WATER SHORTAGE CONTINGENCY PLAN 2020

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ATTACHMENT 1 - WATER SHORTAGE CONTINGENCY PLAN

1. WATER SHORTAGE CONTINGENCY PLAN (WSCP) 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 availability of the sources of water. The Water Shortage Contingency Plan (WSCP) provides a framework to help address water shortages that may occur. As noted in Chapter 2, 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 as it anticipates a wide range of futures which then leads to developing a more resilient portfolio of response actions to manage changing conditions.

1.1 WSCP PURPOSE

EBMUD is responsible for providing drinking water to about 1.4 million people and ensuring a reliable supply of potable water is core to EBMUD's mission. 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 supplemental water supplies 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 distribution 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 develop a coordinated response to these situations and to guide EBMUD's planning and response through thoughtful assessment and management of the water supply.

The WSCP defines an orderly 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 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 firefighting needs.

The WSCP describes emergency readiness and response including efforts to coordinate with local, county, regional, state, and federal agencies. Section 4.7 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 Drought Contingency Plan (CDCP) 2016. The goals of the CDCP that align with EBMUD's are to:

- meet essential human health and safety needs, by supplying adequate water supplies throughout a water supplier's service area for drinking, sanitation, and fire suppression, as a first priority;
- provide and maintain adequate protections for State and Federal endangered and threatened species and other fish and wildlife resources; and
- seek and consider water management flexibilities to maximize the benefit of limited water supplies.

The CDCP defines the roles and responsibilities of state agencies, establishes the structure for integrating state interagency planning, and identifies an integrated regional approach to assessing droughts, drought action levels, and appropriate agency responses as drought severity changes.

Consistent with the Delta Plan, the 2020 UWMP also includes an Enhanced Reliability Element that discusses EBMUD's plan for responding to possible interruption of water supplies resulting from catastrophic events impacting the Delta. This element is discussed in Appendix H.

1.2 WSCP REQUIREMENTS

Section 10632 of the California Water Code requires UWMPs to include an urban water shortage contingency analysis. The relevant section of the Code is provided in Appendix A. As required by the Water Code, in 1992 EBMUD adopted its first WSCP, and the WSCP has continued to evolve since. It was updated in the 2010 UWMP to reflect the 2007-2010 drought period, the completion of the Freeport Regional Water Facility, and numerous other changes. In 2015, EBMUD revised its Drought Management Program (DMP) Guidelines and ordinances on excessive use and water theft to incorporate lessons learned from the recent drought.

In 2018, new legislation required replacing the water shortage analysis under the former law with the creation of a WSCP with several prescriptive elements. With this update in 2020, EBMUD modified its DMP to integrate the requirements of the 2018 legislation as well as incorporating additional lessons learned from the 2014-2016 drought.

2. WATER SUPPLY ANALYSIS

As required by the Urban Water Management Planning Act - Section 10635, 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. EBMUD uses a water supply system model to assess the sufficiency and reliability of its long-term water supply by modeling its Mokelumne River and CVP water supplies against projected demands under three potential future scenarios. Consideration of scenarios in its long-term planning provides for a robust water supply portfolio in combination with a comprehensive Drought Management Program which allows for EBMUD to provide reliable water service in all year types.

2.1 MODELING METHODOLOGY

For the 2015 UWMP and prior plans, the supply assessment was performed using EBMUD's water supply system Simulation Model (EBMUDSIM). Since 2018, the EBMUD has transitioned to using the 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 model. For the 2020 UWMP, hydrology from 1921 – 2015 was available for use in the water supply modeling. The water service reliability analysis assumes that any of the historical hydrologic sequences could reoccur 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 in-stream flow requirements into the model. EBMUD is required to make in-stream flow releases per the terms of its 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, and existing dry year supplemental supplies to be varied so as to be able to analyze for different scenarios or projections.

EBMUD uses historical hydrologic data to inform its modeling and planning for future droughts. 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 history was the 1976-1977 drought, when runoff was only 25 percent of average and total reservoir storage decreased to 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.

EBMUD uses a three year "drought planning sequence" (DPS) to assess the adequacy of its water supply for long-term water resources planning. Model simulation of the first and second years of this DPS uses the actual runoff that occurred in 1976 and 1977, the driest recorded two-year period. The simulated runoff in the third year is 185 thousand acre-feet (TAF), which is the average of a number of hydrologic parameters from 1976 and 1977. EBMUD's water supply system model assumes that such a severe drought (1) would not continue beyond the third year of this sequence and (2) would result in all accessible storage being depleted during the third drought year.

EBMUD undertook an analysis to test the adequacy of the DPS for planning purposes. Because of the

[1] EBMUD continues to meet its flow commitment to protect the lower Mokelumne River by providing instream flow releases from EBMUD's Camanche Dam to improve fishery conditions, per the requirements of the 1998 Joint Settlement Agreement (JSA) among EBMUD, US Fish and Wildlife Service, and the California Department of Fish and Wildlife.

persisting extreme dry conditions throughout most of California from 2012 through 2016, EBMUD analyzed the three-year DPS was in fact the most severe credible drought, in terms of significant impacts to available water supply to meet customer demands and other obligations, that should be considered in its planning. The evaluations found that, when the DPS was applied, it was the most severe drought in the historic record.

EBMUD uses a DPS to simulate the effects of a severe, multi-year drought as the basis of EBMUD's long-term water supply planning. New legislation (Senate Bill 606) also now 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 in the hydrologic period that affected EBMUD and is included in the analysis for this UWMP.

Computer simulations help evaluate the need for additional supplemental supplies in each modeled year. 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.

2.2 Existing Dry Year Supplies

EBMUD's sources for its water supply projections include EBMUD's Mokelumne River flow entitlement, and water from Central Valley Project (CVP) diverted through the Freeport Facilities.

EBMUD uses historic Mokelumne River hydrology with inclusion of the DPS to determine supply availability scenarios from the Mokelumne River.

