electric and hydrogen fuel cell commercial trucks from a variety of manufacturers. Large electric construction equipment like backhoes, excavators and bucket loaders are also scheduled to be piloted when the technology is released in early 2024. EBMUD has already successfully piloted a medium duty EV loader at SD-1 and is in the process of purchasing using grant funding assistance through the CORE program.

In a few years, between 20 and 40 vehicles will be ordered each year in the medium- and heavy-duty vehicle category (over 8,500 GVW). These purchases will be made for vehicles at the end of their useful life. Some vehicles, such as dump trucks, may have a service life of 20 years. After 2027, all purchases will be 100% ZEV. Depending on emergency response needs, EBMUD may retain 50-60 Internal Combustion Engine (ICE) vehicles as allowed by regulation in the long-term. Use of these vehicles could be minimized day-to-day. This transition is show in Figure 10.

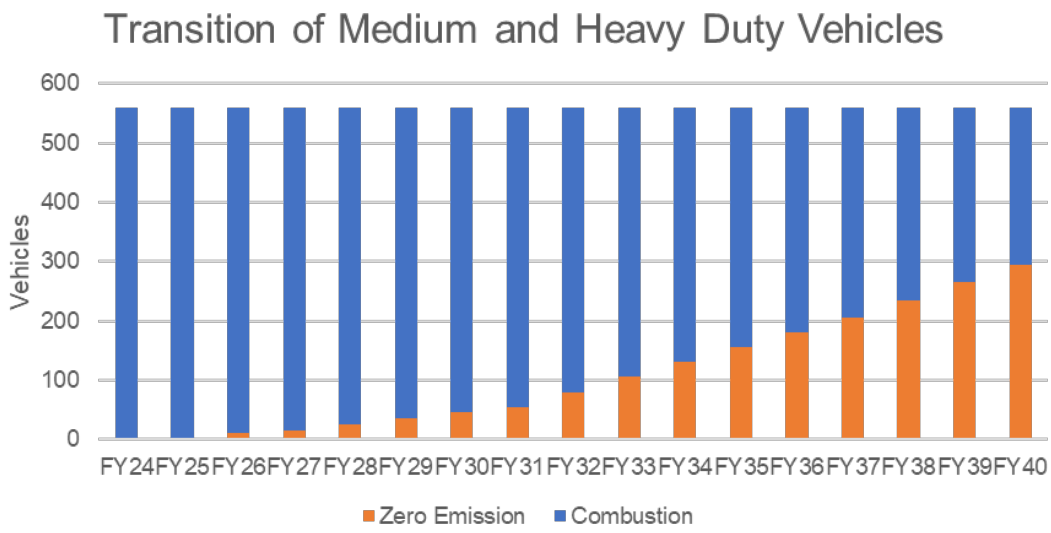


Figure 10. Medium and heavy-duty truck fleet composition.

Purchase of hydrocarbon-based fuels will proportionally drop as the fleet is transitioned, as shown in Figure 11. Use of diesel for generators is expected to remain constant at about 10,000 gallons each year to support maintenance activities, testing, and occasional loss of line power. EBMUD's fleet has been transitioning to renewable diesel for about ten years. As of late 2023, all EBMUD dispensing stations for fleet fueling had been converted to renewable diesel. Wastewater operations utilize about 30,000 gallons of diesel fuel to support gas turbine combustion of biogas.

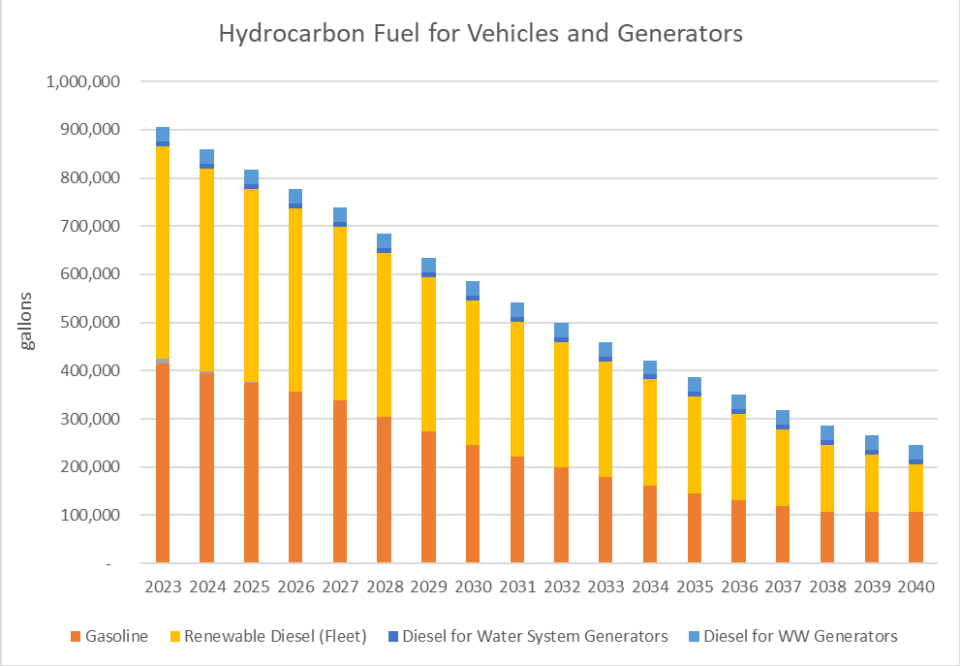


Figure 11. Estimated reduction in hydrocarbon fuel use.

Current EBMUD EV Charging Infrastructure

EV Charging infrastructure currently in place on EBMUD property consists of:

- Main Administration Building – Six Level 2 Clipper creek Chargers, two level one chargers for Chevy Volt Hybrids
- SD1 – Five Level 3 Clipper Creek Chargers (two with credit card capability)
- Pardee Center – Two Level 2 smart chargers with capability for credit card payment option.
- Adeline Maintenance Center – One Level 2 Clipper Creek charger
- Fleet – Four Level 2 smart chargers.

In addition to the chargers that are already in place throughout EBMUD, an effort is underway for planning and building out EBMUD's EV charging infrastructure completely (see Section 4.3.7). The first step is a study that will evaluate EBMUD's facilities, fleet, and various use cases to determine how to comply with the new regulation. This study began and will be completed in 2024. EBMUD is installing two level 3 DC fast chargers at the MWWTP ahead of the capital EV infrastructure upgrade so it can continue to purchase and pilot all types of EVs.

In early 2024, EBMUD plans to purchase a mobile charging trailer that can be moved to different sites to allow for pilot testing EVs with multiple work groups and to have available for emergencies.

Additional Fleet Efforts to Reduce GHG Emissions

In addition to piloting and purchasing approved zero emission vehicles and equipment, EBMUD is also looking at other solutions to reduce GHG emissions. EBMUD currently uses renewable diesel at all its fueling facilities, and it is piloting battery electric PTO (Power Take Off) options for trucks. EBMUD will also equip all fleet vehicles and equipment with telematics hardware and software to monitor engine idle times, comply with smog testing requirements, and manage EV Charging.

Impact on GHG Emissions

As vehicles are replaced with lower or zero emission vehicles, EBMUD will gradually decrease the purchase of fossil fuels. Nearly all medium and heavy-duty vehicles that are now powered with diesel fuel utilize renewable diesel, which according to the U.S. Department of Energy reduces carbon intensity by 65% when compared with petroleum diesel (source: Alternative Fuels Data Center: Renewable Diesel (energy.gov)). Future use of diesel fuel for generators should decrease. Generators are used to operate around construction outages and PG&E outages (including Public Safety Power Shutoffs) and for drought operations. Future capital work should reduce reliance on generators.

3.4 Energy management

EBMUD uses varying amounts of electricity depending on demand and sources of supply. Over the past ten years, spanning two short drought cycles, EBMUD's purchased energy averaged about 100,000 MWhr annually. Nearly 130,000 MWhr were used in 2022 due to supplement water supply pumping. Energy management encompasses a wide variety of activities including marketing of renewable energy (and related commodities), demand-side management to avoid peak time of use fees (or to support the statewide grid when necessary), and projects to reduce energy use.

EBMUD sources for electricity include Alameda Municipal Power (AMP), East Bay Community Energy (EBCE), Marin Clean Energy (MCE), Pacific Gas & Electric (PG&E), Sacramento Municipal Utility District

(SMUD), Western Area Power Administration (WAPA), Tesla, and EBMUD-owned energy generation facilities. EBCE and MCE are part of the California Community Choice Aggregation (CCA) program, purchasing electricity on behalf of customers that is distributed over PG&E distribution assets (e.g., substations, power lines, and poles). EBMUD presently has sixty-eight (68) accounts with EBCE in Alameda County and one hundred seventy-four (174) accounts with MCE in Contra Costa County. Energy suppliers with assets to distribute electricity will include a demand charge in their billings (e.g., PG&E, AMP, SMUD, WAPA).

EBMUD also purchases PV electricity provided directly from Tesla PV projects through Power Purchase Agreements (PPA). Figures 12 and 13 show EBMUD's energy purchases by provider and by location (or operational function), respectively. Elevated SMUD energy use in FY2014 through FY2016, and in FY2022 was due to the operations of supplemental water facilities (i.e., Freeport operations and use of Clay and Camanche Pumping Plants).

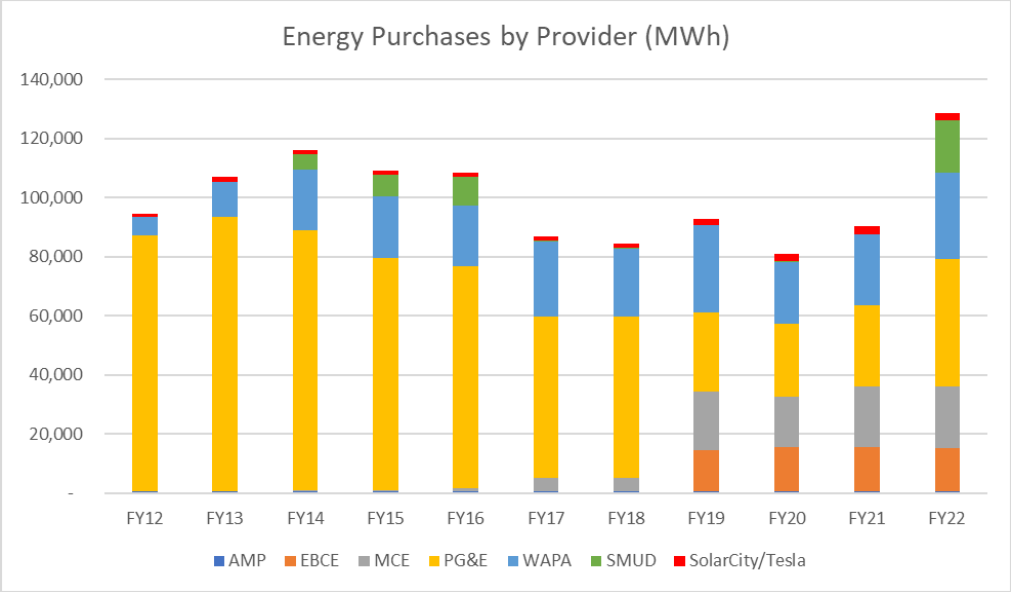


Figure 12. FY12-22 energy purchases by provider.

Energy use in FY21 and FY22 was elevated to accommodate construction and drought. The Mokelumne Aqueducts are operated with pump stations to increase capacity in individual aqueducts to compensate for lost capacity in others which may be offline for construction or utilized for supplemental water operations.

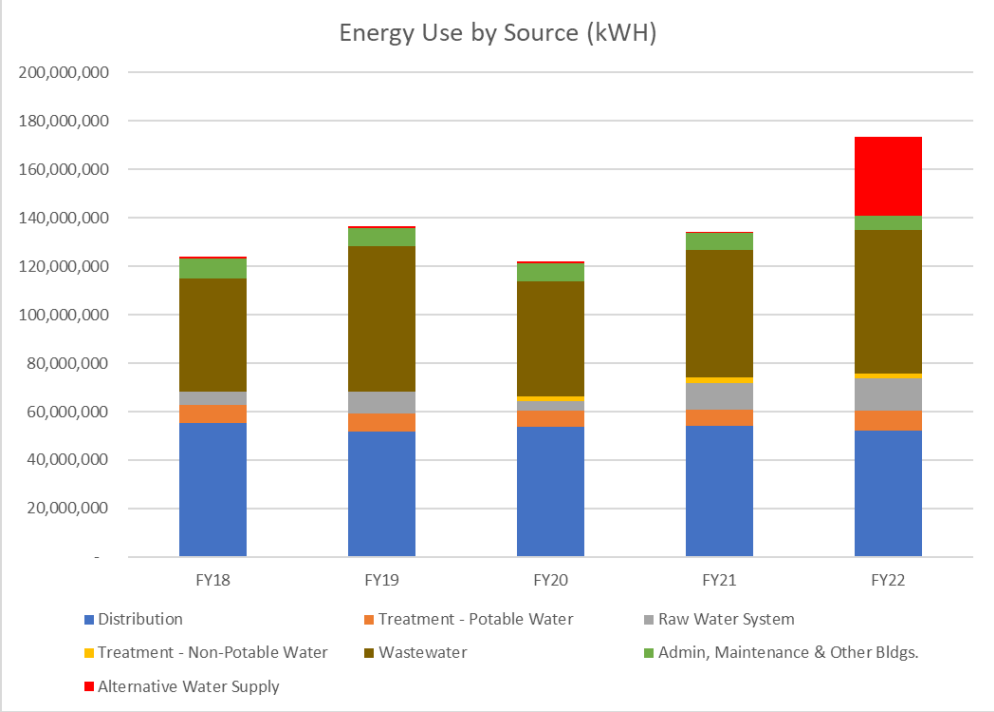


Figure 13. FY18-22 energy use by source.

Most energy suppliers use a portfolio of energy sources to meet demand. The blend of these sources varies from year to year and each have different emission factors. The amount of renewable energy within each portfolio is regulated by the state and is gradually increasing (the state has also broadened

what qualifies as renewable in California – most notably with the recent inclusion of large hydrogeneration and nuclear).

Suppliers, including investor-owned utilities like PG&E, typically offer "greener" options for customers who desire lower emission energy, often at a premium.

The latest published emission factors from EBMUD's energy suppliers are from 2023 as shown below in Table 3, along with prior years. Published emission factors are typically applicable to the prior year's emissions.

Table 3. Emission Factors of EBMUD Energy Suppliers, 2018-2023

	Emission Factor lb CO_2e/MWh					
Supplier	2023	2022	2021	2020	2019	2018
PG&E	56	98	160	(Unavail.)	206.29	210.44
WAPA	TBD	533.6	515.5	453.2	496.5	598.2
MCE	44	75	77	197	127	114
EBCE (Ava)	496	564	591	135.10	100.75	101
SMUD	TBD	462	358	374.85	465.17	383.6
AMP	TBD	117	95	453.2	496.5	529.9
e-Grid CA mix	TBD	533.6	515.5	453.2	496.5	529.9

Generally, the emissions factors of energy suppliers are trending down over time. However, there are notable exceptions – such as EBCE (Ava).

