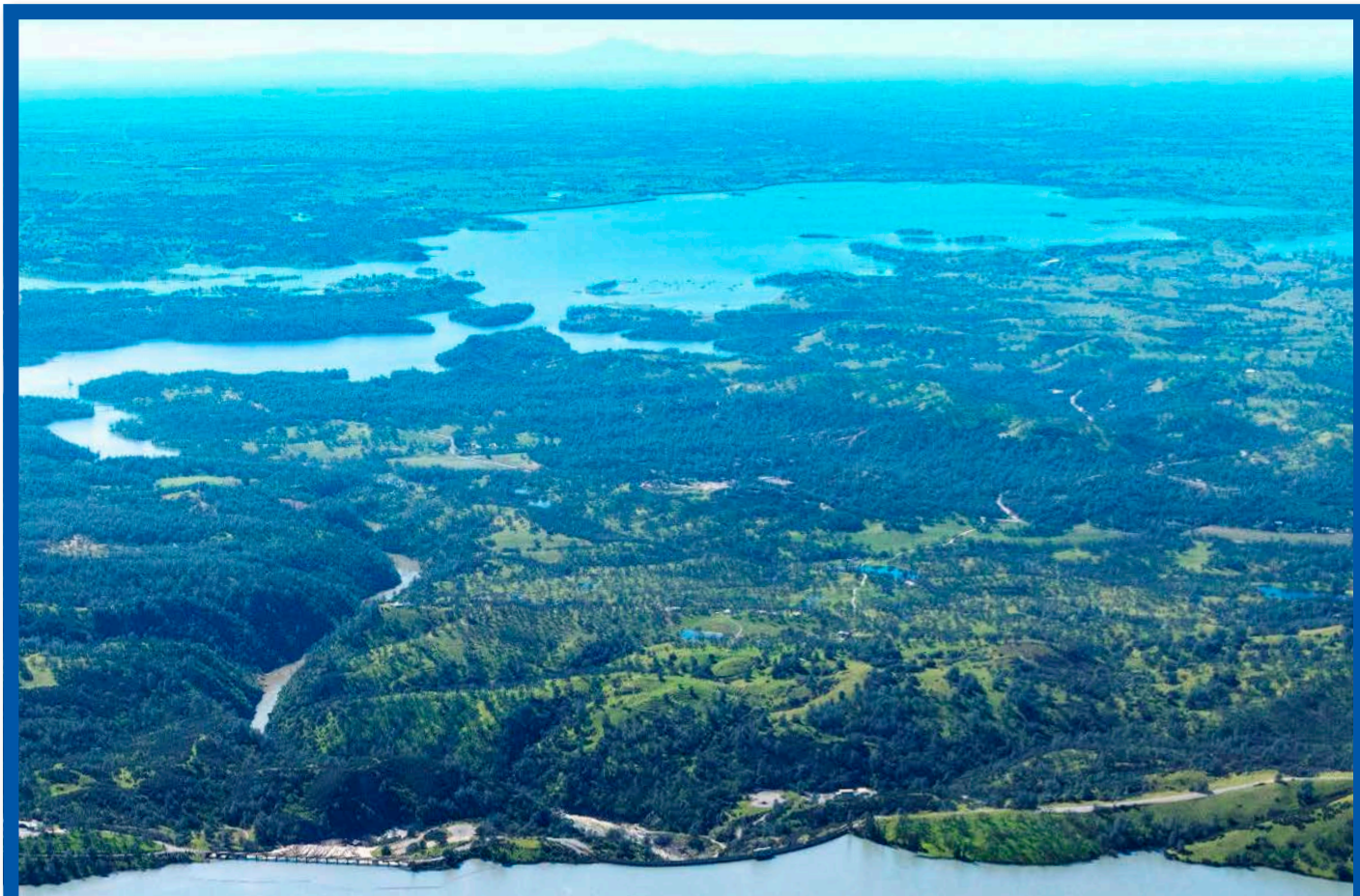
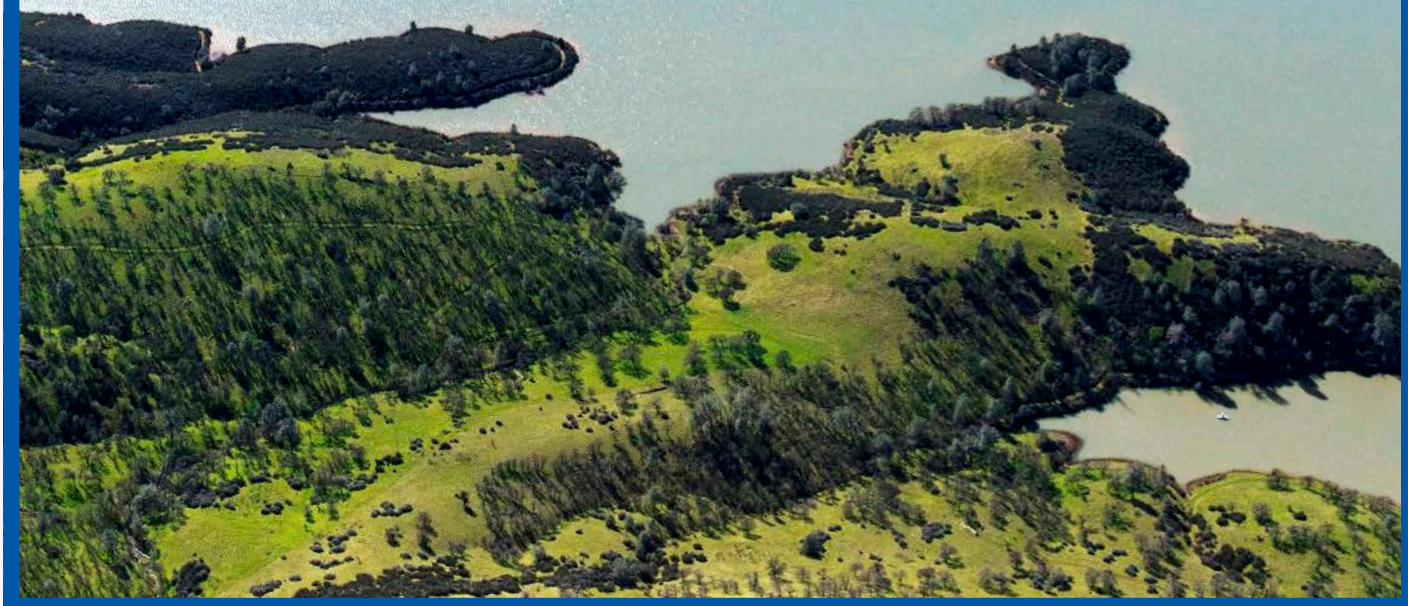


2025 Water Shortage Contingency Plan

EBMUD



Attachment 1 — Water Shortage Contingency Plan 2025

A.1 Water Shortage Contingency Plan Overview

Uncertainty is inherent in any future-oriented planning effort and is a driving factor in long-term water resources planning. Water supplies are constantly subject to uncertainties which directly affect the amount and timing of the sources of water available. The Water Shortage Contingency Plan 2025 (WSCP) provides a framework to help address water shortages that may occur. As noted in Chapter 2 of UWMP 2025, there are many factors that create a high degree of unpredictability on both the supply and demand side, and with that understanding, EBMUD's WSCP considers a range of possible future scenarios considering both aspects of water resources, demand, and supply. This approach is a shift from simply predicting and planning for a singular outcome. The WSCP anticipates a wide range of potential future outcomes, leading to a more resilient portfolio of response actions to manage changing conditions in an uncertain future.

A.1.1 WSCP Purpose

EBMUD is responsible for providing a reliable water supply to approximately 1.5 million people in its service area. As discussed in Chapters 2 and 4, EBMUD has implemented and is planning to implement numerous projects to ensure the reliability of its water supply, including developing secondary water supply facilities, coordinating and planning with other agencies on potential water purchases, and strengthening the resilience of critical infrastructure.

In addition to these efforts, EBMUD recognizes the need to have plans and procedures in place to respond to water shortages that may occur. Droughts, earthquakes that damage the water infrastructure, Delta floods that impact aqueducts, power outages, fire, and other emergencies could impact EBMUD's ability to supply water to its customers. The purpose of the WSCP is to establish a coordinated response to these situations and to guide EBMUD's planning and operational decisions through careful assessment and management of the water supply.

The WSCP outlines a process for collecting information on water supply availability, assessing conditions, determining fiscal actions, allocating resources, enforcing regulatory water use restrictions, monitoring customer response, and planning and implementing drought communications. The WSCP describes EBMUD's actions to implement and enforce regulations and restrictions for managing a water shortage when it declares a water shortage emergency under the authority of the California Water Code. It also describes EBMUD's planned actions to manage supply and demand before and during a water shortage to ensure a reliable water supply. In an emergency, the primary function of EBMUD's water supply system is to meet essential public health, safety, and emergency needs.

The WSCP describes emergency readiness and responses, including efforts to coordinate with local, county, regional, state, and federal agencies. Section A.2.5 on Emergency Preparedness describes EBMUD's roles and responsibilities to provide mutual assistance and highlights coordination with state agencies. This coordination aligns with the state's strategy to prepare for, respond to, and recover from droughts and water shortages as discussed in the California Water Plan Update 2023 (Update 2023). The priorities of Update 2023 that align with EBMUD's include:

- Improving long-term drought resilience by taking actions such as advancing infrastructure modernization and identifying water storage opportunities;
- Considering climate adaptation where the plan emphasizes the need for climate resilience and adaptation strategies to address the increasing severity of drought conditions;
- Achieving equity in water management by affirming the right to safe, clean, and affordable water and expanding funding to assist customers; and
- Targeting conservation as a long-term practice by developing strategies to meet efficiency targets.

A.1.2 WSCP Requirements

Section 10632 of the California Water Code requires Urban Water Management Plans (UWMPs) to include an urban water shortage contingency analysis. The relevant section of the Code is provided in Appendix C. As required by the Water Code, in 1992 EBMUD adopted its first WSCP, and has continued to refine and modify the WSCP in response to changing conditions. The following key changes have been made over the past 15 years:

- 2010 UWMP - Updated to reflect the 2007-2010 drought period, the completion of the Freeport Regional Water Project (FRWP), and numerous other changes.
- 2015 UWMP - The Drought Management Program (DMP) Guidelines and ordinances on excessive use and water theft were revised to incorporate lessons learned from the 2014-2016 drought.
- 2018 – The water shortage analysis was replaced with several prescribed elements required under new legislation.
- 2020 UWMP – The DMP was modified to integrate the requirements of the 2018 legislation and incorporate additional lessons learned from the 2014-2016 drought.

No new legislation was introduced during this cycle (2020 to 2025) that would require modifications to the UWMP.

A.2 Water Shortage Stages and Shortage Response Actions

EBMUD's DMP Guidelines provide a framework to manage customer demand and pursue a diversified portfolio to provide 85 percent reliability for EBMUD customers while continuing to meet all instream flow obligations on the lower Mokelumne River. The DMP guided EBMUD in managing demand and supply during both the 2014-16 and 2020-22 drought periods when mandatory and voluntary rationing was imposed and water supplies were limited. During these recent droughts, EBMUD faced unanticipated constraints and updated and implemented measures to assist with demand and supply management.

EBMUD declares different drought stages based upon projected end-of-September Total System Storage (TSS) with the Normal Stage corresponding to a normal water year condition in which no demand or supply management measures need to be implemented. Each stage thereafter is associated with recommendations for requesting or purchasing secondary water supplies that could be obtained as well as level of customer rationing that may be requested.

EBMUD performed modeling to better understand the effects of various actions on operations, in-stream flow requirements, and customer rationing. The results provided a basis to develop revised drought stages and associated response actions as outlined in Figure W-1. The DMP was revised to reflect the need to have flexibility to acquire secondary water supplies earlier in case conditions worsen.

Figure W-1 shows the link between drought stages, rates, penalties, and regulations in effect. Beginning in Stage 1, EBMUD may apply a drought surcharge to help recover costs, as discussed in more detail in the Financial Consequences of WSCP. In Stages 3 and 4, the Excessive Use Penalty Ordinance and Section 28 of EBMUD's Regulations Governing Water Services may also come into effect.

Table W-1 shows the types of programs and actions that EBMUD might undertake at each stage of drought. The triggers to implement water shortage response actions are defined by the TSS.

The availability of water to EBMUD may be impacted depending on the nature of an emergency. In such cases, EBMUD would determine the applicable shortage response actions as outlined in this WSCP.