EBMUD holds a water service contract with the USBR to receive water from the CVP through the Freeport Regional Water Project in years when EBMUD's water supplies are relatively low. Specifically, EBMUD's contract allows it to receive CVP water in years when EBMUD's March 1 projection, as updated monthly through May 1, of its October 1 total stored water 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 total system storage, with reference to EBMUD's Drought Management Program;
- Likelihood that USBR will have sufficient water in the following year to allow EBMUD to receive the water under its contractual entitlement; and, 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 two 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 Municipal and Industrial (M&I) Water Shortage Policy 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 for 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 Water Shortage Policy 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 Water Shortage Policy Implementation Guidelines and Procedures dated August 2015 and 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) using the CalSim model. The DWR 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 the system. As a result, these allocations may differ from the historic allocations. For example, during a moderately dry year, the DWR CalSim allocation may be lower than the actual, historic allocation because the DWR CalSim results are based on a higher demand and level of development. In the most recent drought that occurred, EBMUD's CVP allocation

went as low as 25 percent and consequently the assessment analysis in the WSCP also includes a scenario to reflect this actual allocation.

The Bayside Groundwater Project, Phase I, was previously included in the 2015 UWMP as an available dry year supply. EBMUD, however, is currently in the process of developing the Groundwater Sustainability Plan for the East Bay Plain Sub-basin, and when the evaluation and recommendations become available, they will be included in the next update of the UWMP.

2.3 Water Supply Planning and Climate Change

Climate change could impact EBMUD's ability to reliably provide water to its customers, with current climate change scenarios predicting an increase of the probability of occurrence of extreme weather events. Changes in precipitation and air temperature can impact the timing and quantity of water resources; long-term changes in maximum daily air temperature and rainfall predicted by available climate change models were reviewed to determine any impact to the water supply. Similar to the analysis done to look at climate change impacts on projected water demand (Chapter 3), the approach used for this study is based on guidance from California Department of Water Resources' expert advisory committee, the CCTAG[1], on the use of climate models and associated technical tools for water resources planning.

To be consistent with the 2050 Demand Study climate change analysis, an ensemble of 10 GCMs for planning studies was used, since these models capture the range and uncertainty of future climate projections. The output for all GCMs and associated scenarios are available via Cal-Adopt.org. In selecting the worst-case scenario, RCP 8.5 scenario was considered for analyzing Mokelumne watershed. Chapter 3 of the UWMP provides more detail as to how this scenario was selected.

For air temperature change, the GCM model CanESM2 (Average) with RCP 8.5 (High Emission scenario) and GCM model HadGEM2-ES (Warmer/Drier) with RCP 8.5 (High Emission scenario) were considered. Figure W-1 presents the model output for annual average maximum air temperatures. Overall air temperatures are projected to rise substantially throughout this century. Data for the aforementioned models were downloaded from Cal-Adopt.org website and analysis was then performed in MS Excel. The plotted maximum air temperatures have a spread, or uncertainty band. Polynomial best-fit line was applied to compute the air temperature change between years of interest from 2020 to 2045. The analysis for CanESM2 showed an approximate 2.4°C increase in 2045 from 2020, and an approximate 2.5°C increase for HadGEM2-ES.

The air temperature increases for both CanESM2 and HadGEM2-ES models are within the range of the analysis done by EBMUD and referenced in the 2015 UWMP climate change scenario. In 2015, EBMUD looked at three possible scenarios related to climate change: a 2°C increase in average air temperature; a 4°C increase in average air temperature; and a 20% reduction in precipitation. These scenarios provide an initial framework to understand potential climate change impacts.

An increase in average air temperature is predicted to shift the timing of runoff, as snowpack melts earlier in the year, or as precipitation falls as rain instead of snow. In order to model this effect, EBMUD used result of its Water Supply Management Plan (WSMP) 2040 study[2] on climate change and applied them to updated conditions and assumptions. The WSMP 2040 study used a Mokelumne Watershed Digital Elevation Model (DEM) coupled with a Geographic Information System (GIS) to estimate potential impacts of increased air temperature on precipitation. The DEM data was used to develop an elevation-area relation from which watershed land area above/below specified contour lines were estimated. EBMUD used snow survey data to develop snow water equivalent (SWE) data. The data were used as input for multiple linear regressions calculating a relationship between monthly air temperature, precipitation, and SWE at five snow courses over the historical record. The regression equations were then used to estimate SWE under the scenarios with 2°C and 4°C increases in air temperature.

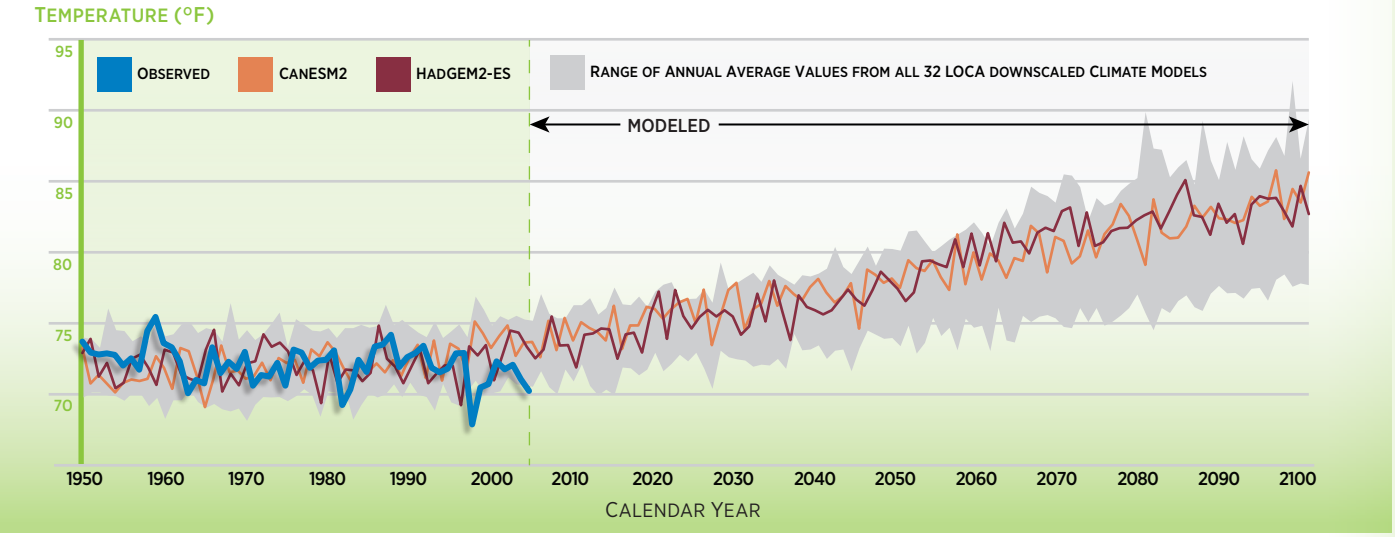
EBMUD also evaluated a 20% reduction in precipitation. A 20% reduction in precipitation was assumed to correspond to a 20% reduction in runoff. EBMUD reduced the runoff in its historic hydrology accordingly.