As discussed above, EBMUD will prioritize purchase of low and zero emissions energy before purchasing RECs or carbon credits to meet its indirect emissions goals. This practice is challenging because most suppliers do not publish emissions factors until the end of the calendar year and frequent switching among suppliers is restricted. Further, retroactive application of emission factors to prior energy use is not allowable under accepted accounting protocols. In the long term, these challenges will become smaller as California regulations (SB 100) require all electrical energy to be emission-free by 2045.

4 Adaptation Strategies

Climate change will impact many aspects of EBMUD's work and priorities, so a diverse set of adaptation strategies are needed to respond. The following discussion of EBMUD's adaptation planning is organized according to the six goals in EBMUD's Strategic Plan:

- Long-term water supply
- Water quality and environmental protection
- Long-term infrastructure investment
- Long-term financial stability
- Customer and community services
- Workforce planning and development

4.1 Long-Term Water Supply

The uncertainty of future conditions adds complexity when doing long-term water supply planning. Uncertainties can take shape in various forms and include but are not limited to climate change, increased demands, reduced availability of water supply on the Lower Mokelumne River, increased flows for ecosystem enhancement, and evolving regulatory requirements. Resilience in the face of these challenges means that EBMUD needs to be able to adaptively manage, and customers to efficiently use their water. EBMUD's long-term water supply goals include improving its water supply reliability and diversifying its water supply portfolio.

4.1.1 Diverse Water Supply Portfolio

Consistent with California's Water Resilience Portfolio, EBMUD is diversifying its water supplies to enable flexibility and resilience as conditions change. As the state indicated, diversification will look different in each region based on available water resources, but it will strengthen water security and reduce pressure on river systems across the state. Over the last few decades, there have been numerous factors that have contributed to changes in water demand in EBMUD's service area. These factors range from effects of multi-year droughts, recessions, implementation of conservation measures, expansion of recycled water programs, and legislation and building codes which led to long-term shifts in customer usage patterns.

In developing a reliable and robust supplemental supply portfolio that is resilient to climate change, EBMUD not only explored projects within the organization but also looked for opportunities to partner with other agencies. Partnerships can offer solutions that are environmentally sound, cost-effective, and sustainable. Partnerships include collaborating with agencies on water transfer feasibility studies, long-term agreements for dry-year supply, regional groundwater banking/exchange efforts, and surface water storage expansion.

Figure 14 below provides a summary of EBMUD's long-term supplemental supply portfolio and the components. More detail about each portfolio component is described below.

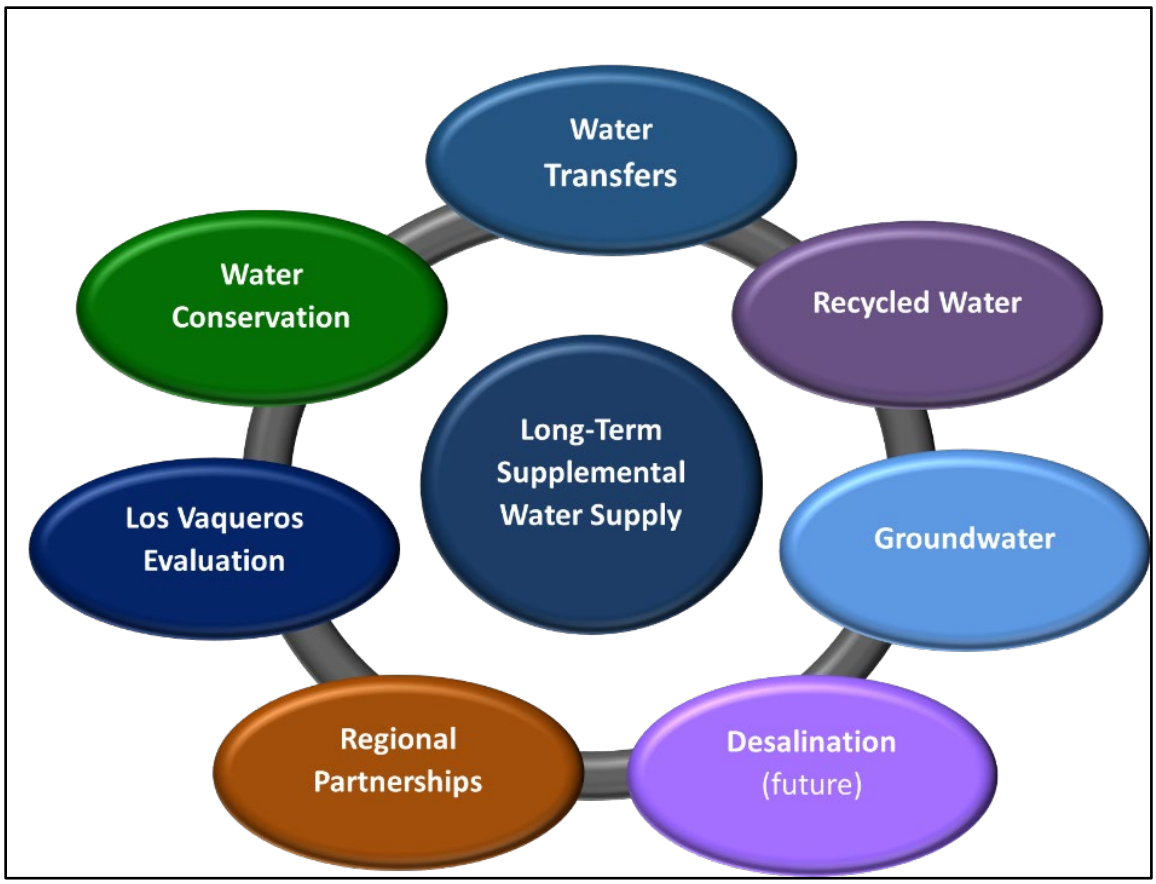


Figure 13. A diverse water supply portfolio.

- **Water Transfers/Central Valley Project (CVP) Drought Supply:** EBMUD has a CVP contract with the United States Bureau of Reclamation for delivery of CVP water during drought years. The contract provided for delivery of up to 133,000 AF in a single qualifying year, not to exceed a total of 165,000 AF in three consecutive qualifying years. In addition, EBMUD has developed a water transfer program to secure dry-year water supplies to meet customer demands. The water transfers consist of both short-term and long-term transfers. Both CVP supply and transfer water can be diverted into the system from the Freeport facility.
- **Recycled Water:** As discussed in more detail in Section 4.1.5, EBMUD has an established recycled water program that currently consists of several operating projects that can produce up to about 9 MGD of recycled water to offset the use of potable water for non-potable purposes such as irrigation and industrial use. EBMUD's current recycled water goal is to achieve 20 MGD by the year 2040, an additional 11 MGD above the current capability.
- **Groundwater:** EBMUD is exploring several conjunctive use and groundwater banking/exchange programs. EBMUD and the City of Hayward developed a Groundwater Sustainability Plan (GSP) for the East Bay Plain Subbasin, which includes basin sustainability indicators and recommends additional monitoring to fill data gaps. Following the guidelines set in the GSP, EBMUD will explore groundwater recharge and extraction opportunities. EBMUD also developed a pilot

project with partners in eastern San Joaquin County. The Demonstration Recharge Extraction and Aquifer Management (DREAM) pilot project is underway and provides EBMUD surface water from the Mokelumne River to San Joaquin County landowners for irrigation of farmlands in lieu of pumping groundwater, thereby storing groundwater for future use. During dry years, EBMUD can recover up to half of the banked groundwater for use in its service area.

- **Desalination (future):** Participation in a future regional desalination project remains a potential option in EBMUD's supply portfolio. EBMUD continues to monitor industry progress and possible needs for this option.
- **Regional Partnerships/Los Vaqueros Evaluation:** EBMUD is a participating agency in the Bay Area Regional Reliability (BARR) Project, along with seven of the Bay Area's largest water suppliers. BARR was formed to jointly explore project to improve regional reliability. A potential regional project is the proposed Los Vaqueros Reservoir expansion project, which is under evaluation by EBMUD and other agencies. Increasing available surface water storage could help EBMUD meet demands during dry years. Through dedicated additional storage, EBMUD could store water in the reservoir in years when surplus water is available and then access that stored supply during droughts or emergencies.
- **Water Conservation:** EBMUD's water conservation program addresses both supply-side (distribution system) and demand-side (customer) factors. Demand-side water conservation measures improve customer water use efficiency and include water use surveys, incentives, education and outreach activities, market support activities, and regulatory programs. Supply-side water conservation measures, which improve efficiency before use by the customer, include distribution system leak detection and repair programs. EBMUD's overall conservation goal is 70 MGD by 2050. More information on the conservation program is provided in Section 4.1.4.

4.1.2 Reservoir Re-operation

Most of EBMUD's water supply is stored in Pardee Reservoir and Camanche Reservoir. These reservoirs have prescriptive flood control requirements through federal permits and authorizations. The flood control requirements – as expressed in flood reservation volume, allowable storage levels through the winter, and corresponding release rates – were recorded in EBMUD's operation permits in 1960 using hydrology measured over the prior 55 years. Flood control requirements are under the jurisdiction of the U.S. Army Corps of Engineers and have not been significantly modified in the last 63 years.

Recently, a broad research effort with participation from the National Weather Service, Scripps Institution of Oceanography, U.S. Army Corps of Engineers, California Department of Water Resources, academic institutions, and others has focused on modernizing flood control by developing better precipitation forecasting tools, better runoff predictions, and more flexible operating rules. These advancements, known collectively as Forecast Informed Reservoir Operations, or FIRO, allow dam operators to temporarily encroach into flood reservation space under certain conditions and when warranted. EBMUD staff are reviewing these new advancements and have recently completed installation of a new high-definition Doppler weather radar station on Rocky Ridge, one of the highest elevations in the East Bay, to assist real-time forecasting.

Use of FIRO is limited for EBMUD operations because of the flow release restrictions at Camanche Dam and physical limitations of downstream levees. Refinements to EBMUD operations provided by FIRO (if any) should be examined in conjunction with expected future extreme hydrology. Expected impacts from climate change and incorporation of additional historical hydrology data may modify expected watershed runoff.

Figure 14. Rocky Ridge High Definition Doppler Radar Unit, December, 2022.

Changes to reservoir operations may also be an opportunity to expand groundwater conjunctive use projects in San Joaquin County. Transferring surface storage to groundwater storage may provide more operational flexibility while also expanding EBMUD's drought storage and helping to recover local groundwater levels.

4.1.3 Water Rights Protection

EBMUD holds water rights that allow diversion of water from the Mokelumne River watershed, local watersheds in the East Bay, and from the Sacramento-San Joaquin Delta.[1] Each of these water rights has terms that define the quantity of water EBMUD can divert, when and where the water can be diverted, the place where the water can be used and how the water can be used. Like all water rights in California, many of the terms in EBMUD's water rights were defined based on the available hydrologic record, existing senior water right holders, or existing regulations at the time the water right was issued.

However, climate change is expected to reduce snowpack, shift precipitation patterns, and increase the frequency and intensity of droughts or floods that will be very different from the hydrologic record under which the water right terms were defined. These hydrologic changes make it challenging for all water right holders in California, including EBMUD, to reliably predict water availability under a given water right over longer planning horizons.

[1] See General Manager C. Chan to Board of Directors, April 6, 2023, Information Memorandum, Summary of EBMUD's Water Rights.

Key measures EBMUD is currently investigating or implementing to respond to the challenges climate change poses to water rights include:

Figure 15. Water rights protection.

- **Data Collection & Monitoring:** EBMUD has flow, rain, and snow gages it uses to track hydrology, and is currently investigating installation of soil probes and other devices that can help track changing hydrologic conditions.
- **Monitor Climate Science & Research:** EBMUD monitors climate change science and research, sends staff to technical conferences, and periodically meets with industry leaders.
- **Updated Water Availability Modeling:** EBMUD is currently updating water supply models with new climate change science to better understand the availability of water supply under the terms of its water rights and maximize beneficial uses (e.g., consumptive or protecting fisheries).
- **Conservation and Recycled Water:** EBMUD will continue to reduce potable water demands through these programs while avoiding forfeiture of existing water rights due to the resulting lower beneficial use.
- **Forecast Informed Reservoir Operations:** EBMUD is evaluating whether reservoir operations can be further modified within the terms of existing water rights to adapt to larger storms and/or longer droughts.
- **Regional Collaboration:** EBMUD is involved in several regional water supply planning efforts (e.g., Los Vaqueros Reservoir, groundwater banking) to enhance its water supply reliability during droughts.
- **Legislative Monitoring & Engagement:** EBMUD is actively monitoring legislation with attention on policies that have a direct nexus to EBMUD's water supply reliability and resilience, water rights, and water management.

4.1.4 Water Conservation

EBMUD has a long history of promoting water conservation, and it continues to be an important component of EBMUD's overall water supply portfolio. The Water Conservation Strategic Plan (WCSP), updated in 2021, serves as a roadmap for helping EBMUD to meet its long-term water supply reliability goals, prepare for droughts, and comply with regulatory requirements. It sets out water conservation goals and details the programs, strategies, and methodologies required to meet those goals.

The 2021 WCSP update covers a ten-year planning horizon, from 2021 through 2030. It builds on previous work and has been developed to meet the water conservation target of 70 MGD conserved in the year 2050. The WCSP also takes into consideration the requirements of state and federal regulations. In particular, the California Long-Term Water Conservation Framework, which was in development during the drafting of this document, sets agency targets for water efficiency based on factors such as population, landscape areas, and water loss.

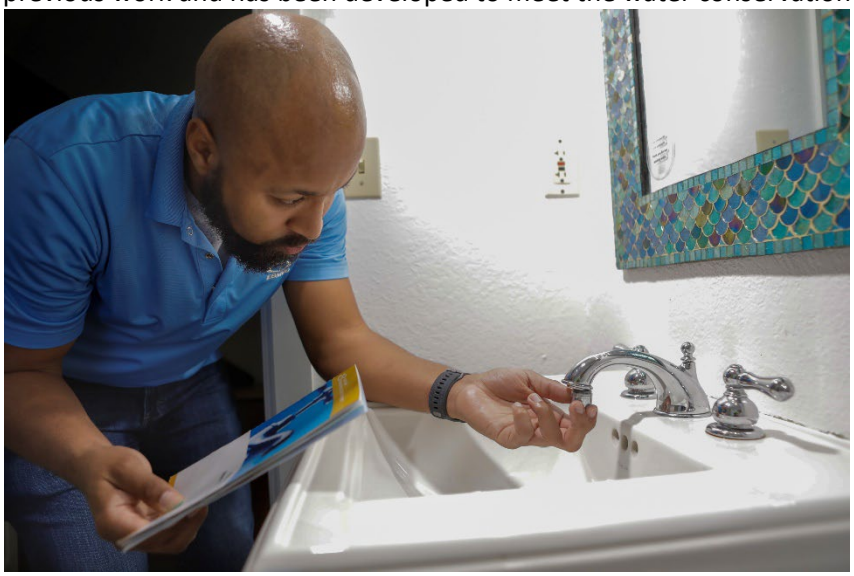


Figure 16. Installing an aerator on a bathroom faucet.

An important component of EBMUD's water conservation program is to quantify and track activities and water conservation savings over time. Achieved water conservation is the amount of water saved by EBMUD's customers as a result of updates to codes and regulations, the natural replacement of fixtures, and active savings from EBMUD's own conservation programs. The 2050 Demand Study evaluated achieved savings from 1994 through the year 2018 and calculated a total achieved conservation savings of 46 MGD. Since the 2018 Demand Study it is estimated that an additional 4 MGD of savings has been achieved for a total of 50 MGD through 2023.