Water Code Section 10632 requires the WSCP to provide water supply shortage levels at 10, 20, 30, 40, 50, >50 percent thresholds. Urban water suppliers with existing water shortage contingency plans may meet this requirement by cross referencing the water utility's existing water shortage stages to the State's six standard water shortage levels.

Table W-2 presents EBMUD's water shortage stages cross-referenced with the State's new standardized water shortage levels.

Quantifying the reduction in the gap between supply and demand due to the implementation of the response actions as outlined in Table W-2 is difficult. Response actions are adjusted based on the achieved level of rationing and to meet EBMUD's policy of providing 85% reliability to its customers. At each shortage stage, EBMUD considers augmenting its supplies as outlined in Figure W-1 with the quantities determined based on antecedent conditions and projected demand. Response actions to close the supply and demand

gap as well as quantify the augmented supplies needed that year are outlined in annual water supply availability assessments from Section A.4.

A.2.1 Water Supply Shortage Mitigation

EBMUD has invested extensively in preparations for water supply shortages. In addition to encouraging conservation as discussed in Chapter 6, EBMUD has developed a portfolio of water supply projects to help supplement any shortage in its water supply. These projects, described in Chapter 4, will not only provide customers with relief from frequent and severe water rationing during multi-year droughts, but will also help EBMUD respond to other adverse situations or emergencies that lead to water shortages.

EBMUD has also invested in projects to provide operational flexibility and improve its ability to recover following an emergency. However, during extreme and catastrophic water shortage conditions, EBMUD may need to explore short-term, temporary options to augment its supply. Temporary secondary water supply options include:

- Drawing from reserve supplies (terminal reservoir standby storage); and
- Pursuing emergency transfers or exchanges.

Figure W-1 **Drought Management Program Guidelines**

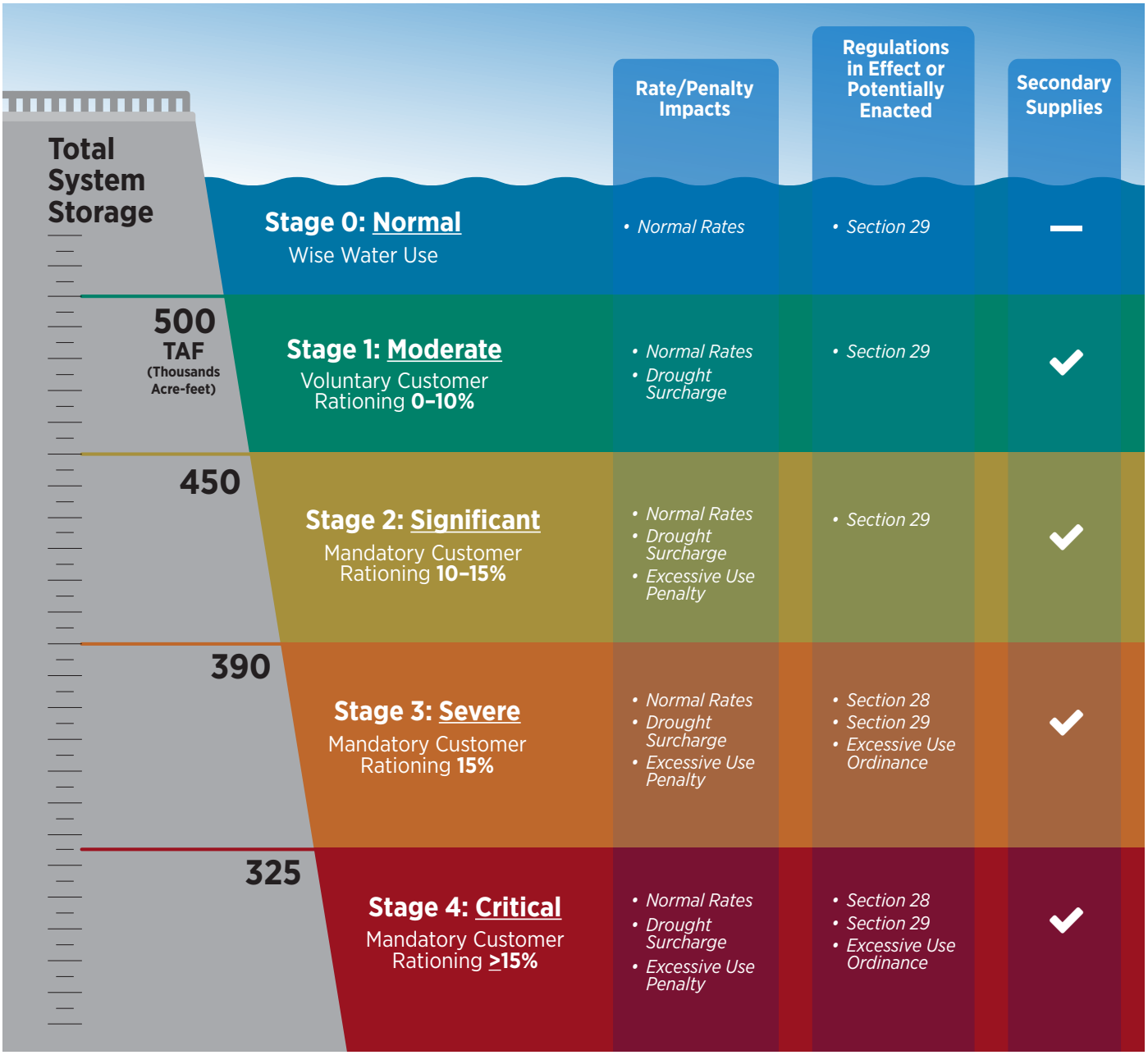


Table W-1 **Drought Management Program Elements by Stage for TSS Scenario**

Drought Stage	Drought Program Elements Considered
Stage 1 Moderate Voluntary 0 – 10% Rationing	Establish voluntary water use reduction goals and determine use restrictions
	Initiate a public information campaign to explain the water supply situation and customer responsibilities
	Outreach and education tools may utilize EBMUD's website, social media, media outreach, advertising, workshops and events, bill inserts and bill messaging
	Promote community water waste hotline and online water waste reporting
	Additional messaging through Water Reports, IRIS water budgets, Pipeline, top of bill messages
	Activate proactive leak outreach (e.g., leak alert follow-up calls to residential customers, leak calls to commercial customers)
	Expand water loss control program (e.g., acoustic loggers, leak detection crews)
Stage 2 Significant Mandatory 10 – 15% Rationing	In addition to elements of Stage 1:
	Apply stage 2 surcharge
	Institute excessive use penalty for Single Family Residential customers with use > 66 hundred cubic feet /month
	Continued outreach and education, expand use of webinars, social media content, advertising
	Provide additional online EBMUD store ordering (e.g., restaurant and hotel tent cards, stickers with water conservation messaging)
	Engage with regional and state water agency partners on proactive planning for extended water shortage response
	Send additional notifications to customers about mandatory prohibitions, surcharges and penalties.
Stage 3 Severe Mandatory 15% Rationing	In addition to elements in stage 2:
	Increase participation and outreach to community meetings, events, and various workshops
	Enact Section 28 of Regulations; specific prohibitions on water use.
	Apply stage 3 surcharge
	Advanced Enhanced media outreach / response
	Advanced Enhanced customer outreach & education
	Consider water saving campaigns, challenges
	Additional staff resources for leak alert calls, water waste investigations
	Institute excessive use penalty for Single Family Residential customers with use > 59 hundred cubic feet ccf/month
	Initiate supersaver recognition program
	Engage with DWR and SWRCB on proactive planning for extended water shortage response
	Robocalls or text alerts to customers to alert them to water shortage emergency situation, rationing level, prohibitions
Stage 4 Critical Mandatory ≥15% Rationing	In addition to elements in Stage 3:
	Provide field enforcement of regulations and water use restrictions
	Apply stage 4 surcharge
	Institute excessive use penalty for Single Family Residential customer with use > 40 ccf/month
	Board outreach to city and county officials offering conservation presentations, resources
	Deploy water waste patrol units

Table W-2 **State's Shortage Levels Cross Referenced with EBMUD's Shortage Stages and Ranges**

State's Standard Shortage Levels	State's Percent Shortage Range	Suppliers Shortage Levels	EBMUD's Percent Shortage Range
1	Up to 10%	EBMUD Stage 1 - Moderate; Regulations and restriction on water use are in effect. Refer to UWMP Attachment 1-WSCP Table W-1 and Figure W-1.	Up to 10%
2	Up to 20%	EBMUD Stage 2 - Significant; Regulations and restriction on water use are in effect. Refer to UWMP Attachment 1-WSCP Table W-1 and Figure W-1.	10 to 22%
3	Up to 30%	EBMUD Stage 3 - Severe; Regulations and restriction on water use are in effect. Refer to UWMP Attachment 1-WSCP Table W-1 and Figure W-1.	22 to 35%
4	Up to 40%	EBMUD Stage 4 - Critical; Regulations and restriction on water use are in effect. Refer to UWMP Attachment 1-WSCP Table W-1 and Figure W-1.	>35%
5	Up to 50%	Stage 4 - Critical; Regulations and restriction on water use is in effect. Refer to UWMP Attachment 1-WSCP Table W-1 and Figure W-1.	>35%
6	>50%	Stage 4 - Critical; Regulations and restriction on water use are in effect. Refer to UWMP Attachment 1-WSCP Table W-1 and Figure W-1.	>35%

A.2.2 Water Reserve Drawdown

EBMUD's terminal reservoir storage generally provides a 180-day (6-month) emergency standby reserve in the event of outages or failure of one or more of the Mokelumne Aqueducts. The local terminal reservoir system has treated and raw water total capacity of 150,380 acre-feet (AF).

EBMUD has interties with the San Francisco Public Utilities Commission (SFPUC), City of Hayward (Hayward), Dublin San Ramon Services District (DSRSD), and Contra Costa Water District (CCWD) that can be used during an emergency to reduce demand on the local reservoirs or following an emergency to help EBMUD's recovery in re-establishing storage levels as described in greater detail below.

A.2.3 Interties & Agreements for Transfers & Exchanges

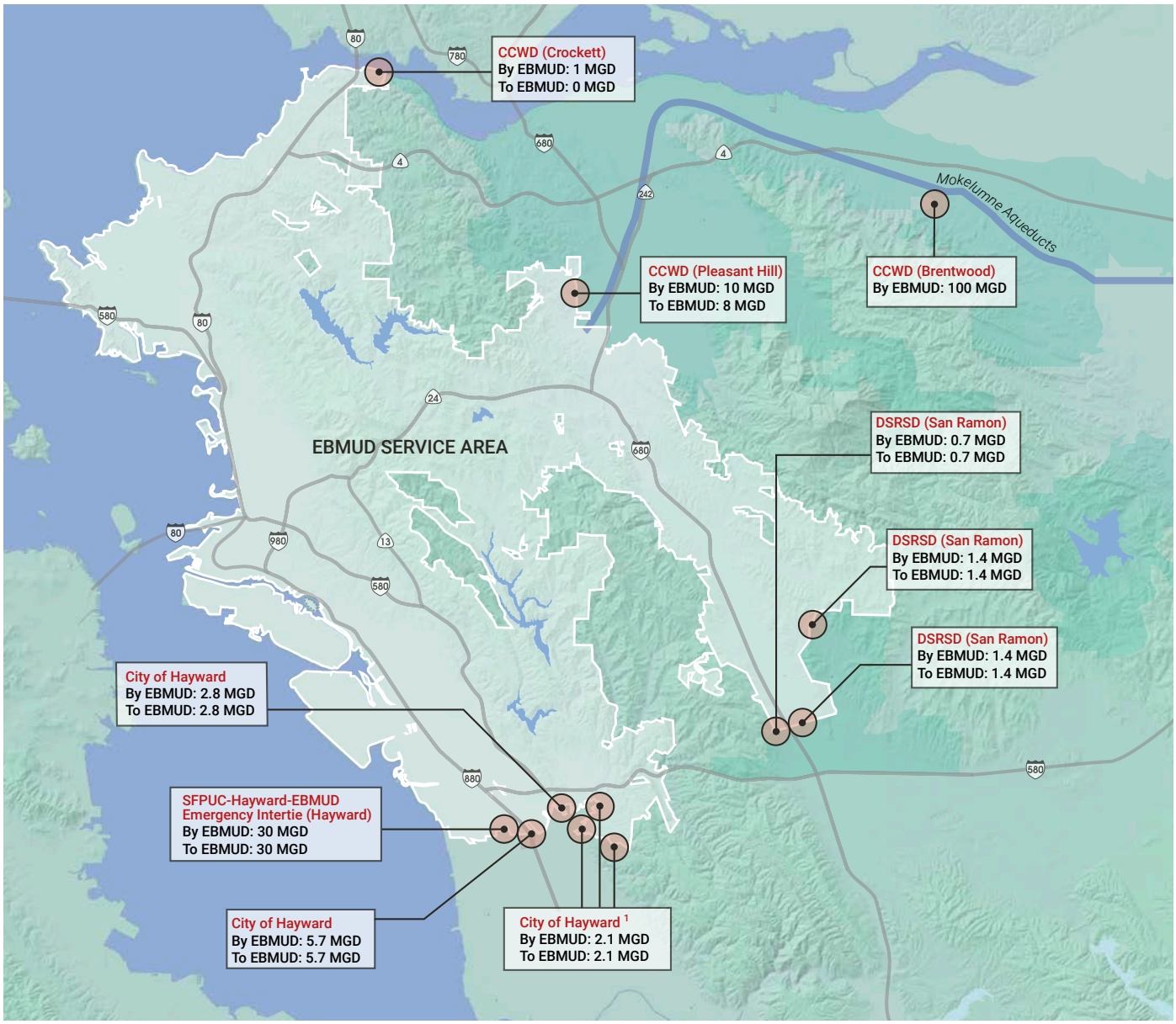
EBMUD continues its efforts to formulate and to support mutual actions, including the development of interties that improve water quality and supply reliability for the Bay Area. As a partner agency in providing mutual aid, EBMUD has limited, short-term water sharing agreements for emergencies with several neighboring agencies, including SFPUC, Hayward, DSRSD, and CCWD. Transfers/exchanges under these agreements would be made only for a short-term period of one year or less as these agreements provide an alternate water source during planned facility outages and for emergency mutual aid to the parties, but do not apply to shortages due to high demand or droughts. Figure W-2 presents a map of these emergency interties for transfers/exchanges in EBMUD's service area and lists the agreed upon quantities with each respective water service agency.