Each of the climate change scenarios was run through a Visual Basic Script adjusting PG&E operations upstream accordingly. The resulting regulated flows

[1] DWR, CCTAG, August 2015. Perspectives and Guidance for Climate Change Analysis.

[2] The Water Supply Management Program (WSMP) 2040 was a program-level effort that looked at EBMUD's water supply needs over a thirty-year planning horizon and proposed a diverse portfolio of policy initiatives and potential projects to pursue. The final plan was adopted by EBMUD Board of Directors on April 24, 2012.

FIGURE W-1 ANNUAL AVERAGE MAXIMUM TEMPERATURE



were then input into the EBMUDSIM model. Although EBMUD has transitioned to using the Riverware model for its supply and demand assessment, the climate change analysis and evaluation based on the aforementioned hydrologic scenarios that was provided in the 2015 UWMP is still informative.

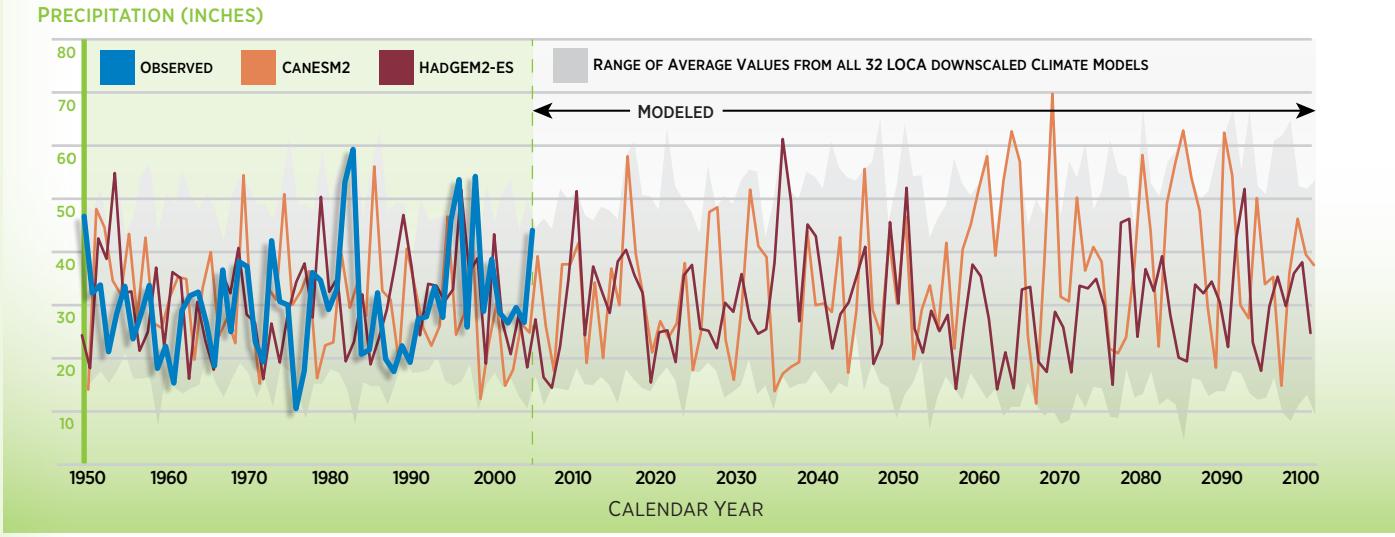
The results from the analysis illustrated potential impacts to EBMUD, depending on how climate change affects EBMUD specific watershed. It is important to note that the modeling of climate change is still an imperfect science, especially at the level of granularity required to study a specific watershed. There is no standard model that is used to quantify the effects of climate change on watershed hydrology. While it is difficult to quantify the exact impacts of climate change, EBMUD's modeling does provide useful information on the potential qualitative impacts.

The scenarios that modeled an increase in average air temperature included a shift in runoff patterns, with some spring snow melt runoff arriving earlier as winter rain runoff. However, the Mokelumne River has storage that helps to attenuate the effects of the change in runoff pattern so as to minimize its effects on EBMUD's customers. For example, there are reservoirs upstream of Pardee and Camanche Reservoirs that would act to regulate runoff. Modeling showed that winter runoff was caught and stored in the upstream reservoirs, then released in the spring and summer in a timeline similar to what EBMUD experiences now. These scenarios do result in small changes in total system storage and rationing, but the need for water was not affected in the time horizon considered. EBMUD will conduct further research and data gathering on runoff forecasting and shifts and operations of reservoirs in the upper Mokelumne watershed and of Pardee and Camanche to better understand the impacts to water supply for the next update of the UWMP.

The other climate change scenario that was evaluated, which focused on a 20% overall reduction in watershed runoff, created more substantial changes than the scenarios focusing on air temperature change. The reduction in runoff scenario showed a significant increase in the need for water as well as an increase in the overall amount of rationing experienced by EBMUD customers. It is important to note that among several models, precipitation projections do not show a consistent trend during the next century. The GCM model output showed high variability in rainfall as well and therefore high uncertainty in the forecasts. Figure W-2 depicts annual average precipitation, and on average, the projections show little change in average annual precipitation.

Due to the high variability and thereby the high uncertainty, more refined analysis, using EBMUD's new water supply system model and improved data science, will be performed with an approach that looks at extreme shifts that may occur within the precipitation range. The results will then be evaluated to understand the potential impacts and how EBMUD will plan to address those potential impacts. These response actions would build upon the current plan of developing a diversified and resilient portfolio to help adaptively manage for long-term water supply planning.

FIGURE W-2 ANNUAL AVERAGE PRECIPITATION



2.4 SCENARIO DEVELOPMENT

For the 2020 UWMP supply-demand analysis, EBMUD evaluated several different scenarios to assess its need for water 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, there is a growing recognition 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. Table W-1 shows additional details on how these scenarios were developed and the assumptions that were included in them.