History of Water Conservation and Adapting to Changing Customer Usage Patterns

Demand management, including water conservation, has been an important piece of EBMUD's water supply planning and policies since the 1970s. The Water Conservation Division was established in 1986 to implement water conservation efforts identified in the 1985 UWMP. EBMUD completed its first WCSP in 1994, which helped develop a structure for the programs, set goals, and outlined methodologies for program development and tracking.

Early phases of EBMUD's conservation programs focused on activities like rebates for water efficient appliances such as toilets and clothes washers. Over time as these rebates reached market saturation, demand hardening, and as programs matures, more program focus will be on changing behaviors and attitudes towards water use, which may be more difficult.

Conservation Culture to Maintain Efficient Water Use Levels

Changes in technology and communications provide challenges and opportunities for the Water Conservation Program. New tools such as social media can help to spread water conservation messaging widely and rapidly. Customer expectations regarding communications are also evolving; customers will

soon expect EBMUD to communicate with them in different formats, or with different frequency and content.

As EBMUD exits another drought and customer's water use remains low, EBMUD is in the development phase of creating a campaign centered around creating a "Conservation Culture".

Conservation culture is about developing positive attitudes, beliefs, norms, and behaviors with a focus on everyday actions that result in long-term water conservation as opposed to short-term drought response. The campaign will emphasize social, economic, and environmental resiliency by recognizing the multiple benefits of water conservation and invites customers to participate in creating and sharing a culture together. The campaign will integrate/support EBMUD's three communication pillars: Dedication to reliably serving the community; investing for the future; and environmental stewardship.

Long Term Framework Legislation and Making Water Conservation a California Way of Life

Following the 2014-2015 drought, the California legislature passed a set of laws (AB 1668 and SB 606) known as "Making Water Conservation a California Way of Life" in 2018. The laws directed the state to develop a new regulatory approach that builds on the Water Conservation Act of 2009 but shifts the focus to achieving greater long-term water use efficiency. The proposed regulations referred to as the Long-Term Framework seek to promote: using water more wisely; eliminating water waste; strengthening local drought resilience; improving agricultural water use efficiency; and strengthening drought planning.

These four goals have created a framework for urban water suppliers and end-users throughout the State to achieve greater water use efficiency by setting an aggregate maximum water use objective for each urban water supplier that they are required to meet. The urban water use objective will be based on four standards: indoor residential use, outdoor residential use, outdoor commercial, industrial, and institutional (CII) use with dedicated irrigation meters, and water loss reduction. Urban water suppliers are not required to meet an individual standard but can choose to invest more in one area versus another so long as they meet their overall urban water use objective.

4.1.5 Water Recycling

EBMUD continues to build a resilient and sustainable water supply through diversifying the water supply portfolio. Recycled water use is a critical element of EBMUD's water supply management policies, as any demand met with recycled water reduces the demand for limited drinking water supplies. The recycled water program increases water supply reliability and lessens the effects of extreme rationing during droughts.

EBMUD has been recycling water for irrigation and in-plant processes at its MWWTP since 1971 and began its first golf course recycled water irrigation project in 1984. The Board of Directors created the Office of Water Recycling in 1988 to centralize and expand water recycling. The initial goal of the EBMUD recycled water program was to expedite recycled water projects in response to the drought that lasted from 1987-1992. Today, the goal of the program continues to be the planning, developing, and implementing recycled water projects throughout EBMUD's water service area to reduce the demand on its drinking water supplies.

Currently, there is approximately 9 MGD of recycled water production capacity within EBMUD's water service area. Recycled water uses can include irrigation, office building toilet flushing, and feed water to cooling towers and industrial boilers. Given numerous factors, including statewide population growth, climate change, ecosystem challenges, and regulatory pressures, EBMUD envisions additional expansion of water recycling efforts will be necessary in the future. To prepare for the future needs of expanded water recycling efforts, EBMUD has set a goal to meet or exceed 20 million gallons per day (MGD) of recycled water by 2040.

EBMUD's Current non-potable projects include:

- North Richmond Recycled Water Facility (North Richmond)
- Richmond Advanced Recycled Expansion (RARE)
- East Bayshore Recycled Water Project (EBRWP)
- San Ramon Valley Recycled Water Project (SRVRWP)
- San Leandro

North Richmond and RARE provide water to the Chervon refinery in Richmond and are EBMUD's largest non-potable project totally approximately 7.5 MGD combined.

The EBRWP project produces high-quality recycled water at EBMUD's own wastewater treatment plant, located at the foot of the Bay Bridge. EBMUD distributes this water through a system that currently offsets drinking water use for irrigation, toilet flushing and building cooling in parts of Oakland and Emeryville. Future phases of the project will reach customers in Berkeley, Albany and Alameda.

Figure 17. East Bayshore Recycled Water Treatment Plant.

The SRVRWP Project is a joint effort involving the Dublin San Ramon Services District (DSRSD)-EBMUD Recycled Water Authority (DERWA) and the City of Pleasanton that provides recycled water in the San Ramon Valley. This water is used for irrigation at parks, greenbelts, school playfields, common area landscapes and golf courses. When complete, the project will serve portions of the Blackhawk, Danville, Dublin, Pleasanton and San Ramon communities.

EBMUD constructed the San Leandro Recycled Water Facility to recycle water from the City of San Leandro's Water Pollution Control Plant. This project can provide irrigation water to a golf course in Alameda and City of Alameda landscaping.

EBMUD continues to work towards the goal of 20 MGD of recycled water by the year of 2040 while considering some challenge, including:

- Availability of recycled water supply: Some areas are supply-constrained, and there is not enough supply to meet the demand. For example, no new recycled water customers can be

connected to EBMUD's recycled water distribution system in the San Ramon Valley unless supplemental supply is secured.
- Location of treatment and distribution infrastructure: EBMUD aims to install recycled water pipelines and infrastructure in locations where there are a lot of high water users. However, many large irrigators are located far from each other, and far from existing recycled water treatment and distribution facilities.
- Cost-benefit evaluation: EBMUD must evaluate cost-effectiveness of potential recycled water projects, and must prioritize funding projects that provide regional benefits, support equity and sustainability.

EBMUD's recycled water program has grown significantly since its inception, provides recycled water to a diverse array of customers, and includes partnerships with other wastewater treatment entities in its water service area. As one of only a handful of large water utilities in California that provide both drinking water and wastewater services to a large urban area, this creates opportunities for integrating recycled water into its source water portfolio, including the future possibility of potable reuse. EBMUD has identified some key strategies for continued growth of the recycled water program: 1) innovation, 2) regional collaborations, and 3) sharing resources.

- Innovation: Decentralized or package treatment plants at user sites, onsite reuse.
- Regional collaborations: Collaborate with other regional agencies to secure more supply and regional projects.
- Resource sharing: explore cost-sharing opportunities.

4.2 Water quality and Environmental Protection

EBMUD is also concerned with ensuring the resilience of the natural resources with which it is entrusted. This includes protecting watershed lands and waters, land management to restore forest health and prevent catastrophic wildfires, and reducing nutrient loading into San Francisco Bay.

4.2.1 Fisheries and Wildlife

Changes in rainfall patterns can drive changes in both the terrestrial and aquatic environments. Amphibious and aquatic species may be the most discernibly affected by changes brought by climate change. EBMUD has the greatest ability to mitigate impacts of climate change in aquatic environments through sound management of its water infrastructure, including reservoirs, ponds, rivers and streams. More work needs to be done to determine the extent to which terrestrial species are impacted by climate change and potential strategies to mitigate these impacts.

Freshwater fish in California are highly vulnerable to the predicted effects of climate change on freshwater environments. Most native fish (82%) and some non-native species (19%) are predicted to suffer population declines and become more restricted in their distributions. Fish requiring cold water (<22C), are particularly likely to go extinct. Many non-native fish species are expected to thrive, with some species increasing in abundance and range, which may also further inhibit native fish survival. However, some non-native species may be negatively affected by loss of habitat due to drought, and by other effects of climate change Atmospheric rivers, increases in rain on snow events, impact the ability

to manage river temperatures and flows in a way that benefit the resources. Lack of early season fall rains, increased drought, impact salmon and steelhead migration timing and habitat availability.

Amphibians that breed in ephemeral freshwater habitats are also vulnerable to climate change. Small ponds and vernal pools are expected to have reduced hydroperiods or may not fill at all during droughts, resulting in loss of breeding habitat or reproductive failure. Permanent water bodies, such as reservoirs and large ponds, may provide some refuge to amphibians during dry years. However, permanent aquatic features often provide limited habitat due to the presence of invasive American bullfrogs and/or predatory fish. Shifting precipitation patterns and increased temperatures may alter the timing of: breeding migrations to aquatic habitats, metamorphosis, and juvenile emigration from breeding sites. Additionally, drought and temperature increases may also render amphibians more susceptible to pathogens such as Bd and Ranavirus. Native amphibians that exhibit greater plasticity in life history may be less impacted by the negative effects of climate change in the long term.

Changes in the climate regime will impact our management regime on the Mokelumne River and East Bay watersheds in significant ways going forward. As a result, adaptive management on the Mokelumne and East Bay watersheds will become even more important in the future. EBMUD will likely have to find innovative ways to manage the cold water pool in reservoirs with increasingly erratic rainfall patterns. Management of ponds and wetlands will likely have to be modified to more efficiently utilize existing water sources and to utilize new water sources on the watersheds.

East Bay Watershed

Priority habitats that may be impacted by climate chance include perennial and intermittent streams, watershed ponds, wetlands and reservoirs. Potential impacts generally include spatial and temporal changes in flows (higher or lower), changes in annual water temperature profiles, reduced hydroperiod, reduction in reservoir cold water pool, degraded water quality due to increased importation of water from other sources and increases in harmful algal blooms (HABs). Priority Species that may be impacted include resident rainbow trout and steelhead, native stream and reservoir fishes, and native amphibians including California red-legged frogs, foothill yellow-legged frogs, and other native amphibians. Generalized impacts are increased water temperatures, lower or more flashy stream flows and reduced hydroperiod.

Mokelumne Watershed and Lower Mokelumne River

Priority Habitats in the Mokelumne Watershed include the mainstem Lower Mokelumne River, other perennial and intermittent streams, watershed ponds, wetland/vernal pool habitats and reservoirs. The impacts in these habitats mirror those in the East Bay listed above.

Priority Species in the Mokelumne watershed include chinook salmon, steelhead/rainbow trout, Pacific Lamprey, native stream and reservoir fishes, western pond turtle, as well as native amphibians including California red-legged frog, foothill yellow-legged frog, California tiger salamander, and vernal pool obligate species (tadpole shrimp, fairy shrimp and western spadefoot toad). Potential risks include increased water temperature, reduced streamflow or increased flashy streamflow, and reduced hydroperiod and increase in HAB occurrence.

Figure 18 Fish in Lower Mokelumne River. Photo by Kingmond/Young Photography.

Detailed, species and habitat specific status, goals and objectives and priority protection measures are detailed in the Water and Natural Resources Climate Change Priorities for EBMUD Watershed Lands document.

4.2.2 Wildfire Mitigation

The advent of climate change-induced wildfire directly impacts EBMUD's ability to meet its fire management objectives, due to the dramatic escalation of fuel load, fire weather, and fire intensity. Proactive fuel management activities over the past two decades will prove insufficient if the four-fold increase of fuel loads seen in 2020 in the East Bay continues to escalate in the future, primarily due to significant tree die-offs and growth of decadent brush. EBMUD's ability to mitigate the dramatic increase in fuel loads can be slowed or hampered by several factors including staffing and funding limitations as well as environmental regulations. State and Federal sensitive species protections such as bird nesting protections may limit methods, locations, and seasons of work. The EBMUD East Bay Low Effect Habitat Conservation Plan protection measures limit the methods and amounts of scrub and chaparral removal on the East Bay watershed. EBMUD is currently requesting an amendment to the HCP to better accommodate required fire and fuels management activities under the effects of climate change.

Climate change effects that may directly impact EBMUD's ability to manage fire hazards include:

- Earlier start and lengthening of the wildfire season
- Increased fuel load from drier vegetation
- Shortened period for fuel reduction activities
- Expansion of nesting season (regulatory changes over time to increase protection) February thru September 15
- Increased disease and die-off of trees
- Increased incidents of Red Flag days
- Greater intensity of wildfire conflagrations and destructive potential.

Subsequent effects of catastrophic wildfire on EBMUD lands would include:

- Increased risk of loss of property and life
- Increased erosion and effect on water quality
- Loss of habitat areas and biodiversity
- Increased GHG emissions and air pollution
- Increased public health impacts from hazardous particulates.

To manage these impacts and ensure resilience for itself and local communities, EBMUD conducts fuel reduction on its watershed lands. In the East Bay, EBMUD also partners with other entities like local fire departments and the East Bay Regional Park District (EBRPD) on fuel reduction programs. Some recent examples of vegetation management in the East Bay include:

- The Tunnel East Bay Hills Fuel Break. EBMUD collaborated with the Moraga-Orinda Fire Department on the constructions of a 3-mile long, shaded fuel break near the community of Canyon. Work was funded by a $6.5 million CAL Fire grant.
- San Pablo Pine Forest. Approximately 750 dead pine trees were felled and processed on site over a 60-acre area.
- Grizzly Peak Fuel Break. Annual fuel mitigation, primarily consisting of hand removal of brush, is conducted over a 3-acre fuel modification zone. This zone is also one of the East Bay's most diverse botanical gardens.

EBMUD is also a member of the East Bay Hills Emergency Forum, which also includes representatives from local cities, the EBRPD, CAL Fire, U.C. Berkeley and the Lawrence Berkeley National Laboratory. Forum members coordinate to share information on fire hazards in the East Bay Hills and collaborate on development of fire safety standards and cores, incident response and management protocols, public education programs, training, and fuel reduction strategies.

EBMUD also conducts fuel reduction in its upcountry watershed lands. In addition, EBMUD is a member of the Upper Mokelumne River Watershed Authority (UMRWA), a Joint-Powers Authority that conducts forest health and other projects in the upper Mokelumne River watershed. UMRWA signed a Master Stewardship agreement with the U.S. Forest Service in 2016 and serves as lead partner for planning and implementing fuel reduction and restoration projects in the Eldorado and Stanislaus National Forests. In 2023, UMRWA launched its Forest Projects Plan Phase 1, which will conduct forest treatments on 26,000 acres in the Eldorado National Forest. UMRWA plans to complete the work by 2031.

Figure 19. UMRWA forest treatment site in Pioneer.

UMRWA is also beginning planning for Phase 2, which would include 225,000 acres of forest treatments in the Stanislaus and Eldorado National Forests.

4.2.3 Extreme Wet Weather – Effects on Sewers and Infiltration/Inflow

Wet weather events are predicted to occur less frequently in the future, though with greater intensity. These events will present greater challenges for the handling of stormwater, particularly that which is able to make its way into the regional sanitary sewer system as either inflow or infiltration (I&I).

Since 2014, in an effort to significantly reduce the impacts of I&I, EBMUD and its seven wastewater Satellite agencies have been rehabilitating both the public and private infrastructure of the collection system while meeting the requirements of a Wet Weather Consent Decree. The Consent Decree has requirements through Fiscal Year (FY) 2036 which are designed to reduce the frequency of sanitary sewer overflows and to eliminate discharges from EBMUD's three wet weather facilities (WWFs) for storm events up to a certain size. Future extreme events will require EBMUD to utilize the treatment capabilities of the WWFs to best protect the environment and to continue to improve the water quality within the San Francisco Bay.