Beyond these four local service area agreements, EBMUD, the Freeport Regional Water Authority (FRWA), County of Sacramento, and Sacramento County Water Agency entered into a long-term non-emergency agreement for water delivery with CCWD and separately with Santa Clara Valley Water District (now Valley Water) as part of the negotiated settlement of the FRWP EIR/EIS. These agreements are also discussed in more detail below.

In the future the FRWP may also provide regional reliability benefits, as EBMUD could partner with

Figure W-2

Emergency Interties For Short-Term Transfers & Exchanges
With Maximum Flows



[1] Emergency Water Transfers/Exchanges to City of Hayward are supplied through connections between fire hydrants instead of through dedicated constructed appurtenances.

other Bay Area water agencies to help said agencies receive water that may otherwise be inaccessible given system constraints. To accomplish this, when EBMUD capacity is available, EBMUD could temporarily use the FRWP to deliver water to its own treatment and distribution system in the East Bay, on behalf of other local agencies, who could then use existing interagency interties to deliver the water to its ultimate destination.

SFPUC-Hayward-EBMUD Agreement for Emergency Water Services

In 2002, EBMUD formed a regional partnership with SFPUC and Hayward to construct the SFPUC-Hayward-EBMUD Intertie Project. This project increases water service reliability by allowing EBMUD and SFPUC to obtain a short-term water supply during emergencies or planned outages of critical facilities. Up to 30 MGD could be provided to either EBMUD or SFPUC and Hayward through the

intertie. The project included a new pump station and 1.5 miles of pipeline in Hayward, with minor improvements in EBMUD's and SFPUC's water systems. Construction was completed in 2007.

Agreement for Emergency Water Services with City of Hayward

A 1994 agreement with Hayward identified three fire hydrant locations available for transferring treated water between the two agencies up to 2.1 MGD at each location. A 2000 agreement with Hayward added a fourth intertie of 2.8 MGD and a fifth intertie of 5.7 MGD. Interconnections are made only for a short-term basis by mutual consent and under emergency conditions and are not substitutes for standby or reserve sources of water for normal operations. Hayward's and EBMUD's personnel would connect the systems during a declared emergency in accordance with the conditions outlined in the agreements. Supplied water would be metered and expenses would be billed to each agency as outlined in the agreements.

Agreement for Emergency Services with DSRSD

A 1990 agreement with DSRSD identified two locations available for transferring treated water between the two agencies, up to 1.4 MGD at one location and up to 0.7 MGD at the second location. A 2007 amendment to the 1990 agreement with DSRSD added a third intertie of 1.4 MGD. The three intertie locations are shown in Figure W-2. The process and billing are outlined in an agreement similar to that which EBMUD has with Hayward.

Agreements with CCWD

EBMUD executed an agreement with CCWD for emergency and non-emergency services in 2002 for treated water intertie and raw water interconnection in 2004 . There are three EBMUD-CCWD interties: two treated water interties (Crockett and Pleasant Hill) and one raw water (Brentwood). The Crockett location allows treated water transfer of up to 1 MGD to CCWD. The Pleasant Hill location allows for treated water transfer of up to 10 MGD to CCWD and up to 8 MGD to EBMUD. The Brentwood location allows raw water transfer of up to 100 MGD to CCWD. One agency will provide the other with water quantities that will reasonably meet needs during the emergency without endangering the supplying agency's system and overall supplies.

Agreement with SCVWD/Valley Water

In 2003, FRWA and Valley Water signed a settlement agreement in which EBMUD would make available to Valley Water 6,500 AF of its Central Valley Project (CVP) allocation during the first year of its 3-year consecutive drought cycle. In exchange, Valley Water would return to EBMUD the equivalent amount of water in the second or third consecutive year of drought. To date there is no implementation agreement.

A.2.4 Demand Reduction Method

During water shortage emergencies, many of the programs and projects described in EBMUD's water conservation program (see Chapter 6) are expanded to reduce demand. Implementation of a drought surcharge and excessive use penalties and application of water use restrictions also help EBMUD reduce demand during declared droughts. All of these are discussed in Section A.6, Compliance and Enforcement.

Water Consumption Reduction

EBMUD partners with its customers to proactively cut back water use in significant and sustained ways during water shortage emergencies. EBMUD's system of drought surcharges, combined with the existing tiered-volume rate structure for single family residential customers, provides a financial incentive for reducing water consumption. In past droughts, EBMUD has expanded incentive and rebate programs to encourage greater water use efficiency. EBMUD's website has also become increasingly important for educating customers about methods for conserving and providing tools to assist them in meeting their water savings goals.

Water Use Reduction Targets

EBMUD's DMP recommends specific levels of voluntary or mandatory rationing based on the projected end-of-September TSS. EBMUD's goal is to provide 85 percent reliability to customers.

EBMUD's ability to limit mandatory water use reductions to 15 percent depends upon the extent to which secondary water supply is available in a given year. Transfer water and CVP supplies may not always be available when needed as indicated by past and recent droughts.

In extraordinary circumstances, such as when CVP or other supplies are minimally available or wholly unavailable during an extreme drought,

EBMUD may need to increase the rationing level above 15 percent to ensure adequate supplies are available for the current and next year. For example, in 2015, EBMUD's Board declared a mandatory 20 percent water use reduction target to meet the State's imposed water use reduction mandate and due to extraordinary conditions at the time.

A 15 percent reduction overall can be achieved by applying different levels of conservation for each customer category. Table W-3 lists example customer category reduction goals that EBMUD estimates would be required to achieve the district-wide rationing target.

The reduction goals are based on an analysis of the total demand of each customer category, outdoor water use of each category, and potential aggregate economic impact on the service area. Several factors are considered: drought management principles; analysis of historical consumption; and the likelihood that customers in each category can achieve their water use reduction goals through indoor and outdoor demand management. The distribution of rationing varies across customer categories, and the actual savings from each customer category can vary due to several factors, including methods of implementation and enforcement. Key assumptions and data for setting customer water use reduction goals are:

1. **Balancing water use reductions across customer categories is based on four principles:**
   - Emphasizing reductions in non-essential uses of water;
   - Avoiding and limiting impacts on the economy and the environment;
   - Safeguarding water supplies for uses that meet public health and firefighting needs ; and
   - Maintaining equity in water use reduction expectations.
2. **Evaluating each customer category's actual historical consumption:**
   - Determining the percent of total water demand by customer category, and
   - Determining the percentage of indoor and outdoor demand by customer category.
3. **Gauging customer response to water savings measures:**
   - Assessing the likelihood of achieving potential savings from each measure;
   - Assessing research on customer ability and willingness to comply with measures; and
   - Considering previous EBMUD experience in managing and monitoring measures.

A.2.5 Emergency Response Plans

In addition to maintaining its own emergency preparedness program, EBMUD coordinates with local, regional, state, and federal partners to ensure readiness in the event of an emergency. The following details multiple plans and documents EBMUD develops for these emergency coordination efforts.

Consistent with EBMUD Policy 7.03 (Appendix J), EBMUD maintains an active emergency preparedness and business continuity program and coordinates emergency responses with other public and private organizations. EBMUD's Security and Emergency Preparedness Section coordinates and publishes the EBMUD Emergency Operations Plan (EOP), which describes the internal organizational structure used in the response to all emergencies, including regional power outages and earthquakes. EBMUD reviewed and updated the EOP in 2019. An update to the EOP for EBMUD's Federal Energy Regulatory Commission regulated dams was done in early 2020 to include, among other revisions, the FERC Emergency Action Plan Support Team in the EBMUD Emergency Operations Team (EOT). The EOP was also updated to formally designate the Director of Engineering and Construction as the Chief Dam Safety Officer, along with an alternate. EBMUD's EOP ensures effective coordination with local and state emergency management agencies in response to emergency conditions.

EBMUD complies with the California Standardized Emergency Management System (SEMS), which

Table W-3 Example of Customer Category Reduction Goals

Customer Category	Reduction Goal[1]
Single-Family Residential	19%
Multi-Family Residential	11%
Commercial	12%
Institutional	8%
Industrial	5%
Irrigation	30%
Total Customer Demand Rationing Goal	15%

1 Annual average goals estimated to achieve 15% reduction of year 2050 total demand.

includes all National Incident Management System guidance for federal emergency operations plans. EBMUD also prepared business continuity plans for all key departments and functions in coordination with EOP actions. In response to an emergency incident or an event requiring significant planning for a potential emergency, a well-trained team of EBMUD personnel assigned to the EOT will carry out the five SEMS functions (management, operations, planning, logistics, and finance, plus a public communication function).

Operating under the EOP, the Emergency Operations Director and Section Chiefs establish response priorities based on the nature of the emergency, focusing on actions to address life safety concerns first, then incident stabilization, and finally protection of property and restoration of normal operations. The America's Water Infrastructure Act mandates that community drinking water systems develop and maintain risk and resilience assessments (RRAs) and emergency response plans on a five-year renewal cycle. EBMUD completed its initial RRA in September 2020 and completed an update in March 2025. The Emergency Response Plan, also known as EBMUD's EOP, was updated in September 2025.

A.2.6 Mutual Assistance and Coordination with Other, Non-Regional Agencies

Effective coordination with state and local agencies is critical in responding to a catastrophic event that interrupts water supplies. As one of the eight major water suppliers in the San Francisco Bay Area, EBMUD recognizes, as do the other agencies, that in the event of a regional catastrophe, assistance from other local agencies is not guaranteed. To mitigate the risk of limited access to local mutual aid, EBMUD entered into a Multi-Agency Mutual Assistance Agreement with the Los Angeles Department of Water and Power and with the Las Vegas Valley Water District to mutually supply as much of the requested resources as possible to the other agency, if possible, if a disaster impacts only one of the agencies. EBMUD is also a member of the California Water Agency Response Network, which serves as a central point of coordination through the Omnibus Mutual Aid/Assistance Agreement with water agencies throughout the state. The signatories may be called upon during an emergency to provide available resources.

A.2.7 Coordination Among Local, County, Regional, State, and Federal Governments

EBMUD is considered a Special District, thus considered a local government agency, which coordinates resources and manages operations during an emergency and serves as an interface with the local Operational Area Offices of Emergency Services. In California, each county is responsible for maintaining these operational area offices. The California Office of Emergency Services (Cal OES) has three administrative response regions: Inland, Coastal, and Southern based in Sacramento, Fairfield, and Los Alamitos, respectively. Cal OES regions are responsible for carrying out the coordination of information and resources within the region and between the different levels of SEMS to support local response in all phases of emergency management.