Base Condition

The base condition scenario represents EBMUD's current operations and assumptions. This scenario uses EBMUD's historic hydrology - with the DPS - to assess the historic water supply against each of the future demands projected in the 2050 Demand Study. In addition to the Mokelumne River supply, it is assumed that EBMUD will receive its requested allocation of CVP supply subject to the M&I Shortage Policy using the modeled yearly CVP allocations provided by USBR[1]. For this scenario, CVP supplies began delivery in May of the first year of drought. The triggers to take delivery of CVP 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 CVP water deliveries and setting voluntary rationing goal between 0 to 10%.

Year 2 being the second consecutive dry year is determined as a year that EBMUD would implement DMP elements, which includes continuing to obtain CVP water deliveries and setting a mandatory rationing between 10 – 15%.

TABLE W-1 SUPPLY-DEMAND SCENARIOS MODELED BY EBMUD

SCENARIO	DROUGHT PLANNING PERIOD	ASSUMPTIONS
UWMP BASE CONDITION	1976-1978 DROUGHT PLANNING SEQUENCE	CVP SUPPLIES ARE AVAILABLE WHEN NEEDED SUBJECT TO M&I WATER SHORTAGE POLICY AS MODELED BY DWR.
HIGH DEMAND	1976-1978 DROUGHT PLANNING SEQUENCE	HIGH WATER DEMAND CONDITION MODELED THE UPPER END OF THE DEMAND PROJECTION.
EXTREME DROUGHT	1976-1978 DROUGHT PLANNING SEQUENCE	CVP ALLOCATION REDUCED TO 25% IN SECOND AND SUBSEQUENT YEARS OF DROUGHT.
FIVE-YEAR HISTORICAL DRY PERIOD	1987-1992 DROUGHT	MEET LEGISLATIVE REQUIREMENT OF LOOKING AT A FIVE YEAR CONSECUTIVE DROUGHT.

[1] The Final State Water Project Delivery Capability Report 2019. August 26, 2020.

Year 3 being the third consecutive dry year is determined as a year that EBMUD would implement DMP elements which includes obtaining CVP water deliveries and implementing mandatory rationing of 15%.

High Water Demand Scenario

The Planning Level of Demand (PLOD) presented in Table W-2 was developed using predictions of changes in land use, climate, and existing customer water demands. However, uncertainty exists in the predictions used to develop the PLOD. To account for this uncertainty in the long-term planning, EBMUD modeled a High Water Demand scenario where the upper end of the demand projection was selected for analysis.

Extreme Drought Scenario

To reflect what can and did occur during the most recent drought, this scenario looks at a reduced allocation of CVP supplies to 25% in drought Year 2 and 3 of the DPS. As discussed earlier, EBMUD's CVP supply is subject to USBR's M&I Shortage Policy. USBR indicated in that policy that, depending on CVP water supply conditions and operational constraints, it is possible for M&I deliveries to be reduced to below 50%. In 2015, EBMUD only received 25% allocation. Therefore, for this scenario, EBMUD takes CVP water when Stage 2 of the DMP is triggered and assumes that only 25% of CVP allocation is received.

Another constraint that occurred in the most recent drought period was curtailments of water diversions. In June 2014 through the Fall of 2014, and then again in May 2015 and through the Fall of 2015, the State Water Resources Control Board curtailed water diversions by EBMUD and all other post-1914 water rights holders. The additional flow released downstream in the Mokelumne River due to curtailments in 2014 and in 2015 was 10 TAF and 25 TAF, respectively.

Although it occurred, curtailment is not included in the Extreme Drought Scenario analysis due to the complexity of determining how and when curtailments would be mandated in the future. Consequently, the impacts of curtailments on water supply availability cannot be quantified at this time. However, based on the reduced CVP allocation assumption, EBMUD's total available water supply storage is essentially empty near the end of the second year of a drought period and the entire third year of the drought period. Any additional reduction of available water supply would result in a direct change in the amount of water that is delivered to EBMUD customers and would result in an additional need for water.

Five-Year Historical Dry Period

Recent updates to the Urban Water Planning Act now require water agencies to assess water supply and demand during a five-year drought. To meet this new requirement, EBMUD looked at the hydrologic record and focused on the 1987-1992 drought period. Base Condition, High Demand, and Extreme Drought scenarios were analyzed for this five-year drought period.

2.5 SCENARIO ANALYSIS RESULTS

Base Condition Scenario Results

EBMUD modeled its system in the UWMP Base Condition Scenario according to the updated DMP guidelines. The 2020-2050 demand projects were modeled against EBMUD's historic 1921-2015 hydrology to determine

TABLE W-2 — **AVERAGE ANNUAL DEMAND PROJECTIONS BY CUSTOMER USE CATEGORY (MGD)**

	2020	2025	2030	2035	2040	2045	2050
SINGLE-FAMILY RESIDENTIAL	115	117	119	121	125	126	129
MULTI-FAMILY RESIDENTIAL	40	44	48	52	59	63	67
INSTITUTIONAL	17	18	20	21	22	24	26
INDUSTRIAL	33	35	35	36	36	37	37
COMMERCIAL	16	18	19	21	22	24	25
IRRIGATION	13	13	13	13	13	13	13
TOTAL	234	245	254	264	277	287	297
WATER CONSERVATION	-48	-53	-58	-61	-63	-65	-66
NON-POTABLE WATER	-5	-6	-6	-9	-13	-13	-13
PLANNING LEVEL OF DEMAND (ROUNDED)	181	186	190	194	201	209	218

system reliability during normal years, single dry years, and the three-year DPS.

The results of this analysis provided in Table W-3, show that under base condition assumptions, EBMUD can meet customer demand out to 2050 during normal years and single dry years; however, during multi-year droughts, even with customer demand reduction measures in place, EBMUD will need to obtain supplemental supplies to meet customer demands.

2.6 Findings from Other Scenarios

All except the five-year drought scenario shows a need for water in the future, but the magnitude of that need varies.

High Water Demand Scenario Results

With higher water demands, EBMUD's water supplies are reduced more rapidly than in the Base Condition Scenario, and the DMP is triggered sooner, reaching mandatory rationing in Year 2 of the DPS. In Year 3 of the DPS, with the combination of a greater supply deficit and increased demands, there is a significant increase in the need for water. Table W-3 provides the results of the analysis for this scenario, focusing in on Year 3 of the DPS.

Extreme Drought Scenario Results

The extreme drought scenario did not change significantly from Base Condition because CVP diversions, although reduced in years 2 and 3, were available throughout the drought period analyzed. Figure W-3 shows the results of the supply and demand assessment in year 3 of the DPS for each of the three scenarios evaluated.