Since the implementation of the Consent Decree rehabilitation efforts, significant reduction in the discharge volumes from EBMUD's WWFs have been realized, demonstrating the effectiveness of the work performed. As future rehabilitative efforts are completed at a similar level of efficacy as the previous work, further reductions in I&I and its associated impacts are expected. The removal of I&I frees up both conveyance capacity within the regional collection system, as well as storage volume within detention basins, which would become available for handling the impacts of future extreme events. As a result, while the impacts of extreme events may strain EBMUD's interceptors and possibly result in sanitary sewer overflows, the on-going and future rehabilitative efforts will provide improved protection of the water quality of the Bay. Additionally, strategic capital planning and rehabilitation can reduce the likelihood of impacts from such events.

In the event of sea level rise, the expectation would be that the localized groundwater levels would increase, potentially exposing sewer mains to additional groundwater infiltration not currently observed. As the rehabilitative measures are creating leak-free conditions within the collection system, elevated groundwaters level may not result in additional I&I impacts over time.

4.2.4 Nutrients in San Francisco Bay

EBMUD, along with 39 other identified dischargers to the San Francisco Bay, is currently covered by the second San Francisco Bay Nutrients Watershed Permit issued by the San Francisco Regional Water Quality Control Board (RWQCB). EBMUD's first nutrient watershed permit was issued in 2014 and expired on June 30, 2019, and its current nutrient permit will expire on June 30, 2024. The purpose of the current nutrient permit is to track and evaluate plant performance, fund nutrient research and monitoring programs, support load response modeling, and evaluate nutrient reduction potential of recycled water and natural systems. The third nutrient watershed permit is expected to impose nutrient discharge caps. Nutrient discharge limits would be based on the individual dischargers' current total inorganic nitrogen (TIN) load (in kg TIN/day) to the San Francisco Bay. Originally, these limits were

expected to be easily achievable until growth in the dischargers' area increases beyond current TIN discharges, making nitrogen treatment and removal from the discharger's effluent necessary.

After many months of planning, EBMUD staff responded to the proposed limits by implementing a biological nitrogen removal (BNR) process in EBMUD's secondary biological treatment process in summer 2020. The secondary process was split using 25 percent of the secondary process' facilities for testing the BNR process, and the other 75 percent for the regular process. The test produced good results and encouraged staff to continue testing in 2021 and 2022.

Toward the end of August 2022, a red tide algal bloom covered the San Francisco Bay and resulted in massive fish kills. Public outcry was substantial and forced the RWQCB to consider much stricter nitrogen removal requirements from dischargers. Currently, 60 percent TIN removal is being considered by the RWQCB. Per EBMUD's Integrated Main Wastewater Treatment Plant Master Plan, this amount of treatment would push EBMUD into a $2 billion BNR facility. Following three dry seasons of full-scale piloting using only 25 percent of secondary treatment facilities, especially following the 2022 fish kill, EBMUD staff was ready to conduct the BNR pilot process using 50 percent of the secondary facilities. The BNR process achieved 60 percent TIN removal from 50 percent of the total wastewater treatment plant flow. Next year EBMUD plans to operate the BNR process for 75 percent of its wastewater flow, and in 2025, its plan to treat 100 percent of the flow through the BNR process.

As a first step to achieving nitrogen compliance, EBMUD discontinued deliveries of high nitrogen trucked-in wastes, mainly animal blood, as of early June 2023. Blood wastes made up about 8-8.5 percent of EBMUD's discharged TIN. Between halting blood wastes and operating the BNR process at 50 percent flow, EBMUD's TIN discharge was reduced by almost 40 percent.

EBMUD continues to work with the Bay Area Clean Water Agencies and the RWQCB to achieve TIN discharge requirements that will protect both the San Francisco Bay and EBMUD's ratepayers.

4.2.5 Water Quality Impacts from Climate Change

EBMUD has six Water Treatment Plants (WTPs). Three offer conventional treatment including rapid mixing, flocculation, sedimentation, filtration, and free chlorine disinfection. The other three, inline WTPs treat water directly from Pardee and offer a simpler treatment process consisting of coagulation, filtration, and disinfection. They do not have a sedimentation process given the pristine, low-turbidity water that typically comes from Pardee reservoir. Climate change may lead to changes in water quality that require different kinds of water treatment at EBMUD WTPs.

Historically, Pardee Reservoir has had very low concentrations of algae due to its low levels of nutrients and the relatively cold temperatures. The absence of algae, coupled with consistently low turbidity, allows the water to be treated by inline filtration, which is very cost effective. As the temperature warms, rates of algal growth will increase. Algal growth can cause various water quality problems such as a reduction in WTP capacity, formation of taste and odor causing compounds, increases in disinfection byproduct formation, and in some cases formation of toxic compounds.

Some types of algae (diatoms) have significant negative impacts on inline filter performance, causing premature filter clogging even at relatively low concentrations. As filter performance degrades, the capacity of the WTPs to produce water decreases. Treatment technologies exist to allow water with filter-clogging algae to be treated, including clarification and oxidation before filtration. These technologies are already in place at EBMUD's WTPs treating water from the East Bay reservoirs, but not at those treating Pardee water.

Other types of algae, notably cyanobacteria or blue-green algae, can impart compounds into the water that cause objectionable tastes and odors. Treatment technologies such as ozonation can remove these odorous compounds, although costs are high. Ozonation has not been installed at EBMUD's WTPs that treat Pardee water. Under some conditions, cyanobacteria can produce toxic compounds in events known as Harmful Algal Blooms (HABs). HABs are expected to become more common as temperature increases. In general, ozonation is effective against cyanotoxins, but it has not been installed at EBMUD's WTPs that treat water from Pardee Reservoir.

Wildfire Risk to Water Quality

The most significant climate change risk in terms of water quality is the increased risk of wildfires in the watershed, particularly large, high intensity wildfires. Higher temperatures and recurring drought lead to increased tree mortality, increased fuel loads, and risk of significant wildfires. Both short term and long-term water quality impacts are expected as a result of wildfires.

In the immediate aftermath, following the first rain events, significant runoff of material into the Mokelumne River will occur. Due to the loss of vegetative cover, soil, burnt plant material and other debris will be washed into the river and the reservoir. Dramatic increases in particulate loading, metals concentrations, and nutrients are expected during this time. Even with clarification and ozonation processes, the WTPs will struggle to treat this water. After the initial runoff impacts subside, there will be longer term impacts from increased in nutrients after a wildfire, resulting in higher algal productivity. Data from other watersheds experiencing high intensity wildfires indicate this water quality degradation can persist for years. The Mokelumne River Watershed is particularly vulnerable since much of the watershed is in "Very high to High fire threat" area according to studies completed by the US Forest services and the Sierra Nevada Conservancy.

Atmospheric River Risk to Water Quality

An additional risk from climate change is the expected increase in intensity of atmospheric river events, including rain-on-snow events. These events can result in significant amounts of sediment in raw water flowing through EBMUD's conveyance system into its inline WTPs, which do not have adequate treatment capabilities to address high turbidity. High turbidity following major atmospheric river events challenged EBMUD treatment operations in 2017, 2019, 2022, and 2023, resulting in reduced capacity, more disinfection byproducts, and reliance on alternative local reservoir supplies (San Pablo, Briones, and Upper San Leandro) due to Pardee Reservoir water being impaired. Large atmospheric river events can even trigger landslides that release significant amounts of sediment into the reservoir all at once. On December 31, 1997, after a major rain-on-snow event triggered dozens of large-scale landslides across

the Sierra Nevada mountain range, Pardee Reservoir was unavailable for 65 days. EBMUD will improve treatment technologies at its inline WTPs in anticipation of more frequent water quality challenges.

4.3 Long-Term Infrastructure Investment

EBMUD is making significant investments in its water and wastewater infrastructure to make it more resilient to the effects of climate change, and to prepare for future changes that could disrupt operations. This includes upgrades to EBMUD's WTPs that would help EBMUD respond to the effects of wildfires or harmful algal blooms, an innovative pipeline rebuild program, and significant upgrades at the MWWTP to prepare for rising sea levels and ensure reliability of the electrical supply.

4.3.1 Capital Improvements to Address Water Quality Impacts of Climate Change

As discussed in Section 4.2.5, climate change is expected to increase the risk to water quality due to algal blooms, wildfire, and increased atmospheric rivers. EBMUD is making significant investments in its reservoirs and WTPs to ensure that it can treat varying water quality.

Watershed Mitigations for Harmful Algal Blooms

San Pablo Reservoir is an important reservoir for EBMUD. It supplies two WTPs, San Pablo and Sobrante, and the reservoir and WTPs are both key to treating water supply during drought and supplementing Pardee Reservoir when conditions in the latter are poor. This reservoir routinely experiences taste and odor episodes caused by algal blooms.

The San Pablo Reservoir Hypolimnetic System project will improve source water quality by adding a hypolimnetic oxygenation system to a reservoir that suffers from algae blooms, heavy metal release, and presence of methylmercury. This project will help reduce harmful algal blooms and address aesthetic issues related to T&O compounds and manganese release.

Water quality in Briones Reservoir has been changing due to more extreme weather events, high algal content, and high concentrations of T&O compounds. The reservoir serves Orinda, Lafayette, and Walnut Creek WTPs, inline plants that have little to no capability to address T&O issues for extended periods.

The Briones Reservoir Water Quality Study focuses on providing information that would support water quality improvements at Briones Reservoir. It will provide a series of technical reports that characterize the chemical, physical, and biological processes of the reservoir and a preliminary design for capital improvements to address water quality issues at the reservoir. The study is expected to be complete in early Winter/Spring 2025 and will likely recommend a hypolimnetic oxygenation system similar to the one installed at San Pablo Reservoir.

Water Treatment Plant Improvements

Orinda WTP

Orinda WTP is one of EBMUD's two "must run" WTPs. It is an inline WTP that lacks the ability to deal with high turbidity caused by climate-driven atmospheric river events, drought, or wildfire events. It is reliant on aqueduct pre-chlorination for disinfection. EBMUD is currently implementing projects to improve treatment capabilities at Orinda WTP.

The Orinda WTP Disinfection Improvements Project will improve drinking water quality by reducing the formation of disinfection byproducts and improving the reliability of pathogen inactivation. The improvements will provide superior *Cryptosporidium p*. and *Giardia i.* inactivation. The project helps maintain high water quality amidst changes in the watershed due to climate change and drought.

Figure 20. Orinda UV disinfection project.

EBMUD has also explored the feasibility of pretreatment and ozone improvements at the Orinda WTP to help expand the capacity of the WTP during poor water quality events. Long term plans have been developed but are out of the current capital planning horizon; EBMUD may choose to implement these plans in the future to respond to water quality impacts (for example, if HAB become normalized at Pardee Reservoir).

Lafayette WTP

Lafayette WTP is an inline WTP that lacks the ability to deal with high turbidity caused by climate-driven atmospheric river events or wildfire events. It does not have a dedicated disinfection process and relies on aqueduct pre-chlorination at the Walnut Creek WTP for disinfection, which can result in high DBPs from climate driven atmospheric rivers, droughts, or wildfire events.

The Lafayette Interim Improvements Project will improve water quality and reliability through the construction of a dedicated chlorine contact basin that reduces reliance on aqueduct pre-chlorination and the formation of disinfection byproducts. The project will also improve the WTP's reliability and capacity during high-turbidity events by replacing the filter media and underdrains of existing filters that are currently out of service due to poor filter performance and by increasing the storage capacity of the spent backwash water equalization basin. The current project schedule has design in 2024-2026 followed by approximately two to three years of construction.

Sobrante WTP

Sobrante WTP is one of EBMUD's three conventional WTPs. It can reliably treat supplemental Sacramento River supply from Folsom South Canal Connection Project (FSCC) /Freeport Project during drought and can be utilized when Pardee Reservoir water is impaired due to climate-driven events.

The Sobrante WTP Reliability and Capacity Improvements Project improves capacity, reliability, and water quality by adding processes typically found in modern WTPs. It improves the pretreatment process through enhanced solids removal and improves disinfection efficiency and reliability with a new, well-baffled chlorine contact basin. The project is currently in the planning phase with an anticipated start of construction in the 2030-2035 timeframe.

Upper San Leandro WTP

The Upper San Leandro (USL) WTP is typically run seasonally. Like Sobrante WTP, it is a primary conventional WTP that can be used to reliably treat supplemental Sacramento River supply from Folsom South Canal Connection Project (FSCC) /Freeport Project. It is expected that the EBMUD will rely more on USL and Sobrante WTPs to supplement Pardee Reservoir water as climate-change effects worsen.

The USL WTP Maintenance and Reliability Improvements Project improves capacity, reliability, and water quality by adding processes typically found in modern WTPs. It improves the pretreatment process through enhanced solids removal and improves disinfection efficiency and reliability with a new, well-baffled chlorine contact basin. The project is currently under construction and should be completed in 2026/2027.

Walnut Creek WTP

Walnut Creek WTP is the second of EBMUD's "must run" WTPs. It is an inline WTP that lacks the ability to deal with high turbidity caused by climate-driven atmospheric river events or wildfire events. The plant has limited ability to handle problems caused by HABs, like T&O issues or certain cyanotoxin contaminants.

Walnut Creek WTP is part of the District's East-of-Hills system. Unlike the West-of-Hills system, which has a mix of conventional and inline WTPs, the East-of-Hills system is served only by inline WTPs, which is vulnerable to impaired water. The projects below will convert the Walnut Creek WTP to a conventional WTP, which can handle significantly impaired water quality allowing the WTP to continue reliable operations during water quality challenges. In addition, a filters upgrade project will aid the plant when water quality is impaired. Phase 1 of construction is planned for 2027.

The Walnut Creek WTP Pretreatment Project will improve the WTP's treatment capabilities by adding ballasted flocculation and ozone to EBMUD's second largest WTP (160 MGD). The project also improves EBMUD's ability to reduce T&O compounds and emerging contaminants in the watershed and protects EBMUD against impaired water quality due to wildfires and high turbidity events caused by excessive run-off. The project will make Walnut Creek WTP the District's fourth conventional WTP, greatly expanding EBMUD's capacity to deal with impaired water and strengthening the reliability of treatment in its East-of-Hills system.

The Walnut Creek Filters Improvements Project will improve water quality by replacing filter media and underdrains with modern filter underdrains and media, improving turbidity removal, filter performance, and overall finished water quality. These improvements are most beneficial when water quality is impaired due to climate change impacts.

San Pablo WTP

San Pablo WTP, the District's third conventional treatment plant, is a standby WTP that is typically operated during major facility outages at the Orinda WTP or Claremont Tunnel, major assets in the EBMUD portfolio. The long-term plan for San Pablo WTP is to decommission the facility and rely on the combined improvements of the USL WTP Maintenance and Reliability Improvements Project, Sobrante Maintenance and Reliability Improvements Project, and the Wildcat Pumping Plant Project. Until those

projects are completed and the WTP is decommissioned, the San Pablo WTP can serve to increase treatment of local supplies from San Pablo Reservoir when water quality is impaired at Pardee Reservoir because of climate change.