A.2.8 Seismic Risk Assessment and Mitigation Plan

Water Code Section 10632.5 requires that UWMPs include a seismic risk assessment of the vulnerability of the water system facilities. Section 10632.5 also allows an urban water supplier to comply with this requirement by submitting a copy of its most recently adopted local hazard mitigation plan under the federal Disaster Mitigation Act of 2000 (Public Law 106-390), if that plan addresses seismic risk. In 2018, consistent with the Disaster Mitigation Act of 2000, EBMUD adopted its Local Hazard Mitigation Plan (LHMP). The chapter on Identified Hazards builds on available historical data and establishes detailed profiles for each of the primary hazards impacting EBMUD's service area: five related to earthquakes (faulting, shaking, earthquake induced landslides, liquefaction, and tsunami), and four related to weather (flooding, landslides, wildfires, and drought).

The Vulnerability Assessment chapter summarizes the risks to each facility type. In particular, it assesses the exposure and vulnerability to the identified hazards and summarizes the impact and estimated loss by facility type. These risk assessments collectively contribute to the development, adoption, and implementation of a meaningful and functional mitigation strategy based on accurate background information.

The Mitigation Goals, Objectives, and Actions chapter describes the specific mitigation actions, capital improvements, and other measures EBMUD has undertaken and/or will undertake to address the identified risks for each facility type.

The 2023 LHMP executive summary is in Appendix G and is available on EBMUD's website at: *ebmud.com/application/files/2916/6638/6837/EBMUD_2023_LHMP_Draft.pdf*

A.3 Water Supply Analysis

As required by Section 10635 of the Water Code, a water supply reliability assessment must compare future water demands and verifiable water supplies under multiple hydrologic conditions as both supply and demand can vary seasonally and changing climate. EBMUD uses a water supply system model to assess the sufficiency and reliability of its long-term water supply by comparing its Mokelumne River and secondary water supplies to projected demands under five potential future scenarios. Consideration of a wide range of scenarios, including design drought assessments, strengthens EBMUD's ability to anticipate and manage water shortages. Although these analyses are based on hydrologic variability, the resulting understanding of system performance, operational flexibility, and supply vulnerabilities also informs preparedness for other types of shortages, such as those caused by seismic events, infrastructure outages, water quality incidents, or regulatory constraints. These non-drought risks are addressed more fully in the preceding section of the WSCP, which outlines the actions and response strategies needed to maintain essential water service during any disruption to normal supplies.

A.3.1 Modeling Methodology

EBMUDSIM-RW is the planning model application developed using the RiverWare software that simulates the EBMUD water supply system, including all regulatory, operational, agreement, and infrastructure constraints. EBMUD uses RiverWare software, equipped with state-of-the-art simulation and accounting algorithms, as its tool to perform water supply mass balance modeling for the supply and demand analyses.

Historic hydrology is used to capture the variability of Mokelumne River water supply in the planning model over the full period-of-record with a key exception described below. For the 2025 UWMP, hydrology from 1921-2020 was available for use in the water supply modeling. The water service reliability analysis assumes that any of the historical hydrologic sequences could recur in the future. In evaluating its water supply, EBMUD incorporates both upstream and downstream diversions by senior water right holders, existing water rights agreements and contractual obligations, flood control flow releases, and other stream flow requirements into the EBMUDSIM-RW model. EBMUD is required to make stream flow releases per the terms of its Joint Settlement Agreement (JSA)[1] with the U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife. The model also allows for rationing levels, demands, dry year secondary supplies, and potential other state/regional contractual obligations to be varied or added to analyze different scenarios or future projections.

During some historical dry periods when runoff from the Mokelumne River Basin was insufficient to meet service area demands, EBMUD relied on stored water in its reservoirs to meet most of its customers' water needs. The worst hydrologic drought event in EBMUD's written record was the 1976-1977 drought, when runoff was only 25 percent of average and total reservoir storage totaled 39 percent of normal. In September 1977, with an uncertain precipitation and runoff forecast for the following year, EBMUD continued to require its customers to ration water to avoid depleting system storage. Fortunately, a very wet year in 1978 followed the critically dry year of 1977 and contributed to the water system's rapid recovery.

The severity of the 1976–77 drought prompted EBMUD to develop a structured approach to long-term resilience: the three-year Drought Planning Sequence (DPS). This modeling framework is designed to simulate the impacts of a severe, multiyear drought and guide EBMUD's long-term water supply planning. The first and second years of the DPS draw directly on the actual runoff recorded in 1976 and 1977—the driest two-year period in EBMUD's history—while the third year assumes a simulated runoff of 185,000 acre-

1 EBMUD continues to meet its flow commitment to protect the lower Mokelumne River by providing instream flow release from EBMUD's Camanche Dam to improve fishery conditions, per the requirements of the 1998 JSA among EBMUD, US Fish and Wildlife Services, and the California Department of Fish and Wildlife

feet, calculated from hydrologic parameters observed during those years. The model further assumes that such a drought would not extend beyond the third year and that all accessible storage would be depleted by its end. EBMUD is currently reassessing its existing design drought (i.e., the DPS) used in long-term water resources planning in light of potential changes in drought frequency and intensity due to climate change. Results from the preliminary analysis support previous findings that the DPS is reasonably conservative and thus remains a robust planning basis. The complete analysis, incorporating newly developed climate scenarios with results, will be published in the 2030 UWMP.

Senate Bill 606 also requires the UWMP to include a drought risk assessment that examines water shortage risks for a drought lasting at least five consecutive years. There was a significant drought that occurred from 1987-1992 that affected EBMUD and is included in the assessment.

Computer model simulations provide a framework for evaluating secondary supply needs in each year over the planning horizon. While modeling cannot predict the future, it does provide comparative analysis that can be used to gauge how the water supply system might perform under different scenarios. EBMUD's response to any specific situation will vary depending on the actual water supply and demand conditions and external factors such as regional to state-wide hydrology.

A.3.2 Dry Year Secondary Supplies

In addition to EBMUD's primary source of its water supply from the Mokelumne River watershed, EBMUD's secondary sources of supply during droughts are from the USBR CVP[2] contract and transfer water agreements. These water supplies are diverted from the Sacramento River at Freeport.

USBR Central Valley Project Water Supply

EBMUD has a permanent repayment contract with the USBR to receive water from the CVP through the FRWP in years where a drought is declared consistent with the DMP Guidelines. Specifically, EBMUD's contract allows it to receive CVP water in years when EBMUD's water supply projection on March 1, as updated monthly through May 1, and its October 1 TSS is forecast to be below 500 TAF. The contract enables EBMUD to receive up to 133,000 AF of CVP water in a single qualifying year, not to exceed a total of 165,000 AF over three consecutive qualifying years. When deciding how much CVP water to request, EBMUD considers the following:

- Current projections of customer demand;
- Current projection of end-of-water-year TSS, with reference to EBMUD's DMP;
- The likelihood that USBR will have sufficient water in the following year to allow EBMUD to receive the water under its contractual entitlement; and
- The remaining amount of the 165,000 AF three-year contractual quantity available to EBMUD in the current CVP contract year, based on deliveries taken by EBMUD in the preceding qualifying CVP contract years.

In some dry years, there may not be sufficient water supplies for all CVP contractors to receive their full requested amount, and USBR may limit allocations. In August 2015, USBR released the final version of its M&I Water Shortage Policy (WSP) outlining how it will allocate water during years when there is not enough water to meet all CVP contractor requests. The policy provides for reduced allocations to M&I contractors in comparison to the contractually specified quantity. Whether allocations are reduced, and the extent of any reductions, depends on the quantity of water available to the CVP. The M&I WSP also states that USBR may increase the amount of water that the contractor receives above the reduced allocation to the extent needed to ensure that the contractor has enough supply to maintain a "Public Health and Safety" (PHS) level calculated in the manner described in the M&I WSP Implementation Guidelines and Procedures dated February 1, 2017.

For purposes of EBMUD's analysis in this WSCP, CVP allocations for each hydrologic year are assigned based on model results generated by Department of Water Resources' (DWR) 2023 Delivery Capability Report (DCR)[3] using the CalSim model. DCR results show what the CVP allocation would have been in a particular hydrologic year given future build-out demands, regulations, and levels of development on

2 In 1970, EBMUD executed a contract with USBR for delivery of CVP water from the American River. In 2000, USBR, EBMUD, and Sacramento region parties reached an agreement to modify the contract and developed a joint water supply intake on the Sacramento River, rather than the American River. This agreement led to the construction of the Freeport Project, discussed in Chapter 1 of the 2025 UWMP.

3 In December 2025, DWR released the draft DCR, however, this was not in time to support the 2025 UWMP.

the system. As a result, these allocations may differ from the historic allocations. For example, during a moderately dry year, a DWR CalSim DCR allocation may be lower than the actual, historic allocation as DWR CalSim DCR results are based on a projected higher demand and level of development.

Contractual Agreements for Water Transfers

EBMUD has also developed a water transfer program to secure secondary water supplies to meet customer demands in dry years. Since the 2020 UWMP, EBMUD has made additional progress pursuing three opportunities for water transfer arrangements. These potential long-term water transfer projects are at various stages of development. In the meantime, EBMUD has existing agreements with Placer County Water Agency, Yuba County Water Agency, and several other water agencies that allowed EBMUD to purchase from 2,000 to 25,000 AF in the last two droughts and will allow EBMUD to purchase water in future droughts. Chapter 4 provides a more detailed discussion on water transfer projects.

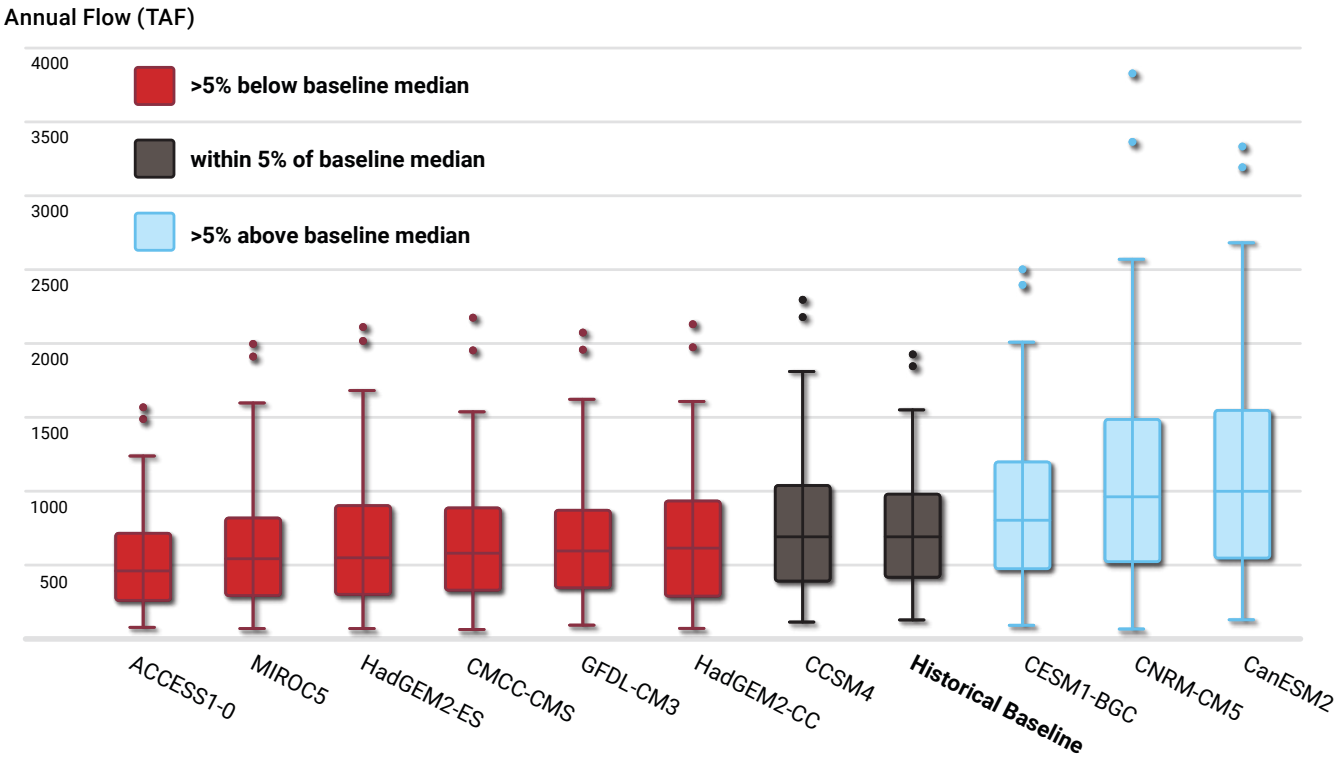
A.3.3 Water Supply Planning and Climate Change

Climate change poses a potential risk to the reliability of EBMUD's water supply, as rising temperatures and shifting precipitation patterns can alter both the timing and quantity of runoff, snowmelt, and streamflow. In response, EBMUD has launched a new study that will analyze a broad range of climate change scenarios and assess long-term risks and vulnerabilities. The study is ongoing but will be completed and incorporated in the 2030 UWMP. In the interim, EBMUD completed a preliminary assessment of the potential for increasing drought risk.