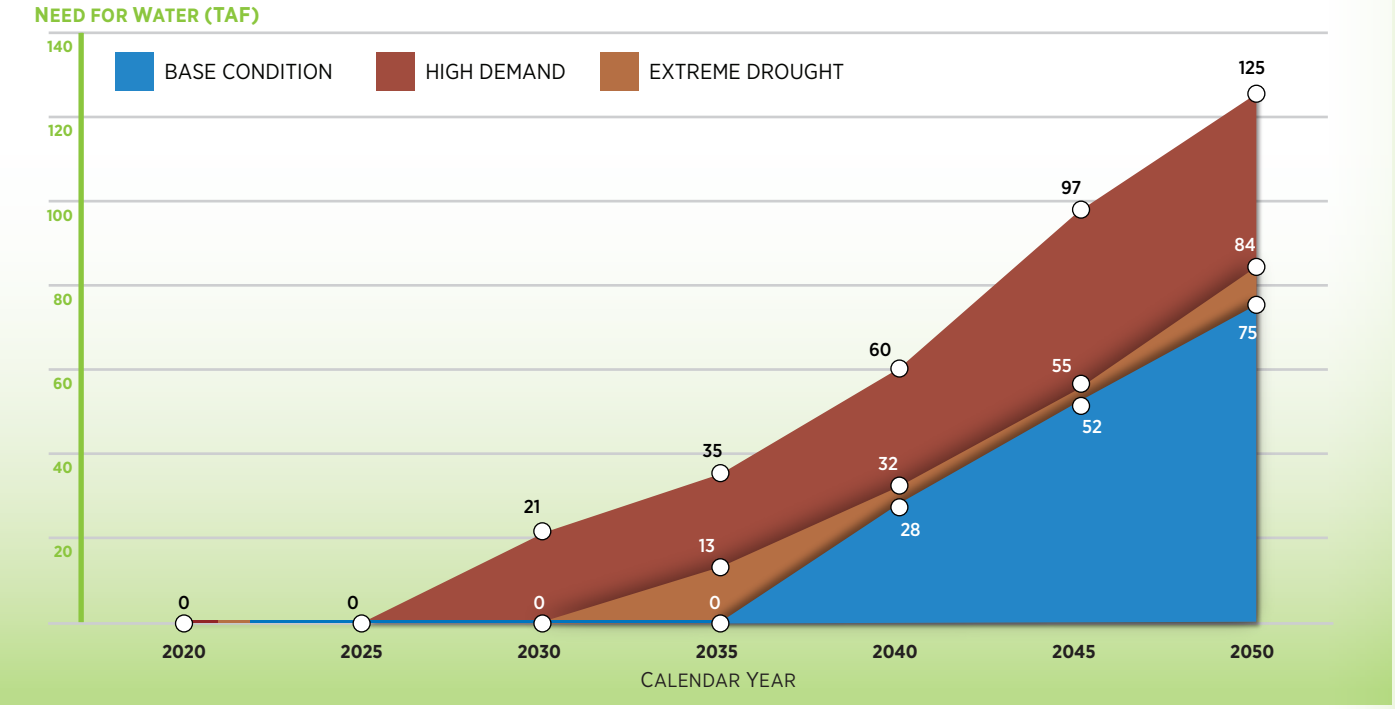
Five-Year Historical Dry Period Scenario Results

The five-year drought period evaluated is longer than the DPS, however it does not have any single year that is as critically dry as what occurs in 1977 in the DPS. The results show overall there are not many changes between scenarios during the five-year drought. The High Demand scenario creates a consistent average

Table W-3 — **Supply & Demand Assessment, 2020-2050**

EBMUD Planning Level of Demand (PLOD)		2020	2025	2030	2035	2040	2045	2050
Normal Year	Mokelumne Supply (MGD)	>181	>186	>190	>194	>201	>209	>218
	EBMUD Planning Level of Demand (PLOD) (MGD)	181	186	190	194	201	209	218
	Need For Water (TAF)	0	0	0	0	0	0	0
Single Dry Year	Mokelumne Supply (MGD)	121	126	129	132	138	144	151
	CVP Supplies (MGD)	60	60	60	60	60	60	60
	Total Supplies (MGD)	181	186	189	192	198	204	211
	Voluntary Rationing (%)	0	0	1	1	2	2	3
	Need For Water (TAF)	0	0	0	0	0	0	0
Second Dry Year	Mokelumne Supply (MGD)	82	86	89	92	98	104	111
	CVP Supplies (MGD)	74	74	74	74	74	74	74
	Total Supplies (MGD)	156	161	164	167	172	178	185
	Mandatory Rationing (%)	13	13	13	14	14	14	15
	Need For Water (TAF)	0	0	0	0	0	0	0
Third Dry Year	Mokelumne Supply (MGD)	141	145	146	145	132	118	105
	CVP Supplies (MGD)	12	12	12	12	12	12	12
	Total Supplies (MGD)	153	157	158	157	144	130	117
	Mandatory Rationing (%)	15	15	15	15	15	15	15
	Need For Water - Base Condition (TAF)	0	0	0	0	28	52	75
	Need For Water - High Demand Scenario (TAF)	0	0	21	35	60	97	125
	Need For Water - Extreme Drought Scenario (TAF)	0	0	0	13	32	55	84

FIGURE W-3 DPS WITH THREE SCENARIOS



reduction in storage compared to Base Condition. The Extreme Drought scenario oscillates from matching Base Condition to results that are similar with the High Demand scenario. Overall, EBMUD's storage has sufficient water supply from 1987 through 1992 during all three potential scenarios – Base Condition, High Demand, and Extreme Drought.

3. 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 G) describes its process for evaluating the adequacy of its water supplies every year. Since the early 1980s, EBMUD has been doing annual water shortage assessments to help make informed decisions on water supply management.

3.1 WATER SUPPLY AVAILABILITY & DEFICIENCY POLICY

Under the Policy, EBMUD's Board of Directors receives a preliminary Water Supply Availability and Deficiency (WSADR) by March 1 of each year evaluating the adequacy of that year's water supply if the year is anticipated to be a Dry or Critically Dry Year. The Board of Directors adopts a final WSADR in April, which updates the water supply projections based on the April 1st snow survey by DWR. These reports inform decisions by EBMUD's Board of Directors regarding whether to declare a water shortage emergency and implement a drought management program, institute mandatory water use reductions, and/or obtain/pursue supplemental supplies. The 2020 WSADR is provided as a sample in Appendix K. The WSADR will be the basis for the annual water shortage assessment report submittal to DWR as required by California Water Code section 10632.1. DWR has indicated it will begin requiring these submittals by 2022.