Distribution Reservoirs

Demand has declined approximately 30% over the last 20 years. This lower use increases the residence time of treated water in storage. When combined with higher air temperatures and continued use of chloramines as a disinfectant for the distribution system, these factors collectively increase the onset of various water quality issues including lower of disinfectant concentrations and other issues related to nitrification in treated water.

It is expected that with climate change and increased temperatures EBMUD will have more difficulty maintaining chlorine residual in drinking water reservoirs, which can result in lower distribution system water quality. Increased temperatures accelerate the deterioration of chlorine residual in distribution reservoirs, which can result in nitrification and decreased water quality.

EBMUD is engaged in a multi-decadal effort to right-size reservoirs since the transition from free-chlorine to chloramines in the 1990s. When distribution reservoirs are due for rehabilitation, EBMUD reviews the anticipated demands and water quality history to identify updated storage needs. Many reservoirs that were originally constructed when free chlorine was the dominant disinfectant have been downsized since chloramines were introduced to balance disinfection by-product production and operational, emergency, and fire-flow storage.

When distribution reservoirs are rehabilitated or new reservoirs are constructed, twin tanks are normally installed to facilitate the operation of the distribution systems to meet climate change. Operation of twin tanks improves operational reliability by allowing short-term removal of one reservoir should any situation require such action (including seasonal outages due to changing demand periods), increases operational flexibility by improving water quality operations efficiency by cycling of the reservoirs during low-demand periods yet providing sufficient fire flow during a single reservoir outage, increases maintenance flexibility by not having to install a temporary reservoir for planned or emergency outages, reduces Engineering, Operations, and Maintenance staff time for future outages and need to install and remove a temporary tank and minimizes or eliminates local manual staff operations for water quality maintenance.

In 1990, EBMUD had 170 reservoirs in service with a combined volume of 920 million gallons; today, 132 reservoirs with 620 million gallons are in service. Each year EBMUD strives to rehabilitate two or three reservoirs while continuing to right-sizing overall distribution system storage. Upcoming projects that will reduce storage in distribution reservoirs include:

- Central Reservoir Replacement: This project will demolish the existing 150-million gallon (MG) reservoir, which is currently oversized and has experienced water quality issues, to three 14-MG reservoirs to maintain water quality and meet new lower system demands. Construction is scheduled for FY27-32.

- Almond Reservoir Replacement: This project will demolish the existing 6.6 MG reservoir and will replace with two 1.8-MG reservoirs to maintain water quality and meet new lower system demands. Construction is scheduled for FY26-28.
- Castle Hill Reservoir Removal: This project will remove the 3.0-MG Castle Hill Reservoir from the distribution system to maintain water quality and meet new lower system demands. Construction is scheduled for FY24-26.

4.3.2 Pipeline Rehabilitation and Replacement

EBMUD's Pipeline Rebuild program is a multi-department initiative to innovate and improve EBMUD's pipeline replacement work by streamlining and improving workflows, driving innovation through carefully planned and reviewed pilots, bridging workgroups with new collaborations, and documenting and scaling proven results. EBMUD's pipeline distribution system is comprised of approximately 3,800 miles of pipe 16-inch and smaller, some constructed more than a century ago. The pipe materials include cast iron (CI), asbestos cement (AC), and plastic, including polyvinyl chloride (PVC) and high-density polyethylene (HDPE). EBMUD's foremost challenge is keeping this distribution network robust, resilient, and reliable to provide high quality, round-the-clock water service. Main breaks can lead to water outages, water loss, and potential damage to public and private assets. To improve reliability and resiliency, new hazard-resilient materials have been researched, tested, and installed that can better withstand ground movement from seismic events, landslides, and liquefaction expected in the EBMUD service area. In addition, alternative approaches to selecting which pipes to replace and utilizing advanced modeling and artificial intelligence are standard EBMUD practices.

Figure 21. EBMUD employees observe 4-point bending test on a 24" pipe with fiber optic sensors at UC Berkeley Center for Smart Infrastructure.

Expected climate change impacts in low-lying areas adjacent to San Francisco Bay include coastal flooding and higher groundwater levels due to sea-level rise. While building levees and sea walls can mitigate coastal flooding, higher ground water levels can impact pipelines in the distribution system, making the soils more saline from the salt water and creating a more corrosive environment. To mitigate corrosion, EBMUD is installing class 54 Ductile Iron (DI) pipe providing a higher-than-normal wall thickness in the pipe barrel with an additional zinc coating that prevents corrosion. In addition to the zinc coating, the DI pipe is wrapped in V-Bio, an enhanced polyethylene encasement that further inhibits corrosion and can successfully protect the pipe in aggressive environments, such as saline groundwater. If environmental conditions include contaminated soils along with high ground water levels, welded steel

pipe may be specified as an alternative to DI pipe. These additional strategic measures for new pipeline installations will reduce and minimize impacts due to climate change.

4.3.3 Adapting to Sea Level Rise

EBMUD's wastewater infrastructure is largely located in areas close to the San Francisco Bay shoreline, and therefore potentially exposed to impacts from rising sea levels. Based on global climate change projections from the Intergovernmental Panel on Climate Change the Bay Area is projected to experience a sea level rise of 5 to 24 inches, with 12 inches being the most likely, by 2050. By 2100, the Bay Area is expected to experience a 17- to 66-inch sea level rise, with 36 inches considered the highest probability. All these projections assume that no new shoreline infrastructure, such as sea walls or wetland restoration, will be implemented in the intervening time.

Given these estimates of sea level rise, the MWWTP is expected to avoid major inundation impacts due to rising sea level prior to 2050, unless the sea level rise is paired with extreme (100-year) storm events where excessive wind causes a storm surge, increasing shoreline inundation during the event. Under these circumstances, the higher sea levels paired with the storm surge could result in temporary inundation and limit accessibility to wastewater infrastructure. The projected inundation in these extreme storm event scenarios is not expected to interrupt treatment processes at the MWWTP due to the limited extent of the inundation expected under those conditions. By 2050, EBMUD remote wastewater facilities, including eight interceptor system pump stations the San Antonio Creek WWF, and the Dechlorination Facility, will be at risk of inundation during extreme (100-year) storm events. All these facilities would continue to operate during this partial inundation, but access to the facilities may be difficult or impossible for staff until the water recedes.

In addition to the flood inundation risk, there will be increasing impacts to MWWTP and WWF operations as sea level rises. As the sea level rises gradually, the capacity of EBMUD's Effluent Pump Station (EPS) will proportionately and incrementally decrease because it will be pumping against more pressure; a 12-inch rise in sea level corresponds to a 3 percent, or 10 million gallons per day (MGD), reduction in discharge capacity. A 42-inch rise corresponds to an 8 percent, or 25 MGD, reduction. Similarly, the WWFs will each have incrementally decreased effluent discharge capacity. These impacts are moderate, depend largely on the tide level at the time of operations, and will be manageable with cost effective modifications to existing equipment and upgrades to equipment. The Wastewater Capital Improvement Program includes projects to evaluate and address these impacts.

In recognition of these projections, EBMUD is incorporating improvements to all projects located in the zone most likely to be affected by sea level rise. During planning and design of new projects, staff follows the "Planning and Design Guidelines for Sea Level Rise," which provide recommendations about locating facilities outside of vulnerable areas. If relocation is unavoidable, the guidelines give direction for locating vulnerable equipment, such as electrical and controls equipment, above projected inundation levels to ensure, even decades into the future, that the facility will operate during temporary inundation.

EBMUD controls relatively small areas of land within the areas vulnerable to sea level rise, and none directly at the shoreline. As a result, EBMUD has joined the neighboring cities, counties, and agencies to

proactively plan for sea level rise, looking for opportunities to partner on multi-benefit projects to reduce its impacts. EBMUD is an active member in the Bay Area Climate Action Network and the San Leandro Bay Oakland-Alameda Estuary Adaptation Working Group to identify adaptation projects within its shared region, find funding, and provide support to make the projects successful.

4.3.4 MWWTP Power Reliability and Emergency Backup Power Generation

Due to the increased risk of wildfires started by failing power transmission infrastructure, PG&E has used public safety power shutoffs (PSPSs) as a tool to reduce failures during periods of high-risk weather. As a result, EBMUD anticipates power outages to be more frequent until PG&E renews and replaces its aging infrastructure and PSPSs are no longer needed. In addition, due to rising temperatures, periods of extreme hot weather will be more frequent in the future and will result in greater peak power demand. Peak power demand can strain the power transmission and distribution system and can result in power outages, such as those that occurred in August 2020.

EBMUD's Wastewater Department is prepared to mitigate the risk of power outages with its configuration of power supply infrastructure. At the MWWTP, the bulk of power supply is provided by the Power Generation Station (PGS), which can supply up to 9 megawatts (MW) of power at maximum biogas production. Supplemental to that, power is supplied from the grid via two connections, known as Line C and Line L, each supplying approximately 5 MW of power. Having two sources of grid power provides redundancy, and rarely do both connections go down simultaneously. Finally, emergency generators are installed strategically at the most essential MWWTP and remote facilities to provide continuous operation even during power outages.

Despite this existing redundancy, neither PGS nor the grid connections can meet peak demand individually, and EBMUD remains vulnerable if PGS is down, or both Line C and Line L are down. In most cases, the redundancy works, but in certain circumstances, like peak wet weather events when power outages are more likely to occur, the current system can fall short. EBMUD is working on the Electrical Resiliency Master Plan (ERMP), which is focused on increasing the resiliency of the power supply infrastructure at the MWWTP to address the increasing frequency of power outages. The ERMP is considering improvements, such as a brand new, high-capacity grid connection, that could supply enough power to meet peak demand, or additional back-up power generators to supplement power supply and maintain continuous operations through all power outages.

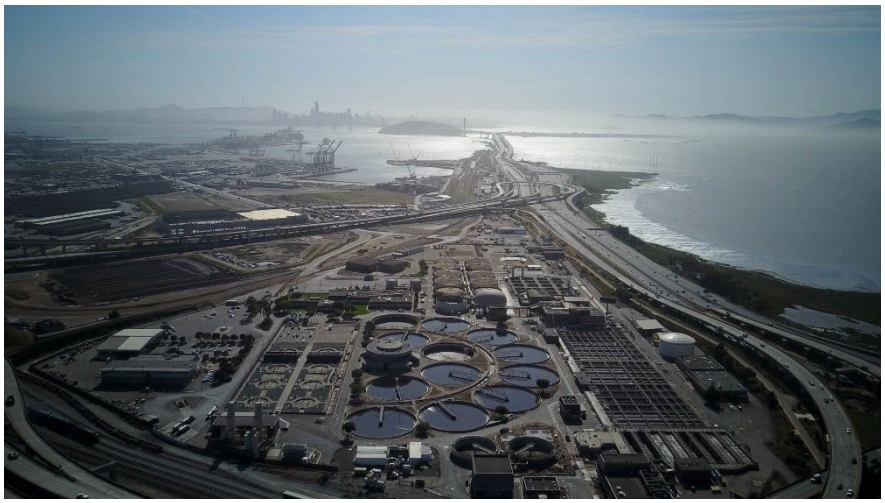


Figure 22. EBMUD's Main Wastewater Treatment Plant in Oakland.

4.3.5 Delta Risk and Mokelumne Aqueducts

EBMUD owns and operates the Mokelumne Aqueduct system consisting of three large diameter steel transmission pipelines ranging in diameter from 63 to 87 inches that conveys water 90 miles from Pardee Reservoir to EBMUD's service area. The first of the Mokelumne Aqueducts was completed in 1929, and two additional aqueducts were completed later in 1949 and 1963, respectively. EBMUD uses the aqueducts to convey water from the Mokelumne River to its service area. The Mokelumne Aqueducts are a vital supply line in EBMUD's water distribution system; on a long-term basis, the Aqueducts provide virtually all of EBMUD's drinking water supply to its East Bay service area and its nearly 1.4 million inhabitants. EBMUD therefore takes great care in safeguarding the Aqueducts.

Approximately 16 miles of the Aqueduct alignment traverse the San Fransico Bay Delta (Delta) which consist of tracts of agricultural land below sea level protected by levees constructed in the mid 1800's. The levees and the pipeline supports are vulnerable to failure during a large earthquake due the soft soil ground conditions and the proximity to major earthquake faults. The ground supporting the Aqueducts and levee fill materials is susceptible to liquefaction, ground settlement, and levee lateral spreading. The Aqueduct support structures are vulnerable to failure due to seismic shaking forces as well as the loss of ground support for the pile supported foundations during an earthquake. Levee failures and subsequent flood flows will result in extensive scour damage and inundation.

An ongoing hazard in the Delta is subsidence caused by farming activities which accelerate oxidation of the peat layer, increase wind erosion, and contribute to soil compaction. The land parcels that the Aqueducts traverse have subsided approximately 8 to 10 feet and are currently on average 15 feet below sea level and continue to subside.

Climate change is expected to increase the likelihood and size of extreme rainfall events, such as warm tropical atmospheric rivers prematurely melting accumulated snowpack over a very short period, which leads to severe river flow events. Larger flood events combined with the ongoing ground subsidence in the Delta exacerbate the risk of future levee failure events and potential failure of the Mokelumne Aqueducts in the Delta.

Mokelumne Aqueducts Resiliency Project (MARP)

EBMUD has been evaluating risks to the existing Mokelumne Aqueducts since 1980, when the Middle River levee failed on Lower Jones Tract. This event resulted in the failure of a parallel railroad embankment which caused two locomotives and rail cars to derail and be deposited by flood waters dangerously close to the Mokelumne Aqueducts. The flood waters also inundated the Mokelumne Aqueducts' pipelines. When the railroad embankment failed, EBMUD was fortunate that scour from flood flows from Lower Jones Tract to Upper Jones Tract did not destroy the pile supported foundation of one or more of the Mokelumne Aqueducts in the area.

The vulnerability of the pipelines was again highlighted in 2004 when the Middle River levee failed and inundated the Mokelumne Aqueducts on Upper Jones Tract. These events and other levee failures in the Delta highlight the significant risk of damage to the Mokelumne Aqueducts due to flooding and seismic events. Consequently, in 2005, EBMUD began a comprehensive hazard assessment, risk evaluation and alternatives analysis on the Mokelumne Aqueducts to safeguard this critical infrastructure in its

alignment through the Delta. The report recommended short-term measures and long-term measures to address the hazards and concluded that a deep tunnel across the Delta would be the most cost-effective solution to mitigate the hazards. To address this potential public health impact from a failure of the Mokelumne Aqueducts due to earthquake and levee failure hazards, the MARP is being planned to improve the resiliency of the existing Mokelumne Aqueducts by replacing them in a proposed buried tunnel within the existing Mokelumne Aqueduct right-of-way for the 16.5-mile reach where they cross the Delta. The tunnel would be constructed from four access shafts along the alignment. Two of the existing Aqueducts would be permanently decommissioned and one would be retrofitted and kept for operational flexibility and future outages of the tunnel. Design of the project is scheduled from 2026-2031 and the construction schedule has not yet been determined.

4.3.6 Reducing Infiltration/Inflow into Sewer Pipes

The impacts of stormwater and groundwater entering the regional sanitary sewer collection system as I&I have significant impacts regarding the volume of flows entering EBMUD's facilities for treatment. In the 1970s, EBMUD, its seven wastewater Satellite agencies, the U.S. Environmental Protection Agency, and both the state and regional Water Quality Control Boards collaboratively planned and implemented the construction and operation of EBMUD's three WWFs to handle the increased flows which occur during storm events. In 2014, EBMUD and its wastewater Satellite agencies entered into a Wet Weather Consent Decree designed to both reduce the discharge volumes from the WWFs as well as the occurrence of sanitary sewer overflows through the rehabilitation of aging infrastructure which allows I&I to enter the sewer system.