According to California's Fourth Climate Change Assessment (Fourth Assessment), climate change is already altering hydrologic conditions in the Sierra Nevada. Rising temperatures, shrinking snowpack, and shifts in the timing of streamflow

Figure W-3

Climate Adjusted True Natural Flow Distributions



Projected annual streamflow distributions for the Mokelumne at Pardee Reservoir based on simulated changes from 10 GCMs. Each box-and-whisker plot displays the distribution of a dataset by showing its median, quartiles, and potential outliers. The line inside the box represents the median, while the edges of the box mark the 25th and 75th quartiles, defining the interquartile range (IQR), which contains the middle 50% of the data. Whiskers extend from the box to the smallest and largest values within 1.5 times the IQR from the quartiles. Any data points beyond these whiskers are considered outliers and are plotted individually. The relative size of the box and the length of the whiskers indicate the spread and possible skewness of the data. Red plots indicate drier conditions (>5% decrease in median). Blue plots indicate wetter conditions (>5% increase in median).

are placing increasing strain on water management systems and community infrastructure (Dettinger et al., 2018). A substantial body of research, modeling, and data were developed to support the Fourth Assessment, including downscaled and bias-corrected climate projections prepared by scientists at Scripps Institution of Oceanography (Scripps; Pierce et al., 2018).

As part of the Fourth Assessment, the Department of Water Resources (DWR) selected climate projections from 10 Global Circulation Models (GCMs) for use in water resources planning (CCTAG 2015). Researchers at Scripps used these climate projections to generate future flow scenarios for major California basins, including the Mokelumne River at Pardee Reservoir. The scenarios were based on two emissions pathways: a high-emissions scenario (RCP8.5) and a moderate-emissions scenario (RCP4.5) (Pierce et al., 2018). In total, 20 streamflow projections were produced using the Variable Infiltration Capacity (VIC) model applied to a statewide river network and bias-corrected using historical unimpaired flow (10 GCMs × 2 RCPs).

For this preliminary review, EBMUD used the streamflow projections developed by Scripps to evaluate how climate change could affect Mokelumne River inflows, which supply on average approximately 90 percent of the EBMUD's water. Specifically, delta change factors for each percentile of the simulated flow distribution were derived from these projections and applied to the to the true natural flows EBMUD uses for planning. This process adjusts (or "perturbs") true natural flows based on the model-predicted changes at the associated percentile. The perturbation was performed using late-century (2050-2099) streamflow data for RCP 8.5 to examine how climate change could affect long-term supply reliability. Climate-adjusted annual streamflow distributions derived from each of the 10 GCM projections are shown in Figure W-3.

Figure W-3 shows the resulting distributions of annual Mokelumne River flows for each of the 10 climate models. Six of the models indicate a significant decrease in the median annual streamflow, while 3 indicate a significant increase, and one model nearly matches the historical median. The wettest model (CanESM2) indicates a 44 percent increase in the median annual flow, while the driest model (Access1-0) indicates a 34 percent decrease. Nine of the 10 models exhibit a higher variance in annual flows, suggesting greater year-to-year variability and potentially more extreme dry/wet years. Even when considering a wet projection (i.e., blue box plots in Figure W-3), the driest years could become drier. The extreme hydrologic variability driven by climate change is expected to increase stress on the water system and heighten the likelihood of shortages.

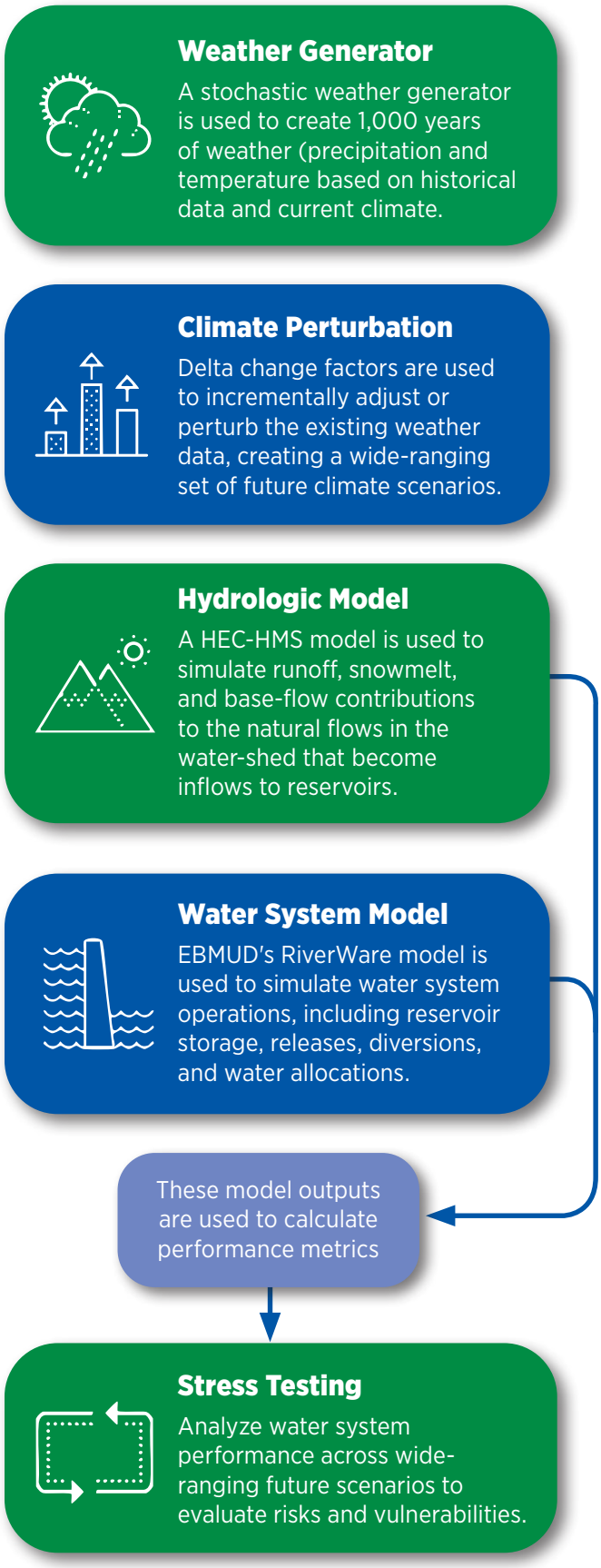
While the preliminary analysis above offers informative insights, the approach has several limitations (e.g., short historical records, coarse-scale hydrologic modeling). Therefore, EBMUD is undertaking a more rigorous modeling study to evaluate supply reliability under conditions of deep uncertainty (Figure W-4). The modeling efforts will support the following:

- Design Drought Analysis – A comprehensive assessment of potential changes in drought severity and duration across the Mokelumne River basin.
- Climate Vulnerability Assessment – An evaluation of EBMUD's water infrastructure system to identify the climate conditions under which the system may fail to meet its core functions (e.g., delivering water to customers, maintaining reservoir water quality, complying with regulations).

As shown in Figure W-4, the first component of the modeling framework is a stochastic weather generator designed to produce long-term precipitation and temperature time series. These datasets are then adjusted using delta-change factors derived from climate model projections to create a broad set of plausible future climate scenarios. For example, scenarios will incorporate changes in key statistics such as average temperature, average precipitation, and precipitation extremes. This weather generator, originally used in the Fourth Assessment, has been tailored for the Mokelumne River basin to provide improved spatial resolution, higher granularity of delta-change factors, expanded climate variable adjustments, and integration of paleo-reconstructed rainfall indices back to year 1400.

Climate-perturbed temperature and precipitation data will then be used as inputs to run a continuous-simulation HEC-HMS hydrology model to calculate snowmelt, runoff, and natural stream flows over a 600-year period. Hydrologic modeling results then become inputs to the EBMUD's EBMUDSIM-RW water system planning model, which simulates

Figure W-4 **Modeling Framework Used for the Water System Vulnerability Assessment**



reservoir operations, diversions, water allocations, and water management decisions. Outputs from both the hydrologic model and the water system model will be used to calculate performance metrics, which are quantitative indicators related to water management decisions that support relevant policies, regulations, and agreements. Key performance metrics fall under four main categories – Hydro-climatology, Water Supply, Flood Control, and Water Quality – and include such things as TSS at the end of the water year, frequency/magnitude of rationing, and the frequency and magnitude of spills at Camanche Reservoir.

Selected performance metrics will be used in stress testing analyses to assess emerging risks and water system vulnerabilities. Potential vulnerabilities will be identified and characterized by examining the conditions that cause the water system to not meet acceptable performance thresholds, a process known as "ex post" scenario analysis. The results of the vulnerability assessment will inform long-term water resources planning and be incorporated into the development of the 2030 UWMP.

A.3.4 Scenario Development

For the 2025 UWMP supply-demand analysis, EBMUD evaluated several scenarios to assess its need for water during the DPS under potential future conditions. The rationale for developing these scenarios is to capture uncertainty in long-term planning. Traditionally, long-term demand forecasts have been and continue to be used for identifying the timing and magnitude of future water supply needs. However, it is widely recognized and understood that factors used in making projections are based on assumptions that may be different in the future. Scenarios were developed based on plausible assumptions in both demand and supply availability. Below is a summary of the five scenarios analyzed:

Base Scenario

- Assess potential water needs by modeling EBMUD's historic hydrology, with secondary supplies of CVP and transfer water, and an activated DPS

Reduced CVP Reliability Scenario

- Assess potential water needs by combining Base Scenario with reduced CVP allocations (i.e., M&I WSP conditions)

Healthy Rivers and Landscape (HRL) Scenario

- Assess potential water needs by combining Base Scenario with EBMUD's proposed commitment to HRL Program

Reduced CVP Reliability and HRL Scenario

- Assess potential water needs by combining reduced CVP allocations and EBMUD's proposed commitment to HRL Program

Five-Year Drought Risk Assessment Scenario

- Assess potential water needs for 1987-1992 drought period

Base Scenario

The Base Scenario represents EBMUD's current operations and assumptions. This scenario uses EBMUD's historic hydrology - with the DPS activated - to assess the historic water supply against each of the future demands projected in the mid-cycle update of the 2050 Demand Study. In addition to the Mokelumne River supply, it is assumed that (1) EBMUD will receive its requested allocation of CVP supply subject to the M&I WSP using the modeled yearly CVP allocations provided by USBR and (2) transfer water is available. For this scenario, secondary supplies began delivery in May of the first year of a declared drought. The triggers to take delivery of secondary supply water and implement rationing are followed as outlined in DMP Guidelines:

- A Normal Water Year is a year that EBMUD does not need to implement any DMP measures.
- A Single Dry Water Year is determined to be a year that EBMUD would implement DMP elements, which includes obtaining dry year secondary water supply deliveries and setting voluntary rationing goal between 0 and 10 percent.
- Year 2, being the second consecutive year of drought, is determined as a year that EBMUD would implement DMP elements, which includes continuing to obtain dry year secondary supply water deliveries and setting a mandatory rationing goal between 10 and 15 percent.
- Year 3, being the third consecutive year of drought, is determined as a year that EBMUD would implement DMP elements, which includes continuing to obtain dry year secondary supply water deliveries and implementing mandatory rationing of 15 percent.

Reduced CVP Reliability Scenario

This scenario looks at a reduced allocation of CVP supplies 50 percent, 25 percent, and 0 percent of the contract limit in drought Year 1, 2, and 3 of the DPS, respectively to reflect what did occur during the 2014-2016 and 2020-2022 droughts when CVP allocations were reduced. As discussed earlier, EBMUD's CVP contract supply is subject to USBR M&I WSP. USBR indicated in this policy that, depending on CVP water supply conditions and operational constraints, it is possible for M&I deliveries to be reduced to below 50 percent. Therefore, for this scenario, EBMUD takes CVP water when Stage 1 of the DMP is triggered and assumes reduced CVP allocation is available.