3.2 DECISION-MAKING TIMELINE & PROCESS

If water supplies are severely depleted, EBMUD's Board of Directors may declare a water shortage emergency and implement the Drought Management Program (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 emergency, depending on drought 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, and 2014-2016 when supplies were limited. Table W-4 shows the rationing levels that EBMUD has historically set, starting with the 1976 drought period.

EBMUD begins drought preparations early in the calendar year if there is potential for a water shortage. Figure W-4 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 supplemental supplies based on projections of end of the water year storage. 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 a shortage 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.

As discussed earlier, the final WSADR is adopted by May 1 of each year. The WSADR is based on EBMUD's projected end of September storage 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 the water year water storage. The adopted stage of drought helps determine the need for dry year supplemental supplies and customer water use reductions. Depending on the projected level of storage, the Board may also decide to request CVP supplies from USBR and/or secure water transfers. Section 2 above, Water Supply Reliability Analysis, discusses EBMUD's CVP supplies and how these supplies factor into drought planning. EBMUD submits an initial schedule of requested CVP deliveries to USBR by March 1. However, 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 the water supply and the impacts on demand of any voluntary or mandatory rationing policy. As warranted by the water supply status and the DMP guidelines, the Drought Committee initiates response activities and sets timelines for these activities. The Drought Committee 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. Depending on the level of 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 year. This includes discussions with potential sellers and preparation of necessary environmental reviews that would be required to implement the water transfer.

3.3 Data and Methodologies for Short-term Demand Forecast

EBMUD has developed an annual demand projection methodology that is used for operational planning. Water treatment plants produce water demand data that is then used to make correlations with current water year estimates combined with screening historical demand patterns and trends to make a new

Table W-4 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

demand projection. The annual projection is then partitioned into projected average monthly demands based on the historical monthly distribution. In recent years, the new annual demand projections take into account water conservation. An assessment on availability of supply takes into account projection of runoff based on DWR's snow survey, Mokelumne River diversions based on water rights terms, agreements, as well as the instream environmental flow requirement and expected diversions by riparian and senior water rights holders. The annual assessment, driven by hydrological conditions and analyzed using a stochastic 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 through the winter and spring months.

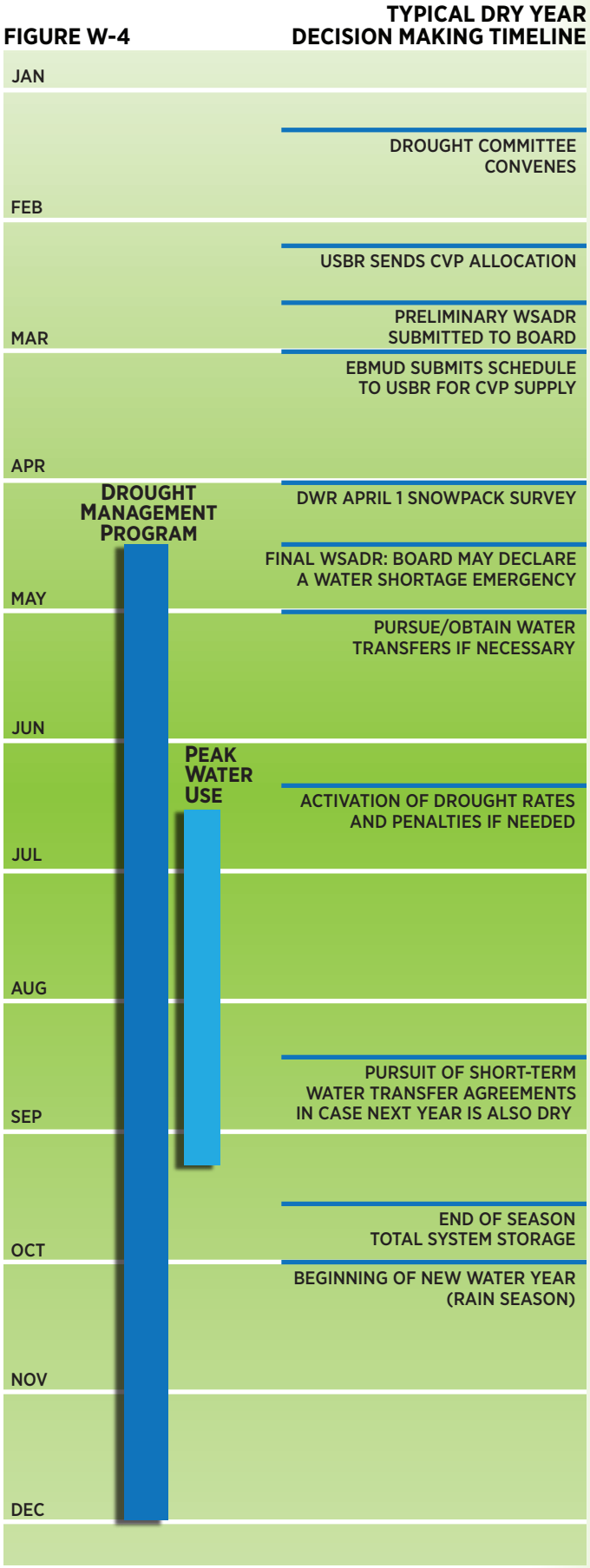
3.4 WATER OPERATIONS DURING DROUGHT

The 2014-2016 drought was the first time the EBMUD delivered water from the Freeport facilities, and valuable lessons were learned regarding water operations. The key findings from the 2016 Freeport Regional Water Project (FRWP) operation are: (1) take delivery of the supply as early as possible in the drought sequence to maximize delivery of the lower-cost drought supply, (2) maximize production at the West of Hills water treatment plants, and (3) manage the terminal reservoirs to maximize available space for storage. These lessons were incorporated into the DMP and operational decision-making processes moving forward.

Obtaining Dry Year Supply Early

EBMUD's CVP allocation was reduced by 50 percent in the contract year 2014 and by 75 percent in contract year 2015 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 by securing options to purchase transfer water for 2016. The transfer water was more expensive than the CVP water and may not have been necessary had CVP water been available. Therefore, EBMUD will maximize delivery of lower-cost drought supply at the start of the drought.