The Consent Decree includes components for addressing I&I on both public and private infrastructure. These rehabilitative measures are required through FY 2036, which should result in EBMUD no longer discharging from the WWFs during storm events up to a certain size. As part of the Consent Decree work, EBMUD will continue to implement a regional investigation program to identify and remove sources of I&I which are not currently being addressed by planned public rehabilitation projects or through private properties that have yet to meet one of the triggers which require demonstrated proper performance of the infrastructure as part of one of the Private Sewer Lateral programs.

As the regional collection system becomes more leak-free, locations for I&I entry will become scarcer. Under climate change, in the event of elevated sea level rise or increased intensity of storm events, the ongoing removal of I&I will allow for available conveyance capacity for handling the impacts in the future.

4.3.7 Infrastructure Support for Fleet Zero Emission Vehicles

EBMUD is reviewing the infrastructure needed to fuel our future fleet that will evolve according to EBMUD's emission targets and the California Air Resource Board's Advanced Clean Fleets (ACF) regulation.

Figure 23. EV charging station with Pardee Reservoir in background.

The plan will provide planning level detail for support facilities (i.e., electric vehicle supply equipment (EVSE) and/or fueling infrastructure) that will need to be installed at approximately twenty-seven (27) EBMUD facilities, including identifying offsite improvements required to ensure adequate fuel supply (e.g., power) at each facility to accommodate the charging infrastructure for fleet vehicles as well as employee vehicle charging. The plan will describe a phased approach that will guide future capital investments in the fleet and facilities. Given EBMUD owns, operates, and maintains critical infrastructure, the plan will evaluate and recommend alternatives that improve sustainability and resilience, as well as ensure EBMUD's emergency response capabilities.

4.3.8 Dam Safety

Climate change is expected to alter precipitation patterns in ways that increase the likelihood and size of extreme rainfall events or lead to extreme river flow events caused by warm tropical atmospheric rivers prematurely melting accumulated snowpack over a very short period (i.e., rain on snow events). Both extreme precipitation and rain on snow events can lead to an increased risk of rapid reservoir filling and potential structural or operational failure without proper planning and mitigation.

Although EBMUD manages 24 dams, only the dams associated with Briones, Camanche, Chabot, Lafayette, Pardee, San Pablo, and Upper San Leandro reservoirs are potentially affected by extreme hydrologic events. A rain on snow event would only affect the Pardee and Camanche reservoirs, which are located in the Mokelumne River Watershed in the central Sierra Nevada. EBMUD's remaining dams are part of the potable water distribution system and do not capture rainfall from a watershed that is expected to be significantly influenced by climate change. Table 2 summarizes dams that are expected to be affected by climate change.

Table 4. Summary of Dams Potentially Affected by Climate Change

Dam	Watershed Area, square miles	Potential Climate Change Related Event	
		Extreme Precipitation	Rain on Snow
Briones & San Pablo Dam[(a)]	32	✓	
Lafayette Dam	1.2	✓	
Pardee & Camanche Dams & Dikes[(a)]	621	✓	✓

Upper San Leandro & Chabot Dams[a]	42	✓	

[a] Dams are in series and located in the same watershed.

Existing Regulatory Oversight and Flood Studies

Regulatory oversight of EBMUD's dams is provided by either the Federal Energy Regulatory Commission (FERC) and/or the California Department of Water Resources Division of Safety of Dams (DSOD). Pardee and Camanche Dams are dual jurisdictional as they come under both FERC jurisdiction (since they have hydroelectric power-generating facilities) and DSOD jurisdiction; the remaining dams are only under DSOD jurisdiction.

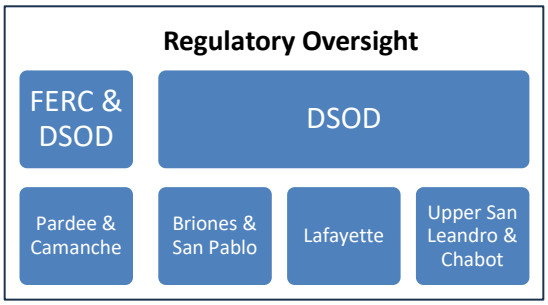


Figure 24. Dam safety regulatory oversight.

As part of dam safety assessment, both FERC and DSOD require dam owners to calculate a probable maximum precipitation (PMP) event and the resulting probable maximum flood (PMF) event for dam, spillway, and appurtenant analysis. The PMP represents the maximum amount of rainfall that could theoretically occur within a specific geographic area during an extreme weather event as defined by the National Oceanic and Atmospheric Administration (NOAA); the PMF is the resulting flood runoff associated with the PMP.

EBMUD has completed PMP/PMF studies for each of the dams potentially affected by climate change. All the dams and spillways are currently considered safe to operate under the latest regulatory inspections and ongoing surveillance and monitoring program. Although the District has recently completed updated PMP/PMF studies for Pardee and Camanche Dams using Hydrometeorological Report No. 59 (HMR-59) in 2022, the updates are still being reviewed by FERC. In addition, EBMUD is performing more detailed site-specific studies. FERC and DSOD input could significantly change the results of the PMP/PMF studies, so the updates are not yet final and remain draft.

Adaptation Strategy for More Extreme Precipitation and Rain on Snow Events

The current regulatory framework around PMP/PMF studies requires the use of procedures that rely on historic hydrology and past extreme events (e.g., HMR-59). Although research institutions and regulators across the world, including FERC and DSOD, are investigating and researching how to incorporate climate change and probabilistic risk-based analysis into PMP/PMF studies, a new regulatory framework is at least a few years away.

Consequently, EBMUD is actively investigating and implementing several key measures to respond to the challenges climate change poses to dam safety, including:

- **Emergency Preparedness Program:** EBMUD has Emergency Action Plans that guide response during emergency conditions at the dams, and continuously exercises and updates these EAPs in response to new information, including PMP/PMF studies.
- **Completing Site-Specific PMP/PMF:** EBMUD is actively investigating the use of more refined PMP/PMF approaches that better account for localized watershed climatological conditions, including the effects of climate change.
- **Monitor Climate Science & Research:** EBMUD monitors climate change science and research, sends staff to participate in technical conferences (e.g., AGU[2], ASDSO[1], SEDHYD[1], USSD[1]), and regularly meets with industry leaders and regulators.

Figure 25. Dam safety program components.

- **Data Collection & Monitoring:** EBMUD has flow, rain, and snow gages it uses to track hydrology, and is currently investigating installation of soil moisture probes and other devices that can help track changing flood conditions within key watersheds susceptible to extreme precipitation (i.e. atmospheric rivers) and/or rain on snow events.
- **Forecast Informed Reservoir Operations:** EBMUD is preparing to evaluate the feasibility of whether reservoir operations can be adaptively managed to move water out of the reservoir ahead of a major extreme event to avoid or reduce potential flooding while improving water supply and flows for the environment.

4.4 Long-Term Financial Stability

Long-term financial stability and resilience is an important component of EBMUD's response to climate change. As part of the overall financial planning and budgeting process, EBMUD carefully considers revenue fluctuations that could occur from increasing droughts and other climate change impacts and delineates the funding for the many EBMUD projects and initiatives discussed in this document that aim to improve EBMUD's climate resiliency. Additionally, EBMUD maintains financial policies that support climate change mitigation and adaptation beyond EBMUD's service area. Some examples of the ways EBMUD financial initiatives address climate change include:

- Drought Surcharges: EBMUD's adopted drought surcharges help pay for the acquisition, delivery, and treatment of more expensive supplemental supplies and to offset decreased revenues due to decreased water consumption during drought. The drought surcharge also incentivizes conservation when it is needed most.
- Green Bonds: EBMUD issues Green Bonds when projects meet our criteria for enhancing climate resilience or providing other environmental benefits. Issuing Green Bonds helps develop this market and potentially increase demand from investors with environmental goals and mandates.

[2] AGU: American Geophysical Union; ASDSO: Association of State Dam Safety; SEDHYD: Sedimentation & Hydrology; USSD: United States Society on Dams.

- Investing: EBMUD explicitly considers Environmental, Social and Governance (ESG) factors and objectives in its investment process.
- Cross-Sector Collaboration: EBMUD has been working with US EPA's Creating Resilient Water Utilities (CRWU) initiative on integrating climate readiness into financial assessments.

Careful attention to potential climate change impacts supports EBMUD's overall financial health. EBMUD's bond ratings are presently high, reflective of a strong financial profile and stable underlying economy. For the Water and Wastewater systems, the ratings are AA+ from Fitch, Aa1 from Moody's, and AAA from S&P. These high ratings help keep EBMUD's borrowing costs low.

4.4.1 Drought Surcharges

In 2015, EBMUD's Board adopted a staged system of drought surcharges designed to recover water-shortage related costs. The drought surcharge is calculated based on projected increased drought costs and decreased revenues because of reduced water sales at each stage.

EBMUD recently implemented the drought surcharge. In April 2021, water storage level projections were low enough for the Board to declare a Stage 1 drought. No drought surcharge is associated with a Stage 1 drought, so cash reserves were used for drought expenses at this time. With the drought continuing into 2022, the Board declared a Stage 2 drought in April 2022 and later implemented an 8 percent drought surcharge that went into effect on July 1, 2022. Until the drought declaration was suspended by the Board the in the spring of 2023, revenues from the drought surcharge were used to pay for approximately half of the drought expenses, preventing excessive reliance on cash reserves.

EBMUD is conducting a new Cost of Service Study starting in late 2023 with planned completion in early 2024. All drought surcharges will be revisited and potentially revised through this Cost of Service Study.

4.4.2 Green Bonds

EBMUD has issued green bonds for four Water System revenue bond issuances and one Wastewater bond issuance since 2015. EBMUD is planning to issue new revenue bonds in Fiscal Year 2024 (FY24) for the Water and Wastewater systems with a portion of these bonds being green bonds. Green bonds differ from traditional bonds in that the proceeds are intended to be used for environmentally beneficial projects.

There is no single green bond standard mandated by a regulatory body nor universally accepted by investors. Accordingly, since 2015, EBMUD has implemented its own set of green bond standards as Guidance for Issuing Green Bonds. In selecting projects for green bond financing, EBMUD staff focus on the projects that best meet the criteria detailed the guidance and exclude those that appear marginal or that have unresolved sustainability issues.

EBMUD's commitment to the triple bottom line (in this instance, long-term economic viability) is underscored by this work in promoting the development of the green bond market through the responsible use of green bonds to finance qualifying capital projects.

4.4.3 Investing

EBMUD recognizes its responsibility to positively impact society and that investments are one way to affect societal change. Given similar levels of safety, liquidity and yield, EBMUD will prioritize investment in entities that promote sound environmental stewardship, invest in its people through policies that support equity, inclusion and access; and meet high standards of transparency, supporting the rule of law and protecting stakeholder rights. EBMUD Policy 4.07 (Investments) stipulates that:

It is the intent of the District to align its investment decisions with its policies, mission, and values. Safety, liquidity, yield and diversification are the District's primary investment objectives. The District will also consider sound Environmental, Social and Governance (ESG) factors and objectives in its investment process, subject to the prudent investor standard.

Additionally, the EBMUD-sponsored Employee Retirement System (ERS) has committed to considering ESG factors in its portfolio management practices. These factors are considered in asset allocation, the hiring of investment managers, and reviews of manager performance. This includes yearly reviews of ERS investment managers with respect to ESG and diversity, equity and inclusion (DEI). The ERS is also a signatory on several investor-led initiatives to improve environmental stewardship. This process is ongoing, and both EBMUD and the ERS Board are continually looking for ways to use investments as a way to encourage positive societal outcomes.

4.4.4 Cross-Sector Collaboration

As part of US EPA's Creating Resilient Water Utilities (CRWU) initiative, EBMUD is participating in a workgroup consisting of subject matter experts from the financial and insurance industries, academia, and other water utilities. In a series of meetings from June 2022 through January 2023, the workgroup focused on integrating climate readiness into financial assessments, infrastructure investments, public outreach, and financial disclosures, and to identify effective strategies for water sector utilities to improve their operational and financial strength.

As discussed by the workgroup, water sector utilities that inform stakeholders about their climate change risk and current and future resiliency efforts will likely have more favorable outcomes in the financial and insurance markets. Climate risk management strategies are rapidly evolving, and water sector utilities and the financial and insurance industries are working to translate climate change-related risks into defensible and quantifiable financial assessments. The use of consistent methods, performance indicators, and comparable disclosures may help to better align practices, move to a more quantitative approach to assessing and managing climate risk, and improve climate change resiliency in the water sector. The workgroup plans to continue its efforts to improve the alignment between the water sector and the financial and insurance industries.

4.5 Customer and Community Services

Customer service is the core of EBMUD's mission. Ensuring that customers have access to water – one of the most fundamental, basic human needs – is key to having resilient communities. Emergency preparedness and response is an important part of overall resilience to climate change, so that EBMUD can recover quickly from emergencies and ensure that customers have the services they depend on. EBMUD also offers a robust Customer Assistance Program to help low-income customers maintain their

water service. This program will be increasingly important as climate change disproportionately affects frontline, disadvantaged communities.

4.5.1 EOP and BCP

EBMUD policy 7.03 ensures preparations are made and maintained to respond to and recover from emergencies, and the processes to do so are documented in the Emergency Operations Plan (EOP) and the Business Continuity Program Plan (BCPP). These preparations include plans to address scenarios related to all-hazards, including climate related hazards.

The all-hazards preparation approach includes situations related to both natural and malevolent emergency situations (e.g., a major regional earthquake, cyber security breach, dam failure, pandemic), including those related to climate-related disasters, such as: increased risk of fire, flooding, droughts, atmospheric rivers, extreme temperatures.

The EOP is certified by the Environmental Protection Agency and includes, in part: legal authorities; an all hazards planning model; emergency response structure (ICS/SEMS/NIMS); assumptions; emergency notification systems; organization, roles and responsibilities; mutual assistance; recovery and restoration; and cost recovery.

The EOP also includes two sets of annexes: functional and hazard specific response. Functional annexes consist of processes used for emergency preparedness and response, for example: how to declare an emergency (Emergency Declaration Annex); describe the public notification process for significant water quality issues (Tier 1 Public Notification Annex).

The hazard specific response annexes are technical and relate to a specific emergency, for example: public safety power shut off response (PSPS Annex) and Earthquake Annex.

The EOP is exercised annually, thus continually refined and employees trained on it. Employees are also trained as a Disaster Service Worker and the need to be prepared at both work and home for disasters. Supporting the preparation efforts, EBMUD offers employees a no-interest loan to be used to purchase emergency supplies.

The BCPP documents describe how after an emergency interruption EBMUD will continue its business functions and recover. There are more than twenty unique Business Continuity Plans throughout EBMUD which are exercised annually and renewed bi-annually. These plans include critical vendor information, succession planning, alternate work locations, contacts and more.

Due to EBMUD's commitment to always meet the mission statement, the EOP and BCPP documentation are clear guides for constant preparations to respond to and recover from climate-related emergencies.

4.5.2 Customer Assistance Program

EBMUD recognizes that climate change will have a disproportionate impact on some customers, particularly marginalized and disadvantaged communities. A full discussion of EBMUD's policies and plans related to equity and environmental justice are discussed in more detail in Chapter 5; this section focuses specifically on programs to support low-income customers.