Healthy Rivers and Landscapes (HRL) Scenario

This scenario reflects EBMUD's participation in the Bay-Delta update process to demonstrate that any proposed changes affecting the Mokelumne River do not undermine the fisheries' success attained under the existing JSA on the Mokelumne River and does not adversely affect the continued viability of the EBMUD Mokelumne River supply, the primary supply source, that provides vital water to its service area.

Reduced CVP Reliability and HRL Scenario

This scenario is a combination of the reduced CVP allocation and EBMUD's proposed HRL Program.

Five-Year Drought Risk Assessment Scenario

Section 10635 of the Water Code requires water agencies to assess water supply and demand during a drought lasting five consecutive years in the agency's historical period of record. To meet this requirement, EBMUD analyzed modeling results for the historic 1987-1992 drought period.

A.3.5 Scenario Analysis Results

Base Condition Scenario Results

EBMUD modeled its system in the UWMP Base Scenario according to the DMP guidelines presented in Figure W-1. The 2025-2050 demand projections were modeled against EBMUD's historic 1921-2020 hydrology to determine system reliability during normal years, single dry years, the three-year DPS, and the multi-year 1987-1992 drought.

Table W-4 **Supply & Demand Assessment for Base Condition Scenario, 2030-2050**

EBMUD Planning Level of Demand (PLOD)			2030	2035	2040	2045	2050
Normal Year	Mokelumne Supply	(MGD)	>196	>203	>205	>210	>215
	EBMUD PLOD	(MGD)	196	203	205	210	215
	Need for Water	(TAF)	0	0	0	0	0
Single Dry Year	Mokelumne Supply	(MGD)	128	134	136	140	144
	CVP + Transfer Supplies	(MGD)	59	59	59	59	59
	Total Supplies	(MGD)	187	193	195	199	203
	Voluntary Rationing	(%)	5%	5%	5%	5%	5%
	Need for Water	(TAF)	0	0	0	0	0
Second Dry Year	Mokelumne Supply	(MGD)	108	114	115	120	124
	CVP + Transfer Supplies	(MGD)	59	59	59	59	59
	Total Supplies	(MGD)	167	173	175	179	183
	Mandatory Rationing	(%)	15%	15%	15%	15%	15%
	Need for Water	(TAF)	0	0	0	0	0
Third Dry Year	Mokelumne Supply	(MGD)	124	130	132	136	141
	CVP + Transfer Supplies	(MGD)	42	42	42	42	42
	Total Supplies	(MGD)	167	173	174	178	183
	Mandatory Rationing	(%)	15%	15%	15%	15%	15%
	Need for Water	(TAF)	0	0	0	0	0

The results of this analysis, provided in Table W-4, show that under Base Scenario assumptions, EBMUD can meet customer demand out to 2050 during normal years, single dry years and multi-year droughts. There is no water shortage.

A.3.6 Findings from Other Scenarios

All scenarios show existing supply sources provide a reliable water supply over the future planning horizon except for the Reduced CVP Reliability Scenario and the combined Reduced CVP Reliability with HRL Program. The Reduced CVP Reliability scenario was based on actual events during the last two drought periods, and the results from the analysis show a need for water is approximately 15 TAF under the 2050 level of demand for both. Results like this allow EBMUD to develop adaptive strategies to help ensure water reliability in the long term. Chapter 4 describes EBMUD's future water supply projects that could help offset the 15 TAF supply shortfall. Factors contributing to the lack of supply shortage shown in the other modeled scenarios include reduced water use by upper Mokelumne River watershed agencies, availability of transfer water, and lower demand. Findings from these scenarios are provided in Table W-5. The current scenarios do not incorporate climate-driven changes in hydrology, even though climate change is expected to increase the need for water. The 2030 UWMP will provide detailed assessments of climate change impacts to the water supply system.

In addition, EBMUD made investments spanning over 50 years to diversify and increase water supplies. In 1970, EBMUD executed a contract with the USBR for delivery of CVP water. EBMUD relies on CVP water to be available when EBMUD is eligible based on contractor terms that are triggered during droughts. However, based on past drought experiences, EBMUD received reduced or no CVP allocations during several drought periods. The Reduced CVP Scenario reflects potential supplies available and allocations recently received.

A.4 Annual Water Supply and Demand Assessment Procedures

EBMUD has developed a process and policies for monitoring, assessing, and responding to annual water supply availability. EBMUD's Water Supply Availability and Deficiency Policy 9.03 (Appendix J) describes its process for evaluating the adequacy of its water supplies every year. Since the early 1980s, EBMUD has been performing annual water shortage assessments to help make informed decisions on water supply management.

Table W-5 **Findings from Other Scenarios, 2025-2050**

Scenario	Purpose	Water Supply Shortage
Base with Reduced CVP Reliability	Assess potential water needs when CVP allocation (50%, 25%, 0%) is subject to M&I water shortage policy	15 TAF (Future level of Demand)
Base + HRL	Assess potential water needs by combining base scenario with EBMUD's proposed commitment to HRL Program which reduces EBMUD water supply increased in-stream flow requirements	No shortage
Reduced CVP + HRL	Assess potential water needs by combining base scenario with reduced CVP allocation and proposed HRL program	15 TAF (Future level of Demand)
Five-Year Historical Dry Period	Assess water supply and demand for 1987-1992 drought period per Section 10635 of the Water Code	No shortage

NOTE:
A Low-Demand Scenario, as described in Section 3.2.2 in Chapter 3, was also evaluated and did not result in a water-supply shortage.

A.4.1 Water Supply Availability and Deficiency Policy

Under the Policy, EBMUD's Board of Directors may receive a preliminary Water Supply Availability and Deficiency Report (WSADR) by March 1 of each year evaluating the adequacy of that year's water supply, considering the full range of hydrologic conditions from critically dry to wet years. The Board of Directors adopts a final WSADR in April, which updates the water supply projections based on the April 1 snow survey by DWR. These reports inform decisions by EBMUD's Board of Directors regarding whether to declare a water shortage and implement a drought management program, institute mandatory water use reductions, obtain or pursue secondary supplies, or rescind drought measures. The 2025 WSADR is provided as a sample in Appendix I. The WSADR forms the basis for the annual water shortage assessment report submittal to DWR as required by Water Code Section 10632.1. DWR began requiring these submittals in 2022.

A.4.2 Decision-Making Timeline and Process

If water supplies are severely depleted, EBMUD's Board of Directors may declare a water shortage emergency and implement the DMP, which is designed to provide guidance to minimize drought impacts on its customers while continuing to meet stream flow release requirements and obligations to downstream Mokelumne River water users. Following the declaration of a water shortage

Table W-6 **Historic Rationing Levels**

Date	Rationing Level
05/25/1976	Voluntary conservation, no level set
02/08/1977	25% Mandatory
04/26/1977	35% Mandatory
01/24/1978	Voluntary conservation, no level set
04/14/1987	12% Voluntary
05/09/1989	25% Rationing
09/12/1989	15% Voluntary
02/26/1991	15% Mandatory
04/09/1991	15% Mandatory
04/14/1992	15% Mandatory
03/09/1993	10% Voluntary
04/26/1994	Voluntary conservation, no level set
05/01/1994	15% Voluntary
04/24/2007	15% Voluntary
05/13/2008	15% Mandatory
05/12/2009	10% Voluntary
02/11/2014	10% Voluntary
04/22/2014	10% Voluntary
12/09/2014	15% Voluntary
04/14/2015	20% Mandatory
04/27/2021	10% Voluntary
04/26/2022	10% Mandatory

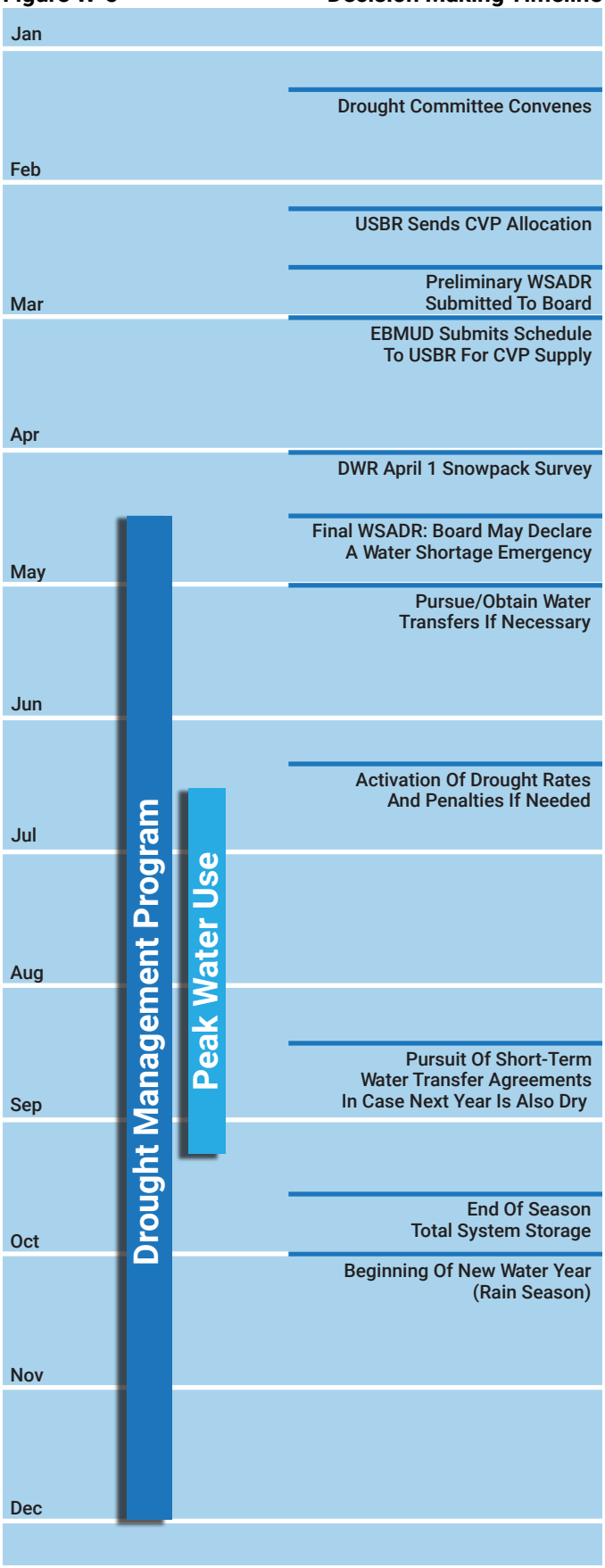
emergency, depending on stage, EBMUD's Board of Directors may put into effect certain regulations, ordinances, and surcharges. The Board may also implement the DMP in the absence of a declaration of water shortage emergency if the supplies are moderately depleted or the State mandates water use restrictions. The DMP guided EBMUD in successfully managing water demand during mandatory and voluntary rationing periods in 1976-1978, 1987-1994, 2007-2010, 2014-2016, and 2020-2022 when supplies were limited. Table W-6 shows the rationing levels that EBMUD has historically set, starting with the 1976 drought period. EBMUD has not historically declared a water shortage for non-drought emergencies. Non-drought emergencies such as earthquake impacts, localized pipeline failures, or short-term water quality issues have been handled operationally.

EBMUD begins drought preparations early in the calendar year if there is potential for a water shortage. Figure W-5 shows the timeline of a typical dry year, marking when EBMUD makes key decisions about that year's water supply. As illustrated, EBMUD determines drought actions involving rationing levels, state and federal mandates, and acquiring secondary supplies based on end-of-the-water-year storage projections. Often EBMUD must make these decisions as hydrologic conditions continue to evolve.

EBMUD monitors water supply conditions and projected runoff into EBMUD reservoirs. Beginning in January, EBMUD assesses the potential for shortages and, if warranted, convenes EBMUD's Drought Committee. This committee includes senior staff representing key functions that are affected and involved in customer response to drought.

The WSADR is based on EBMUD's projected end-of-September TSS, which includes water supplies from local, Pardee, and Camanche reservoirs. Based on this report, the Board may declare one of the four stages of drought and activate the DMP depending on the projected end-of-water-year TSS. The adopted stage of drought helps determine the need for dry-year secondary supplies and customer water use reductions. Depending on the projected TSS, the Board may also decide to request CVP supplies from USBR and/or secure water transfers. Section A.3 above, Water Supply Reliability Analysis, discusses EBMUD's CVP supplies and how these supplies factor into drought planning. In terms of timeline, EBMUD submits an

Figure W-5 **Typical Dry Year Decision Making Timeline**



initial schedule of requested CVP deliveries to USBR by March 1. As conditions change, EBMUD may modify the requested quantity or timing of CVP deliveries, up to the maximum quantity allocated by USBR in that particular year or may cancel previously made requests as needed.