FIGURE W-4



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

The delivery quantity of dry year supply water can be maximized when the treatment rate of this water matches the delivery rate. When dry year water was delivered at a greater rate than it could be treated, it increased the storage levels in USL and San Pablo reservoirs within the service area. This limited the reservoirs' ability to store runoff and increased the risk of spill.

In 2016, the treatment rates at conventional WTPs could not be maximized, because in-line Orinda WTP needed to operate at a lower rate, which would allow more dry year supply water to be treated at the conventional WTPs. Improvements at Orinda WTP will be completed as a part of the WTP infrastructure improvements project so Orinda WTP can operate at a lower rate so more dry year supply water can be treated at the West of Hills plants. Chapter 4 of the UWMP discusses in more detail the infrastructure improvements project.

Terminal Reservoir Management

At the start of the 2015 FRWP operation, the dry year supply could only be delivered to USL and San Pablo reservoirs and treated at the associated conventional WTPs. Because the rate of FRWP delivery exceeded the rate of treatment at the 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 the lower end of their operating ranges. This practice will be continued in future FRWP operations.

4. Water Shortage Levels and Shortage Response Actions

EBMUD's Drought Management Program provides a framework to manage customer demand and pursue a diversified portfolio to reach a goal of providing 85 percent reliability for customers in EBMUD's service area while continuing to meet all stream flow obligations on the lower Mokelumne River. The DMP guided EBMUD in managing demand and supply during the 2014-16 drought when mandatory and voluntary rationing was imposed, and water supplies were limited. During that recent drought, EBMUD faced unanticipated constraints and updated and implemented measures to assist with demand and supply management. The DMP was revised to reflect lessons learned and actions that were taken.

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 the revised drought stages and associated response actions as outlined in Figure W-5.

EBMUD declares different drought stages based upon projected end-of-September total system storage 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 CVP water or additional dry year water supplies that could be obtained in combination with the level of customer demand reduction that may be requested.

Table W-5 shows the link between the drought stages and rates, penalties, and regulations in effect. Beginning in Stage 2, 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 come into effect.

Table W-6 shows the types of programs and actions that EBMUD might undertake at each stage of drought. The triggers to implement water shortage response action 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.

Table W-5 — Drought Management Program Guidelines

Stage	Rate/Penalty Impacts	Regulations in Effect or Potentially Enacted
0 Normal	Normal rates	Section 29
1 Moderate	Normal rates	Section 29
2 Significant	Normal rates Drought Surcharge	Section 29
3 Severe	Normal rates Drought Surcharge Excessive Use Penalty	Section 28 Section 29 Excessive Use Ordinance
4 Critical	Normal rates Drought Surcharge Excessive Use Penalty	Section 28 Section 29 Excessive Use Ordinance

Notes:
a Drought Surcharges will reflect the most recently adopted Proposition 218 rates.
b Under Stages 3 or 4, the Board would declare a water shortage emergency and enact Section 28 to implement water conservation measures. Penalties under the Excessive Use Ordinace would apply.

Water Code Section 10632 requires water shortage contingency plans 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.

In general, EBMUD begins to bring in supplemental supply water and requests customers to reduce demand when the total operational storage is reduced by almost one-third.

Table W-7 presents EBMUD's water shortage levels cross referenced with the State's new standardized water shortage levels. EBMUD's water shortage levels for this cross-referencing is determined by the total operational storage[1] that is available.

It is difficult to quantify the reduction in gap between supplies and demand due to the implementation of the response actions as outlined in Table W-6. The response actions would be adjusted based on the level of rationing that is achieved and to meet EBMUD's policy of providing 85% reliability to its customers. At each stage, EBMUD will consider augmenting its supplies as outlined in Figure W-5 with the quantities determined based on antecedent conditions and projected demand. The response actions to close the gap between supply and demand as well as the augmented supplies needed that year are outlined in the annual water supply availability assessments.

[1] EBMUD's Total System Storage (TSS) is defined in the contract with U.S. Bureau of Reclamation as the total reservoir capacity for the upcountry and terminal reservoirs, which is approximately 771 Thousand Acre-Feet (TAF). The Total Operational Storage (TOS) is defined as the accessible water supply volume in the upcountry and three terminal reservoirs, thereby excluding: dead storage in all reservoirs, 20 TAF of water (referred to as "gainsharing" water per the FERC license) allocated for environmental use only, and Chabot & Lafayette Reservoirs which are currently disconnected from the distribution system. The TOS results in total accessible water supply volume of approximately 697 TAF.

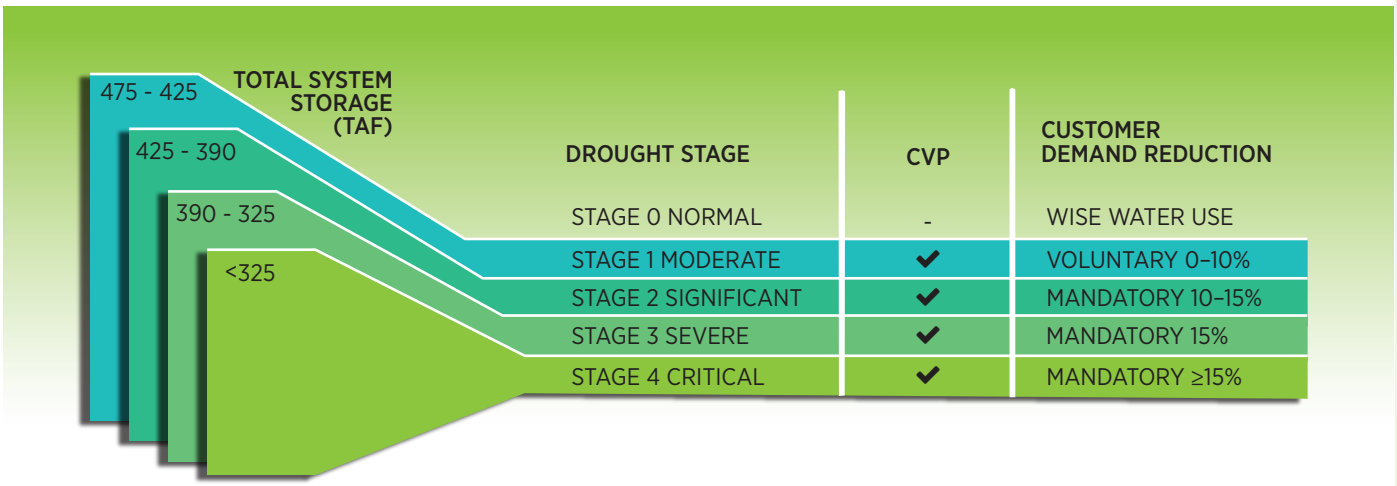
4.1 WATER SUPPLY SHORTAGE MITIGATION

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 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 dry year supplemental water supply options include:

- trucking recycled water for customers for approved uses;
- drawing from reserve supplies (terminal reservoir standby storage);
- pursuing emergency transfers or exchanges.