The adaptation projects strategies described in this document may be expensive to implement. Projects to upgrade water treatment plants or equip facilities for ZEV charging will add to the overall capital budget. Operating expenses may also increase because of climate change; for example, more frequent or severe droughts may require additional purchases of supplemental supplies. These costs will result in rate increases that may make it more challenging for some customers to pay their water bill.

For over 35 years, EBMUD has offered a Customer Assistance Program (CAP Program) to help customers who are struggling financially. The CAP Program helps pay a portion of the water bill for qualifying low-income customers and homeless shelters. Qualifying single-family residential customers may receive up to 50 percent off the standard bimonthly service charge and 50 percent off their home water use (up to a maximum of 1,050 gallons per person per month). EBMUD also offers a 35 percent discount on its wastewater treatment charge and has worked with local sewer districts to offer similar discounts. Customers may also request payment plans and extensions.

Figure 26. EBMUD's CAP program recently celebrated 35 years of helping low-income customers.

In 2020, the Covid-19 pandemic highlighted the importance of water service for public health. EBMUD's Board made the decision to stop residential shutoffs due to nonpayment and reconnect customers who had been disconnected. In December of that year, the Board approved a resolution affirming the right to safe, clean, accessible water and ended water service shutoffs for long-delinquent accounts, ensuring that customers have enough water for basic needs.

In 2023, EBMUD launched a pilot program to help CAP customers replace inefficient plumbing fixtures and repair leaks. Household leaks can be expensive, both due to repair costs and the resulting higher water bill. A 2021 survey of EBMUD CAP customers indicated that many were concerned about the costs of upgrading inefficient fixtures or struggled to repair leaks. This pilot program will pay for basic leak repairs and fixture upgrades, both helping customers to reduce their water bill and conserving water.

4.6 Workforce Planning and Development

EBMUD's Strategic Plan also has a goal for workforce planning and development. Adapting to climate change will require a workforce with the skills and knowledge needed to operate and maintain new systems, innovate in response to challenges, and understand and respond to the emerging science of climate change. EBMUD must also consider the safety of its employees as they perform their critical work.

4.6.1 Heat Events, Wildfire Smoke

An important aspect of adaptation of climate change is ensuring the safety of EBMUD's workforce. EBMUD has numerous policies and procedures related to creating a safe work environment.

Extreme heat events are anticipated to increase because of climate change, creating a particular hazard for some workers. Human beings need to maintain their internal body temperature within a very narrow range of a few degrees above or below 98.6° F. People suffer from heat illness when their bodies are not able to get rid of excess heat and properly cool.

During an hour of heavy work in hot weather, the body can easily sweat out one quart of water. Prolonged sweating can deplete the body of water and salt causing dehydration. As dehydration gets worse the body can no longer keep its temperature within the normal range, sweating stops and severe heat illness occurs. In heatstroke, a person's body temperature can rise rapidly causing damage to the brain, muscles, and vital organs, posing a risk of death if not treated urgently.

In response to this increasing threat Cal OSHA issued the *Heat Illness Prevention in Outdoor Places of Employment* regulation in 2005. That regulation can be found at Title 8 of the California Code of Regulations §3395. EBMUD has created Required Safety Practice (RSP) 4300 – *Heat Illness Prevention,* which describes its response and actions during high heat events. RSP 4300 calls for access to drinking water and shade, training for employees and supervisors on how to identify signs and symptoms of heat illness, and appropriate emergency actions to take when employees are observed to be suffering some sort of heat illness.

Similarly, smoke from increasingly frequent wildfires is composed of harmful chemicals and tiny particles suspended in the air that present significant health hazards for workers who are exposed to it. These particles can irritate the lungs and cause serious health effects, such as reduced lung function, bronchitis, worsening of asthma and heart failure.

In response to this increasing threat Cal OSHA issued a *Protection from Wildfire Smoke* regulation in 2021. That regulation can be found at Title 8 of the California Code of Regulations §5141.1. EBMUD has created Required Safety Practice (RSP) 5900 – *Wildfire Smoke Protection*, which describes our response and actions taken during poor air quality events. When the Air Quality Index (AQI) is greater than 150 outdoor work is limited to urgent, critical, and continuous operations only and employees are offered respiratory protection, generally an N95 respirator. As the AQI worsens, different actions are triggered. Details can be found in RSP 5900.

The Workplace Health and Safety section monitors the AQI and alerts staff when it reaches an unhealthy level. Often during poor AQI events it will be concentrated in a certain area of our service area and we will direct our employees to avoid the areas with poor AQI and move to the areas with improved AQI.

4.6.3 Workforce Development

Workforce development is an important component of meeting the challenges of climate change. Implementing the projects and strategies described in this document will require a diverse workforce with a range of skills and training.

EBMUD is currently in the early stages of developing a Human Resources Strategic Plan that will guide how the organization attracts, develops, and retains the staff needed to meet its mission. A recent survey conducted by the Society for Human Resources Management found that environmental, social and

governance initiatives were important to Millennials and members of Generation Z in considering potential employers. Thus, “telling the story” of EBMUD’s work related to climate change and sustainability may be helpful in recruiting and retaining employees from these demographics.

EBMUD also has several internship and training programs designed to help develop the workforce it needs. The organization offers college and trade internships for engineering, human resources, industrial maintenance and machining, and instrumentation technicians. EBMUD also offers in-house training programs that prepare trainees for regular, full-time employment, including the Pipeline Academy that trains plumbers for work in pipeline maintenance crews.

5 Collaboration and Community Participation

EBMUD has long been a leader in its work on climate change, including participation in research and collaboration with local, state, and federal entities. Given the potential impacts of climate change, EBMUD is also aware of the need for robust community engagement and participation as it develops its response plans.

5.1 Industry Leadership and Research

EBMUD collaborates with other agencies, professional organizations, nonprofits, research institutions, and local, state, and federal government to develop and implement strategies to address climate change. Locally, EBMUD partners with organizations lie the San Francisco Regional Water Quality Control Board and the San Francisco Estuary Institute to discuss and plan climate change mitigation measures and adaptation strategies for the Bay Area. EBMUD participates in the Bay Area Climate Adaptation Network (BayCAN) which provides a forum for coordination and information sharing with local cities, counties, agencies, and community groups working on adaptation strategies and projects for the Bay Area. EBMUD also participates in the Bay Area Regional Reliability (BARR) partnership, a collaboration of eight local water agencies working together to improve water supply reliability through studies and joint projects.

On the State and National level, EBMUD is an active participant in professional and industry organizations working to lead climate change efforts. These include the Association of California Water Agencies, American Water Works Association, the California Association of Sanitation Agencies, the National Association of Clean Water Agencies. EBMUD also participates in more specialized groups like the Alliance for Water Efficiency, which works to promote water conservation on a national scale.

Research and Innovation

EBMUD is an industry leader with a strong history in advancing science through research and innovation. EBMUD also participates actively in state and national industry organizations, often taking a leadership role.

In 2023, EBMUD furthered its commitment to research and innovation by partnering with the University of California at Berkeley (UC Berkeley) School of Engineering to launch the Center for Smart Infrastructure. Based at UC Berkeley's Richmond Field Station, the Center for Smart Infrastructure applies state of the art technology to address infrastructure challenges resulting from climate change, aging infrastructure, and natural hazards. EBMUD provided $1.5 Million to fund one of the Center's first research priorities, the construction of a large-scale, fault-rupture pipeline testing facility. EBMUD and UC Berkeley also collaborated on the development of an undergraduate course, "CE-112," focused on infrastructure operation and management and featuring many EBMUD staff as guest lecturers.

EBMUD is also developing an internal "Office of Innovation" to coordinate research and advance innovation within the organization. The new office includes a new, full-time staff member to help coordinate across the organization.

5.2 Diversity, Equity, and Inclusion (DEI) Strategic Plan

The effects of climate change will not be felt equally. According to the IPCC Sixth Assessment Report, "These impacts disproportionately affect marginalized groups, amplifying inequalities and undermining sustainable development across all regions. Due to their socioeconomic conditions and the broader development context, many poor communities, especially in regions with high levels of vulnerability and inequality, are less resilient to diverse climate impacts."

These communities (often referred to as "frontline communities") may both experience more impacts of climate change *and* have fewer resources to respond and adapt. In EBMUD's service area, this could manifest as increased risk of flooding for communities near the Bay and other waterways, and increased risk of health effects resulting from heat events and poor air quality.

EBMUD is mindful that its own actions could exacerbate these inequalities. For example, the implementation of projects to adapt to climate change could lead to rate increases that make it harder for low-income customers to pay their water bills. Decisions about where to locate facilities or how to complete construction projects could impact local communities, and programs like conservation rebates may be difficult for many customers to utilize if they are not designed with equity in mind. In addition, policies and practices that make it harder for some communities to engage with the organization may make it challenging for those communities to share their concerns or influence decision making.

EBMUD has policies, plans, and programs that relate to the issues of climate impacts on frontline communities. First, EBMUD Policy 7.05 includes a broad statement on Environmental Justice. It commits that EBMUD will conduct its business "in a manner that that promotes equity and affords fair treatment, accessibility, and protection for all people, regardless of race, age, culture, income, or geographic location."

In 2022, EBMUD developed a DEI Strategic Plan that assessed the organization's current state and set a plan for improving equity and inclusion. The DEI Strategy outlined five pillars:

- Leadership Commitment
- Workforce Diversity
- Inclusive Culture
- Supplier Diversity
- Social Responsibility

Pillar 5, Social Responsibility, set a number of goals and objectives related to community engagement and environmental justice and listed specific two-year actions. EBMUD launched several internal work groups to help implement these actions. A Community Engagement Pilot Project is focused on improving engagement with communities with limited English proficiency. The Capital Improvement Program Pilot Project is evaluating EBMUD's delivery of capital projects through an equity lens and recommending improvements to guide EBMUD's engagement with communities impacted by capital projects. EBMUD also formed an Environmental Justice Steering Committee.

The DEI Strategy also includes organization-wide training and development of an equity toolkit that would apply standardized equity principles to project planning and implementation so that project managers can make decisions with equity in mind.

5.3 Education and Outreach

In an era marked by unprecedented climatic shifts and environmental challenges, water agencies find themselves at the forefront of a growing crisis. As extreme weather events, prolonged droughts, and rising sea levels become more frequent, water and wastewater agencies must ensure the reliable supply of clean water to communities while managing the environmental impact of their operations. Effective communication is key to helping the public and peers understand the actions EBMUD is taking, and to communicate actions being asked of them.

Climate change is causing a profound transformation in the water sector. Altered precipitation patterns, increased temperatures, and more frequent and severe weather events are creating new and complex challenges for water agencies. EBMUD's task is to clearly communicate these conditions, and EBMUD's solutions to water supply, water quality, wastewater, and general infrastructure issues. For example, as conditions shift rapidly from drought to deluge, customers may become confused about EBMUD's responses and potential impacts. As another example, the increase in nutrient levels in San Francisco Bay is a complex problem that requires clear actions based on science, at a time when some members of the public may be quick to jump to conclusions. The need for adaptive and resilient strategies has never been greater, and effective communication plays a pivotal role in addressing these issues.

Public Awareness and Education

One of the primary roles of water agencies is to provide safe and reliable water services to communities. Communicating with the public is vital to maintaining trust and ensuring that residents understand the challenges the agency faces as a result of climate change. Public awareness and education campaigns are essential in conveying the importance of water conservation and the potential impacts of climate change on water quality and availability. Effective communication can empower individuals to adopt more water-efficient practices and to support policy changes that enhance water resource management.


customer Pipeline

NOVEMBER/DECEMBER 2023

EBMUD | 100

Small changes, big splash

How many gallons of water do you use in a typical day?

More than 90 percent of EBMUD customers say they either don't know or estimate they use less than 30 gallons a day, according to a recent survey.

In fact, the average East Bay customer uses around 50 gallons a day for drinking, cooking, bathing, dishwashing and laundry. (That doesn't even take outdoor watering into account.)

Yes, our water supply is in much better shape following heavy rains last winter. But as climate change intensifies the swings between wet and dry conditions, our most precious natural resource remains under pressure. So mindful water use is always in season.

Every California household is being asked to continue saving water for our future. Across EBMUD's service area, our goal will be to reduce average indoor water use from 50 to 42 gallons per person per day by 2030 to meet new state standards.

Take EBMUD's online quiz at ebmud.com/calculator (available in English and Spanish) to see how your water use stacks up – then let us help you save! Adopting simple habits and making small changes can make a big difference. We are here to help you make water conservation a way of life with tips, webinars, rebates and more at ebmud.com/conservation.

How can you use less than 35 gallons a day?

Take a five-minute shower	9 gallons
Flush toilet five times	6.5 gallons
Run bathroom faucet for three minutes	3.5 gallons
Run kitchen faucet for five minutes	9 gallons
Do laundry twice a week	4.3 gallon daily average
Run dishwasher three times a week	1.5 gallon daily average
Fix leaks to eliminate water waste	0 gallons
Average daily usage	about 34 gallons*

*Figures based on high-efficiency appliances.

Figure 27. EBMUD's Customer PIpeline newsletter, December 2023.

EBMUD works through various channels to communicate with both customers and non-bill payers on these issues, primarily through traditional media engagement, social media, the Customer Pipeline bill insert, online events, in person events, advertising, and an evolving education program for youth.

Stakeholder Engagement

Water agencies often collaborate with a variety of stakeholders, including local governments, environmental organizations, and community organizations. Effective communication is vital to building and maintaining these relationships. Open and transparent communication with stakeholders fosters a sense of shared responsibility and encourages collective action in addressing climate-related challenges.

EBMUD is increasingly aware of the need to communicate with its diverse audience in more languages to ensure more inclusive understanding. As a result, EBMUD is evaluating its translation practices and evaluating options for improving access for communities with limited English proficiency.

Emergency Response and Preparedness

As climate change leads to more frequent and severe weather events, water agencies must be prepared to respond swiftly and effectively to emergencies such as floods, droughts, and water contamination incidents. Communication systems must be robust, adaptable, and well-practiced to ensure timely and accurate information dissemination. When public health and safety is at stake, offering clear and coherent communication during crises can become a matter of life and death. EBMUD has tools to communicate with customers via text message and email and also utilizes social media like NextDoor to communicate more broadly.

Infrastructure Resilience

Maintaining and upgrading water infrastructure is essential in the face of climate change, and aging infrastructure is a clear priority for EBMUD as it embarks on its most capital project intensive 5-years in history. Maintaining and upgrading water infrastructure is essential in the face of climate change, and aging infrastructure is a clear priority for EBMUD as it embarks on its most capital project intensive 5-years in history. Communications with the public to build an understanding of the importance and need for resilient infrastructure using creative, innovate engineering requires careful planning, funding, and public support. Effective communication – through press releases, the Customer Pipeline newsletter, or via events like Water Wednesday webinars – can help secure necessary resources and political will to invest in infrastructure improvements.

6 Next Steps/Call to Action

This Plan describes the mitigation and adaptation strategies EBMUD is pursuing to prepare for and respond to climate change, based on its current understanding of the science. As scientific understanding and modeling of climate change impacts improves, EBMUD may need to revise its plans to respond. It is expected that this Plan may need to be updated in the future.