Throughout the year, EBMUD continues to monitor water supply and potential impacts to demand of any voluntary or mandatory rationing policy. As warranted by the water supply status and DMP guidelines, the Drought Committee initiates response activities and sets timelines for these activities. The Drought Committee also manages program implementation and monitors and reports on activities and results.

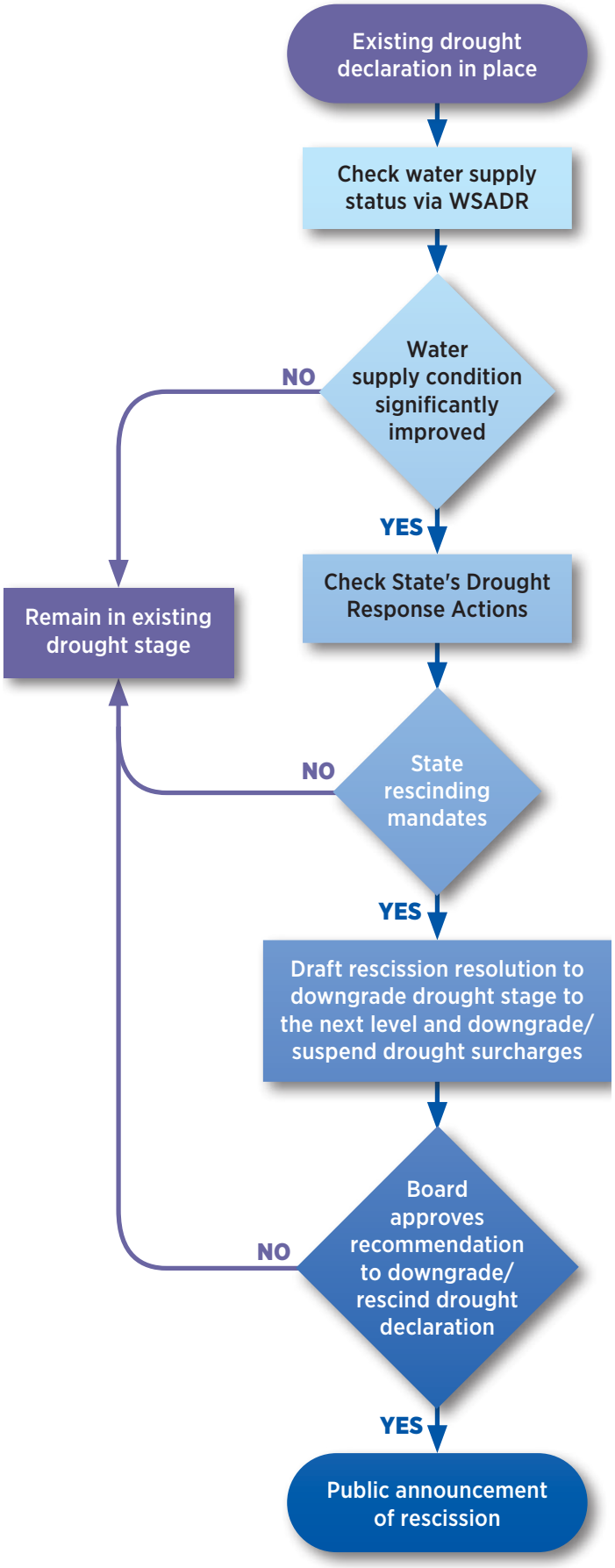
In multi-year droughts, EBMUD begins planning in the fall for the following year's water supply needs in anticipation of continuing dry year conditions. Due to uncertainty regarding the availability of water transfers and the length of time required to secure permitting and regulatory approvals, EBMUD must begin planning to secure water transfers early if EBMUD anticipates there may be a need the next water year. This includes discussions with potential sellers and preparation of necessary environmental reviews that are required to implement water transfers.

Just as EBMUD has a process to prepare for drought declarations, a drought recission declaration usually mirrors the process used to declare one. It is data-driven and legally formalized. A common framework is illustrated in the process diagram shown in Figure W-6.

A.4.3 Data and Methodologies for Short-Term Demand Forecast

EBMUD has developed an annual demand and supply projection methodology that is used for operational planning. New demand projections are initially developed by correlating historical demand patterns/trends with WTPs current water demand data. The annual projection is then partitioned into projected average monthly demands based on historical monthly distributions. In recent years, EBMUD's annual demand projections also accounted for water conservation. Supply availability incorporates runoff projections based on DWR's Bulletin 120 as well as Mokelumne River diversions based on water rights terms/ agreements, instream environmental flow requirements, and expected diversions by riparian

Figure W-6 Drought Rescission Process Diagram



and senior water rights holders. The annual assessment, driven by hydrological conditions and analyzed using a probabilistic spreadsheet model, is evaluated against the criteria established in the DMP to make a determination of water availability and, if necessary, implementation of any potential response actions. The results of the assessment and all relevant operational decisions are captured in the annual water operations plan. This plan is a dynamic document as hydrologic conditions and forecasts can change significantly throughout the winter and spring months.

A.4.4 Water Operations During Drought

The 2014-2016 drought was the first time EBMUD delivered water from Freeport facilities, in which valuable water operations lessons were learned. Key findings from the 2016 FRWP operation were: (1) take delivery of secondary supplies as early as possible in the drought sequence to maximize delivery of lower-cost drought supplies, (2) maximize production at the West of Hills WTPs in order to treat secondary water supplies , and (3) manage terminal reservoirs to maximize available space for storage. These lessons were incorporated into the DMP and operational decision-making processes.

Obtaining Secondary Supplies Early

Based on past droughts experiences, EBMUD plans to maximize delivery of lower-cost secondary water supplies at the start of a drought. EBMUD's CVP allocation was reduced by 50 percent in contract year 2014, by 75 percent in contract year 2015 and 2021, and to zero in 2022 as the CVP was faced with increasing demands and reduced supplies as the drought continued. EBMUD made up for the reduced allocation by purchasing transfer water in 2015 and 2022, and by securing options to purchase transfer water in other years if the droughts had continued. Transfer water was consistently more expensive than the CVP water.

Maximize Production at West of Hills (WOH) Water Treatment Plants

The maximum amount of secondary water supplies that can be delivered occurs when the water treatment rate aligns with the delivery rate. When the delivery rate of secondary water supplies surpasses the treatment rate, the excess water is delivered to Upper San Leandro and San Pablo reservoirs, which increases reservoir storage levels. This limits the reservoirs' ability to store local runoff, while increasing the chance of spills.

In previous drought periods, treatment rates at conventional[4] WTPs could not be maximized, which would have allowed for more secondary water supplies to be treated, as the in-line[5] Orinda WTP needed to operate at a lower rate. Ongoing improvements at Orinda WTP will allow more secondary water supplies to be treated at the WOH plants. UWMP Chapter 2 describes EBMUD infrastructure improvement projects in more detail.

Terminal Reservoir Management

At the start of the 2015 FRWP operation, the secondary water supplies could only be delivered to USL and San Pablo reservoirs and treated at those associated conventional WTPs. Because the rate of FRWP delivery exceeded the rate of treatment at those conventional plants, terminal reservoir capacity needed to be made available to maximize delivery rates. This was accomplished by operating the Sobrante and USL WTPs in advance of the FRWP delivery so that San Pablo and USL reservoirs began the FRWP operation at their lower operating range. This practice will be continued in future FRWP operations.

A.5 Communication Protocols

During a water shortage emergency, EBMUD implements a public education program to inform the public and uses various methods and tactics to promote water use reductions and improved efficiencies. The campaign explains the potential impacts of a water shortage, the water supply status, methods to reduce water consumption, potential excessive use penalties, EBMUD actions, and customer responsibilities. The campaign typically highlights specific EBMUD programs and services to help customers reduce their water use.

At the onset of a water shortage emergency, EBMUD develops a detailed Drought Communication Plan (DCP) to provide information to customers, public officials, and other stakeholders. The specific details and messages are tailored to

4 Conventional water treatment plants use rapid mixing, flocculation, sedimentation, filtration, and free chlorine disinfection to treat water.

5 In-line water treatment plans have a simpler treatment process consisting of coagulation, filtration, and disinfection. They do not have sedimentation process and is typically used for high-quality raw water source.

the particular drought situation. Components of an effective DCP include a set of well-defined, focused key messages and an action plan detailing all communication activities. The DCP outlines general and targeted communication methods; general communication methods focus on creating a strong education campaign with broad reach, while targeted communication methods focus on particular customers or sectors. General communication methods include media outreach, creating outdoor and other advertising, expanding stakeholder outreach, providing information on the web, producing bill inserts and messages, sending direct mail to public officials, briefing key community leaders and officials, and providing information through the customer contact center. Targeted communication methods can include direct contact with high-volume water users, proactively offering more support to customers through conservation training and tools, and increasing EBMUD's interactions with customers a about their water use. In some previous, statewide droughts, EBMUD has also benefited from "earned" media when statewide messaging and advertising reached EBMUD customers.

Following are additional details on some of the general and targeted communications methods that EBMUD has employed in previous droughts:

- Advertising campaigns throughout the EBMUD service area broadcast conservation messages on radio and cable television, local newspapers and magazines, outdoor displays at public areas, streaming music services, bus exteriors, transit shelters, and EBMUD billboards. EBMUD has also participated in regional advertising campaigns related to water conservation on radio and television when the messages were consistent with EBMUD's. Campaign messages included appreciation for customer conservation, continued encouragement to save water by fixing leaks and installing efficient outdoor landscape irrigation, and using online tools to understand and curb water use.
- EBMUD invests in resources and tools to support customer contacts and customer billing functions to ensure a continuous level of quality customer service during a water shortage. Drought periods increase the volume of calls to EBMUD's customer Contact Center, Field Services, Water Conservation, Customer Services Support, and Public Affairs divisions. EBMUD ensures adequate staffing to respond to customers' questions and requests for assistance.
- EBMUD's website has become an increasingly important tool for disseminating information to customers and the media during drought periods and EBMUD's social media presence provides another platform to engage with customers about drought.
- EBMUD initiates significantly more direct customer contact and responds to significantly more inquiries from customers during droughts. Water conservation and field services staff distribute drought messages and water-saving devices, encourage water savings, assist customers in changing their water use, inform customers about voluntary program requirements, and enforce mandatory requirements.
- EBMUD has used "out-dial" calls and direct mail to alert customers to the start of the drought program and to request curtailed water use during especially prolonged hot weather.
- EBMUD reaches out to civic, community, non-governmental and business groups, homeowner associations, nurseries, schools, trade organizations, and local officials and also conducts workshops on water conservation topics, as discussed in Chapter 6. This work expands during droughts. EBMUD informs local stakeholder groups and seeks their assistance in communicating with their constituents, which generates a multiplier effect as they share the information with additional customers.

A.6 Customer Compliance and Enforcement

A.6.1 Water Use Restrictions

EBMUD's Regulations Governing Water Service to Customers, included in Appendix J, include various restrictions on water use and prohibitions on the waste of water. Section 29, "Water Use Restrictions," is continuously enforced. Section 28, "Water Use During Water Shortage Emergency Condition," is enacted when the EBMUD Board of Directors declares a Water Shortage Emergency. Section 28 may also be enacted in response to state- mandated water use reductions designed to address short-term statewide water shortages.

Section 29 details ongoing requirements that residential and nonresidential customers must

observe. For example, residential customers are required to irrigate their property in a manner that does not result in excessive flooding or runoff, and all customers are required to repair leaks wherever it is feasible to do so. Under normal conditions, EBMUD relies on customer education to ensure that these requirements are met. When customers and field staff report on overwatering or water waste, EBMUD responds by contacting the customer and may send water conservation and field services personnel to apprise the customer of the wasteful conditions and make recommendations on using water more efficiently. If the customer cannot be located, and the water loss is significant, staff may turn off the water at the meter until the customer is contacted or the problem is resolved. The ongoing restrictions in Section 29 are supplemented temporarily with additional restrictions when the Board declares a Water Shortage Emergency and enacts Section 28.

Section 28 sets water use rules and provides guidance to customers about reducing water use during a declared water shortage emergency or when necessary to comply with state mandated water use reductions. Enforcement actions can include extra meter readings, written warnings, installation of flow-restriction devices, and even discontinuance of water service.

Section 28 typically prohibits certain uses of potable water during a water shortage emergency. Section 28 can also impose more detailed restrictions on irrigation. For example, during the 2020-2022 drought, Section 28 stated that irrigating turf and ornamental landscape with potable water was permitted no more than two days each week, not on consecutive days, and only before 9 AM and after 6 PM. Irrigation of turf and ornamental landscape with potable water was also prohibited during and within 48 hours following measurable precipitation.

During a water shortage situation, enforcement of water waste restrictions becomes particularly important and EBMUD may choose to devote additional resources to this effort. EBMUD staff monitors the service area to encourage water savings, help customers change their water use habits, and enforce regulatory requirements and water waste prohibition rules.

During water shortages, EBMUD typically receives a higher volume of water waste reports from members of the community who report the waste via the EBMUD website or by calling the Water Waste Hotline or Contact Center. Customers can also report water waste for EBMUD through the State Water Resources Control Board's online water waste portal. EBMUD staff investigate the reports and take appropriate actions. In most cases, EBMUD only needs to notify the party responsible, who then takes action to address the problem. If necessary, EBMUD can also proceed with enforcement.

EBMUD also adopted two separate ordinances to control water use: an Excessive Water Use Penalty Ordinance (Ordinance No. 363-21) and a Water Theft Penalty Ordinance (Ordinance No. 368-17). The Excessive Water Use Penalty Ordinance only applies during declared water shortage stages to discourage high discretionary usage, whereas the Water Theft Penalty Ordinance provides year-around authority to address unauthorized water use. Copies of these ordinances are provided in Appendix J.

The Excessive Water Use Penalty Ordinance sets penalties for single-family residential (SFR) customers who use large volumes of water during a specific water shortage stage. If the Board declares a Stage 2 water shortage, SFR customers must not consume more than 132 hundred cubic feet (CCF) of water over a two-month billing cycle. Customers using in excess of this amount are charged a per CCF penalty above the Water Flow Charge volumetric rates shown in EBMUD's Schedule A (Rate Schedule for Water Service). During Stage 3 water shortage, the maximum amount of water allowed before incurring a penalty drops to 118 CCF over a two-month billing cycle. During Stage 4 water shortage, the maximum amount of water allowed before incurring a penalty drops to 80 CCF over a two-month billing cycle. The purpose of the ordinance is to prohibit excessive water use when the Board has declared a Stage 2 or greater water shortage and to authorize EBMUD to impose a financial penalty on customers who violate the Ordinance.

The Water Theft Penalty Ordinance prohibits theft or unauthorized use of water. Although this ordinance was established during a drought period, it is enforceable throughout the year and not directly tied to water shortage declarations. This ordinance builds on existing EBMUD regulations related to water theft and gives EBMUD the authority to impose administrative penalties on any person who violates the Ordinance's prohibitions.

Per Water Code Section 10632.2, EBMUD has procedures and ordinances that have exemptions and appeals processes in effect during water shortage emergencies. The Excessive Use Penalty Ordinance appeals process allows for appeals due to meter error medical reasons, or due to leaks. Section 28 of the Regulations, "Water Use During Water Shortage Emergency Conditions," states that customers may apply for an exemption to the water use restrictions in the regulation. EBMUD can grant an exemption to prevent undue hardship or to avoid conditions affecting health, sanitation, fire protection, or safety.

There are also regulations, procedures, and ordinances that are always in effect, not just during water shortages. EBMUD Procedure 145, "Wasteful Use of Water," has exemptions for hardship and potential public health risks. Similarly, the Water Theft Penalty Ordinance has an appeals process and Section 29 of Regulations, "Water Use Restrictions," offers exemptions for undue hardship or to avoid conditions affecting health, sanitation, fire protection or safety.

EBMUD also has policies related to the approval of water connections for new developments during a water shortage. EBMUD Policy 3.07, "Responsibility to Serve Water Customers," sets out the agency's priorities during a water shortage. EBMUD's first priority is to serve existing customers within its existing service area. EBMUD then serves expected new customers within its service area, but only if this does not unacceptably impair its ability to serve existing customers. Lastly, EBMUD will consider customers outside its existing service area only if this does not impair its ability to serve existing and expected new customers within its service area.

A.7 Legal Authorities

This section provides a description of the legal authorities that empower EBMUD to implement and enforce its shortage response actions as discussed in this WSCP.

Municipal Utility District (MUD) Act

Among other things, the MUD Act, California Public Utilities Code Section 11501 et seq., authorizes and empowers EBMUD to fix rates and charges, and make and enforce rules, regulations, and practices in connection with its provision of water service within its service area.

Local Emergencies

California Government Code Section 8558 defines the types of emergencies that can be proclaimed under the California Emergency Services Act. The Act allows for the proclamation of a local emergency based upon the existence of drought conditions. In a Stage 3 or Stage 4 drought, EBMUD will coordinate with cities and counties within its service area regarding the possible proclamation of a local drought or other water shortage emergency.

Water Shortage Emergencies

Water Code Section 350 calls for water agencies like EBMUD to declare a water shortage emergency when the "ordinary demands and requirements of water consumers cannot be satisfied without depleting the water supply of the distributor to the extent that there would be insufficient water for human consumption, sanitation, and fire protection." EBMUD would declare a water shortage emergency as described under the DMP Guidelines set forth in the WSCP. Among other things, Water Code Sections 351 through 359 require a water agency to hold a properly noticed public hearing prior to declaring a water shortage emergency, to adopt regulations and water use restrictions that will conserve water supplies, and to maintain those regulations and restrictions in full force and effect until the water shortage emergency has ended.

Water Conservation Programs

Water Code Section 375 et seq. allows water agencies like EBMUD to adopt and enforce water conservation programs to reduce the quantity of water used by its customers. Water conservation programs adopted pursuant to section 375 may be enacted by ordinance or resolution and must be published and/or posted according to section 376. Following publication or posting, violation of any requirement of a water conservation program is a misdemeanor, and a violator may be held criminally or civilly liable. (See Water Code Section 377.) In specific DMP stages, EBMUD may choose to adopt a water conservation program pursuant to section 375 et seq.

Excessive Use Penalty Ordinance

Water Code Sections 365-367 require water agencies like EBMUD to identify and discourage excessive residential water use in

times of a drought. EBMUD complies with this requirement through its excessive use penalty ordinance as discussed in Section A.6.1.

CVP Contract

EBMUD executed a permanent repayment contract with the USBR for delivery of CVP water. Chapter 1 of the UWMP provides in-depth discussion of this contract.

A.8 Financial Consequences of WSCP

As discussed in Section A.8.2, the drought surcharge provides funds to cover EBMUD's implementation and compliance with its water shortage program components, including the costs of purchasing and delivering secondary water supplies, increased treatment costs, increased public outreach and messaging, increased customer account management services, and revenue loss due to reductions in water use.

A.8.1 Impact of Reduced Sales on Revenues & Expenditures

Implementation of the DMP entails added costs for EBMUD. Costs include paying for additional temporary personnel and equipment resources, transfer water purchases, increased outreach to customers, expansion of water conservation rebate and device distribution programs, and development and execution of educational and marketing programs.

In previous droughts, EBMUD hired temporary staff to help implement the DMP. These workers provided administrative support to respond to customer and media inquiries, provided field support to perform water use audits, assisted customers in identifying leaks, provided information technology support for bill adjustments, provided community outreach, responded to water waste calls/emails, and assisted with mass media outreach efforts.

Outreach to customers is intensified during a drought. There are costs to create and place ads, resources needed for website updates and tools, costs to develop and print publications, production costs to create informative videos, expenses to place automated "out-dial" phone calls, and special mailings costs. Additional media response also requires added resources to gather and vet information, respond to calls, and set up and conduct onsite interviews. These efforts help to educate customers about the drought, highlight water use prohibitions, and emphasize each customer's role and responsibility in responding to the drought.

As part of the DMP, EBMUD may also intensify some of its conservation programs, such as the distribution of water-saving devices and home water audit kits, which also add costs. Additional costs are also incurred for rebate programs that target improving water efficiency; for example, EBMUD offers rebates to encourage customers to remove turf, to install flow meters, to upgrade irrigation equipment, and to upgrade to water-efficient commercial equipment.

In addition to costs related to implementation of the DMP, EBMUD may face additional costs for the purchase, delivery, and treatment of secondary water supplies. These costs can include the purchase of transfer water, permitting, administrative and environmental work related to transfers, increased treatment costs related to the transfer water, and the operations costs associated with activating and using projects like the FRWP.

Table W-7 Drought Surcharges Corresponding to Drought Stages

Maximum Applicable Drought Surcharge Percentage				
	Stage 1	Stage 2	Stage 3	Stage 4
All potable water flow charges	5%	10%	20%	30%

A.8.2 EBMUD Drought Rate Structure

EBMUD uses drought surcharges to reflect the costs to provide service during drought. As established in EBMUD 2025 Water Cost of Service Rate Study Report, drought surcharges are calculated based on the estimated revenue needs during different stages of drought, including costs to purchase transfer water, additional operating costs to treat and deliver the purchased water, costs for drought outreach, and costs for additional water conservation efforts. The surcharges can also account for revenue loss due to the reduction

in water sales during droughts in response to voluntary or mandatory reduction targets. Drought surcharges are set as maximum surcharges that can be implemented during each drought stage. After a drought is declared by the EBMUD Board of Directors, the Board will determine the magnitude of any actual drought surcharge to be implemented based on the declared drought stage, EBMUD's budget, and necessary financial considerations.

As shown in EBMUD's Schedule L-Drought Surcharge Rate Schedule for Water Service (Appendix J), the rates for the Water Flow Charge shown in EBMUD's Schedule A-Rate Schedule for Water Service (Appendix J) may be increased up to the following maximum percentages during the specified declared drought stage.

Table W-7 shows when the drought surcharge would first be applied and the corresponding percent increases throughout the various drought stages.

The drought surcharge adopted by EBMUD's Board will be applied to the applicable rate of the customer's potable Water Flow Charge from Schedule A. Prior to implementing the drought surcharges, EBMUD will update drought-related costs and develop surcharges based on the updated cost of service. Any surcharges that are imposed will be consistent with EBMUD's staged system of drought surcharges and will not exceed the drought surcharge maximums listed in Schedule L.

A.9 Monitoring and Reporting

During droughts, EBMUD monitors customer demand closely to ensure that its DMP is effective in reducing demand to the required level. Data gathered from monitoring can help EBMUD to make decisions on priorities for customer outreach and conservation programs.

EBMUD evaluates both billed consumption and daily water production data relative to reduction goals. Using this data, staff gauges EBMUD's effectiveness in managing overall demand and customers' responsiveness to requests to conserve. The results are presented to the EBMUD Board of Directors in regular drought management reports. The reporting frequency depends on the level of activity occurring and the severity of the drought.

Customer accounts are metered, providing bi-monthly and monthly (for large water use accounts) consumption data that can be evaluated by customer category characteristics. Water production data tracks treated water input to the distribution system leading to customers' taps. Air temperature variations are also tracked with water production to observe the effects of weather conditions on consumption behavior. Using financial records summarized from customer bills, EBMUD analyzes whether customer groups are reaching their conservation targets based on the distribution of customers affected by drought surcharges and higher drought rates.

EBMUD assesses the effectiveness of its demand management programs on the projected water supply in each report to the Board. This ensures timely action can be taken to recommend improvements to the DMP for Board consideration if results fall short of EBMUD's water use reduction goals.

The success of a DMP depends on customers reducing their water use. Experience shows that providing clear feedback on consumption relative to goals and water use reduction expectations, benchmarking efficient water use among customer sectors, clearly stating the financial penalties for overuse, clearly stating the consequences for violating water use regulations and ordinances, and acknowledging all customers' efforts to save water all reinforce prudent behavior. EBMUD uses Home Water Reports for enrolled customers and uses its Customer Information System to inform all customers of their current and past water uses and routinely updates printed messages on customer water bills. This information helps customers monitor their individual rationing efforts and encourages adjustments to usage.

A.10 WSCP Refinement Procedures

EBMUD prepares internal lessons learned reports from various departments after consecutive drought events; these reports document the challenges and successes to understand causes of difficulties and to make improvements in handling future droughts/water shortages. The benefits of looking back at past experiences include process improvement, risk management, and identifying constraints and uncertainties. This reflection and evaluation contributes to EBMUD's continuous improvement in refining response actions.

EAST BAY
MUNICIPAL UTILITY DISTRICT

375 Eleventh Street, Oakland CA 94607 • 1-866-403-2683 • ebmud.com