Near-term goals include:

- Transition EBMUD's fleet to include ZEVs, both to comply with the ACF regulations and to help EBMUD meet its goal of achieving carbon neutrality by 2030. This effort will require completion of the ZEV Plan to identify charging infrastructure needed at EBMUD facilities to support the fleet transition as well as ongoing pilot testing of new ZEVs.
- Completion of PV systems including the Duffel project and installations at Stockton and Oakport.
- Increasing application of the biological nutrient removal (BNR) process to cover a higher percentage of flows at the MWWTP to reduce nutrient loading into San Francisco Bay.
- Completion of the Electrical Resilience Master Plan that will identify upgrades needed at the MWWTP to ensure the resiliency of power supply infrastructure.
- Update of the Recycled Water Strategic Plan to identify new recycled water projects and goals in support of EBMUD's long-term water supply reliability. The update will include consideration of whether and how potable reuse could play a role in EBMUD's water supply portfolio.
- Ensuring compliance with the Making Conservation a California Way of Life framework.
- Completion of capital upgrades at WTPs.
- Establishment of an "Office of Innovation" within EBMUD to help initiate and coordinate research and innovation projects.
- Continued involvement in policy development related to emissions inventory and accounting

Long-term goals include:

- In addition to the above, the District will need to develop a carbon offset purchase program as actions to reduce emissions will not likely result in complete elimination. Development of purchase guidelines would help staff evaluate the quality and sustainability of carbon offsets or credits which greatly vary.
- Emissions associated with electrical energy and fleet operations can be expected to decline assuming California maintains its present policy and regulatory focus. After 10 years, the majority of this transition may be complete so additional mitigation actions by the District (aside from carbon offset purchases) may not be necessary.
- Adaptation projects, most of which involve capital upgrades and associated permitting) will be active for at least 20 years and will be incorporated into future capital plans.

As EBMUD advances its plans for climate change mitigation and adaption, ongoing communication and collaboration with its customers, local cities and counties, environmental organizations, and other stakeholders will be crucial. It is EBMUD's hope that this Plan itself will serve as a useful communication

tool and resource for those wanting to understand EBMUD's planning, and as a resource or inspiration for agencies interested in developing similar plans of their own.

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Survey: ESG Strategies Rank High with Gen Z, Millennials, Society for Human Resources Management, March 21, 2023. (Survey: ESG Strategies Rank High with Gen Z, Millennials (shrm.org))

Appendix A: District Policies

- Policy 7.05: Sustainability and Resilience
- Policy 7.07: Energy
- Policy 7.15: Climate Action

EBMUD

Policy 7.05

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SUSTAINABILITY AND RESILIENCE

IT IS THE POLICY OF THE EAST BAY MUNICIPAL UTILITY DISTRICT TO:

Provide reliable, high-quality drinking water and wastewater service through sustainable and resilient planning, design, and construction, operations, maintenance, rehabilitation, and disposal activities that manage long-term economic, environmental, and human resource benefits, with the goal of attaining equitable outcomes for the communities served by the District.

Objective

The District will consider environmental, social, and economic impacts in its decision-making, policies, programs, and work practices. In doing so, the District will:

- Promote an environmental stewardship ethic in its staff and among other drinking water and wastewater treatment agencies;
- Adhere to principles and practices of sustainability and environmental justice,
- Comply with environmental laws and regulations;
- Look for opportunities for and implement practices to support continuous improvement of environmental performance including pollution prevention and resource conservation;
- Promote and implement purchasing and using recycled and recyclable products;
- Move towards zero waste and seek ways to recycle materials that cannot be used in its operations and activities;
- Identify and implement projects and plans that mitigate climate change impacts and reduce greenhouse gas emissions;
- Evaluate economic, environmental, and social factors when making key business decisions; and
- Foster communication with employees, contractors, other water and wastewater agencies, regulators, cities and counties, and the public about the District's sustainability efforts.

Sustainability and Resilience

Sustainability means practices that support environmental, economic, and social needs in a responsible manner to meet the needs of today without compromising the ability of future generations to meet the needs of tomorrow. This triple bottom line approach seeks to minimize waste; conserve water, energy, and natural resources; promote long-term economic viability; and promote the safety and well-being of the District's employees, communities, and customers.

Resilience means the ability to prepare and plan for, absorb, recover from, and adapt to adverse events.

Environmental Justice

The District will accord the highest respect and value to every individual and community, by developing and conducting business in a manner that promotes equity and affords fair treatment, accessibility, and protection for all people, regardless of race, age, culture, income, or geographic location.

Responsibilities

The District will conduct facility audits, administer staff training and encourage management and operational practices that facilitate active consideration of environmental, social, and economic impacts while ensuring compliance with laws and regulations.

The District will support the development of sustainable environmental guidelines and practices for the water and wastewater industry by encouraging an ongoing dialogue with local regulatory agencies and with industry, and public interest organizations about effective approaches to triple bottom line-focused practices and procedures.

The District will continue its leadership by actively communicating its triple bottom line considerations to implementing sustainable utility operations and programs, and will advocate this approach through participation in water and wastewater organizations and associations, and through interactions with employees, the environmental community, cities, and the public.

To promote the use of recycled and recyclable products, the District will purchase materials that include recycled and/or recyclable content without compromising the product's fitness, quality, price, availability, and life cycle costs.

The District will consider economic, environmental, and social objectives in decision-making. Staff will annually report to the Board of Directors, management, and staff summarizing the status of the District's sustainability efforts (both challenges as well as positive impacts) and application of the triple bottom line approach to meet the District's goals and objectives for regulatory compliance, environmental impacts, resources consumption, waste reduction, etc.

Authority

Resolution No. 32881-94, September 13, 1994
Amended by Board Resolution No. 33120-98, September 22, 1998
Amended by Board Resolution No. 33684-08, September 10, 2008
Amended by Board Resolution No. 33780-10, September 14, 2010
Amended by Board Resolution No. 33904-12, November 27, 2012
Amended by Board Resolution No. 33950-13, November 12, 2013
Amended by Board Resolution No. 34052-15, September 22, 2015
Amended by Board Resolution No. 35099-18, June 26, 2018
Amended by Board Resolution No. 35189-20, June 23, 2020
Amended by Board Resolution No. 35315-22, September 27, 2022

References

Policy 3.02 – California Environmental Quality Act Implementation
Policy 4.12 – Purchasing and Materials Management
Policy 7.07 – Energy
Policy 7.09 – Workplace Safety and Health
Policy 8.02 – Biosolids Management
Policy 9.04 – Watershed Management and Use
Policy 9.05 – Non-Potable Water
Policy 9.06 – Bay-Delta Protection
Procedure 900 – Water Consumption Accounting and Reporting

Policy 7.07

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ENERGY

IT IS THE POLICY OF EAST BAY MUNICIPAL UTILITY DISTRICT TO:

Promote energy efficient practices within the District's water and wastewater systems, service area, and watersheds, minimize reliance on fossil fuels, diversify energy sources, reduce energy costs, and achieve the District's goal to be carbon neutral for direct and indirect greenhouse gas (GHG) emissions from the water and wastewater systems by 2030.

Objectives

To support this policy, the District will:

- Implement the following GHG reduction goals:
  - Achieve carbon neutrality for indirect and direct GHG emissions by 2030 for the water and wastewater systems.
  - Carbon neutrality will be achieved by prioritizing actual emission reductions and applying emissions credits to residual emissions that cannot be eliminated or are outside of the District's control.
  - Emerging GHG issues, such as process emissions related to wastewater treatment and discharge, are estimated and reported based on the most recent methodology available but not included in District goals.
- Carbon neutrality means that all anthropogenic GHG emissions are balanced by anthropogenic GHG removals. GHG emissions include carbon dioxide, methane, nitrous oxide, and refrigerant gases.
- Promote and encourage energy management and energy efficient practices both in design and operations of the District.
- Efficiently use all forms of energy including electricity, petroleum and non-petroleum based fuels, and natural gas to reduce costs and energy consumption, conserve natural resources, and minimize impacts on the environment.
- Increase the use and generation of renewable energy to preserve natural resources, reduce environmental pollution and GHG emissions, and support the District's mission to protect and preserve the environment for future generations.
- Secure reliable energy supplies at the most advantageous rates and implement economical projects to protect operations from interruptions and minimize costs.
- Support the State of California's and other regulatory renewable energy goals.
- Promote its energy policy by informing staff and the public of its efforts to use lower GHG emissions energy, efficiently raising awareness of the nexus between water and energy, and increasing generation of economical renewable energy.

Methods

To meet these objectives, the District will:

- Track GHG emissions associated with water and wastewater systems separately using The Climate Registry's (TCR) "Water-Energy Nexus" (WEN) Registry.
- Participate in studies, projects, and other efforts to advance science and accounting methodologies to accurately account for GHG emissions in relation to emerging issues, such as wastewater process emissions and raw water reservoir emissions. Review new and existing facilities and capital improvement projects for opportunities to include energy efficiency, renewable energy, reduction of on-site emissions and water conservation features.
- Evaluate consistency with existing master plans and impacts to the environment and natural resources.
- Review and evaluate opportunities to increase hydropower generation and revenue.

- Consider establishing public-private partnerships that would increase renewable energy generation capacity when economically feasible and beneficial to the District.
- Identify and implement cost competitive projects to offset GHG emissions through sequestration of carbon.
- Develop local renewable energy and carbon sequestering project.
- Semi-annually review and estimate future GHG emissions levels and take proactive actions to meet the District's annual GHG goals.
- Prioritize purchase of low and zero emissions energy before purchasing California Renewable Portfolio Standard Compliant Renewable Energy Credits (RECs) or carbon credits to meet the District's indirect emissions goals.
- Purchase carbon credits to meet the District's indirect GHG emissions goals only if cost competitive with RECs.
- Accelerate conversion to zero emission vehicles (ZEVs) and comply with the California Air Resource Board Advanced Clean Fleet Regulation.
- Purchase carbon credits to meet the District's direct GHG emissions goals.
- Consider reducing vehicle miles traveled, changing operational behaviors, and using alternative energy sources for operating vehicles and equipment.
- Invest in equipment, develop programs, and support industry efforts to increase overall District vehicle fuel economy and efficiency.
- Continue to manage the sourcing and digestion of organic material for producing energy from biogas while maintaining the lowest GHG emission possible and minimizing increases in nutrients introduced into wastewater effluent.
- Inform District staff and the public of the benefits realized from experiences in energy efficiency and purchasing and operating renewable energy generation equipment.

The District's energy management strategy reinforces the Energy Policy by providing guidance on reducing energy use, increasing renewable energy generation, diversifying energy supplies, improving energy efficiency, and pursuing economical projects that offset/reduce GHG emissions.

Energy use (including conservation, efficiency, optimization and purchase) and generation projects must be at least economically neutral to the District or support the District's wastewater and water systems' GHG reduction goals.

To support the state of California's renewable energy goal, the District will increase its use and generation of renewable energy from a range of sustainable renewable sources while continuing to generate renewable energy from its existing generation facilities, including hydropower, photovoltaic systems, in conduit hydro and anaerobic digestion/biogas facilities.

Direct emissions are emissions from sources controlled by the District, including the burning of fuels, wastewater process emissions and use of refrigerants. To meet the District's GHG goals, the District will prioritize developing programs to reduce vehicle miles traveled, investigate alternative fuel sources for operating vehicles, work with the industry to increase overall availability of ZEVs, and work to improve the science of GHG emission estimates for emerging issues such as wastewater process emissions. In addition, the District will offset direct GHG emissions by investigating projects through the sequestration of carbon or when needed, purchase carbon credits.

Indirect emissions are emissions from the District's purchase of electricity. To meet the District's GHG goals, the District will prioritize energy conservation, development of economical renewable energy projects, purchase of low and zero emissions energy and GHG offset projects. When needed purchase of RECs or carbon credits will be utilized. Renewable energy programs or projects will be evaluated against the cost of purchasing power.

To promote projects that are cost neutral over their life, the District will pursue low-cost public financing, grants, and favorable electric rate structures. Project cost evaluations will include consideration of public financing, grants, tax credits over the useful life of the project, with consideration given to the avoided cost of traditional power supply and distribution, as well as the operational reliability of on-site generation. The District will choose the least cost option to meet its annual and overall GHG reduction goals if the goals cannot be met through the above methodology

Authority

Resolution No. 33369-03, August 12, 2003
As amended by Resolution No. 33465-05, March 8, 2005
As amended by Resolution No. 33594-07, April 10, 2007
As amended by Resolution No. 33703-09, February 24, 2009
As amended by Resolution No. 33793-10, November 23, 2010
As amended by Resolution No. 33904-12, November 27, 2012
As amended by Resolution No. 33950-13, November 12, 2013
As amended by Resolution No. 34064-16, January 26, 2016
As amended by Resolution No. 35099-18, June 26, 2018
As amended by Resolution No. 35203-20, September 22, 2020
As amended by Resolution No. 35364-23, September 26, 2023

Reference

Policy 7.05 – Sustainability and Resilience

Policy 7.15

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CLIMATE ACTION

IT IS THE POLICY OF THE EAST BAY MUNICIPAL UTILITY DISTRICT TO:

Consider the impacts of climate change and take appropriate action to understand, mitigate and adapt to those impacts through sustainable activities that manage long-term economic, environmental and human resource benefits.

Overview

The District recognizes that climate change will result in rising sea levels, reduced snowpack, increased climate variability, and impacts to ecosystems on District watersheds. Furthermore, the District recognizes that these changes will impact water and wastewater operations and infrastructure, and our communities.

In addition, the District recognizes that climate change will have significant impacts worldwide and may have disproportionate impacts to historically marginalized populations. The potential impacts of climate change are well-documented by the United Nations Intergovernmental Panel on Climate Change, in California's Climate Change Assessment, and the United States' National Climate Assessment reports.

The District maintains a Climate Change Monitoring and Response Plan to inform the District's planning efforts for future water supply, water quality and infrastructure and to support sound water and wastewater infrastructure investment decisions.

Objective

The District will consider climate change impacts in its policies, procedures, projects, and work practices. In doing so, the District will:

- Monitor climate science and identify the potential impacts to the District
- Plan for climate change by applying the best available science to understand climate risks and implement adaptation and mitigation strategies to improve resilience
- Integrate climate science into planning, design, construction, watershed land management, and operations and maintenance
- Consider solutions that address disproportionate impacts in historically marginalized neighborhoods or populations
- Complete an annual greenhouse gas (GHG) emissions inventory
- Reduce GHG emissions consistent with the District's Energy Policy
- Support global, federal, state, and regional action to respond to the impacts of climate change
- Support appropriate legislation and regulations to fund and mitigate climate change impacts and promote collaborative adaptation measures
- Recognize the Retirement Board's plenary authority to consider environmental, social and governance factors in the portfolio management of the District's retirement system to address sustainability and evaluate climate change exposure
- Collaborate with public agencies, researchers, regulators, utilities and communities to develop sustainable solutions
- Educate communities and employees on the impacts of climate change
- Take a leadership role in the industry and the community in addressing climate change

Authority

Resolution 35141-19, June 11, 2019
As amended by Resolution No. 35156-19, September 24, 2019
As amended by Resolution No. 35243-21, August 24, 2021
As amended by Resolution No. 35364-23, September 26, 2023

References

Policy 7.05 – Sustainability and Resilience
Policy 7.07 – Energy
Policy 9.04 – Watershed Management and Use
Policy 9.06 – Bay-Delta Protection