FIGURE W-5 **DROUGHT MANAGEMENT PROGRAM GUIDELINES**



TOTAL SYSTEM STORAGE includes Pardee, Camanche, Upper San Leandro, Briones, Lafayette, Chabot, and San Pablo Reservoirs

CVP - Central Valley Project

TABLE W-6 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 MAY INCLUDE EBMUD'S WEBSITE, SOCIAL MEDIA, MEDIA OUTREACH, ADVERTISING, WORKSHOPS AND EVENTS, BILL INSERTS AND BILL MESSAGING
	INITIATE COMMUNITY WATER WASTE HOTLINE AND ONLINE WATER WASTE REPORTING
	ISSUE UP TO 50,000 SINGLE FAMILY RESIDENTIAL (SFR) HOME WATER REPORTS
	PROVIDE COMMERCIAL AND RESIDENTIAL LANDSCAPE WATER BUDGETS TO UP TO 5,000 ACCOUNTS
	PROVIDE CONSERVATION AUDITS AND WATERSMART HOME SURVEY KITS
	ISSUE UP TO 5,000 INDOOR PLUMBING FIXTURE AND APPLIANCE REBATES
	ISSUE UP TO 5,000 OUTDOOR LANDSCAPE & IRRIGATION REBATES
	CONDUCT WATER AUDITS
	PROVIDE UP TO 5,000 FREE WATER SAVING DEVICES
	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 DROUGHT SURCHARGE
	CONTINUED OUTREACH AND EDUCATION
	PROVIDE ONLINE EBMUD STORE ORDERING (RESTAURANT AND HOTEL TENT CARDS, STICKERS)
	INCREASE SFR HOME REPORTS TO 75,000 HOUSEHOLDS
	INCREASE COMMERCIAL AND RESIDENTIAL LANDSCAPE WATER BUDGETS TO 25,000 ACCOUNTS
	ISSUE UP TO 10,000 FREE WATER SAVINGS DEVICES
STAGE 3 SEVERE MANDATORY 15% RATIONING	IN ADDITION TO ELEMENTS IN STAGE 2:
	APPLY STAGE 3 DROUGHT SURCHARGE
	ADVANCED MEDIA OUTREACH / RESPONSE
	ADVANCED CUSTOMER OUTREACH & EDUCATION
	CONSIDER WATER SAVING CAMPAIGNS, CHALLENGES
	CONSIDER SUPPLEMENTING EDUCATION AND OUTREACH WITH WEBSITE TOOLS AND INFORMATION; OUTDOOR, RADIO, PUBLICATIONS, AND ONLINE ADVERTISING; DROUGHT THEATERS OR OTHER EDUCATION FOR CHILDREN; CONTESTS AND PLEDGES; PROMOTIONAL ITEMS, SIGNS, DROUGHT NEWSLETTERS, CUSTOMER OUTDIAL MESSAGES, POSTCARD MAILINGS, ETC.
	INSTITUTE EXCESSIVE USE PENALTY FOR SFR CUSTOMER WITH USE > 60 CCF/MONTH
	INITIATE SUPERSAVER RECOGNITION PROGRAM
	INCREASE SFR HOME REPORTS TO 100,000 HOUSEHOLDS
	INCREASE COMMERCIAL AND RESIDENTIAL LANDSCAPE WATER BUDGETS TO 50,000 ACCOUNTS
	ISSUE UP TO 7,000 INDOOR PLUMBING FIXTURE AND APPLIANCE REBATES
	ISSUE UP TO 8,000 OUTDOOR LANDSCAPE & IRRIGATION REBATES
	ISSUE UP TO 15,000 FREE WATER SAVINGS DEVICES
	PROVIDE FIELD ENFORCEMENT OF REGULATIONS AND WATER USE RESTRICTIONS
STAGE 4 CRITICAL MANDATORY ≥15% RATIONING	IN ADDITION TO ELEMENTS IN STAGE 3:
	APPLY STAGE 4 DROUGHT SURCHARGE
	INSTITUTE EXCESSIVE USE PENALTY FOR SFR CUSTOMER WITH USE > 40 CCF/MONTH
	INCREASE SFR HOME REPORTS TO 325,000 HOUSEHOLDS
	INCREASE COMMERCIAL AND RESIDENTIAL LANDSCAPE WATER BUDGETS TO 150,000 ACCOUNTS
	ISSUE UP TO 20,000 FREE WATER SAVINGS DEVICES

TABLE W-7 SHORTAGE LEVELS CROSS-REFERENCE WITH STATE'S SHORTAGE STAGES

EBMUD DROUGHT STAGE	EBMUD SUPPLY SHORTAGE	STATE SHORTAGE LEVELS
0	NORMAL	1–4
1	MODERATE (43%)	5
2	SIGNIFICANT (50%)	5
3	SEVERE (55%)	6
4	CRITICAL (64%)	6

4.2 WATER RESERVE DRAWDOWN

It is EBMUD's policy to operate its terminal reservoirs to maintain enough standby storage to meet rationed customer demand for 180 days, in case the Mokelumne River supply is disrupted. After the emergency ends, the Mokelumne River supply is returned to service soon as practicable and within the regulatory framework to refill terminal reservoirs to meet minimum standby storage levels while also supplying inline plants. Emergency supplies through interties with the Contra Costa Water District (CCWD), San Francisco Public Utilities Commission (SFPUC), Dublin San Ramon Services District (DSRSD), and City of Hayward (Hayward) can be used during an emergency to reduce demand on the local reservoirs or used following an emergency to help EBMUD's recovery in re-establishing storage levels.

4.3 INTERTIES & AGREEMENTS FOR TRANSFERS & EXCHANGES

EBMUD continues its efforts to formulate and to support mutually agreeable 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, DSRSD, Hayward, and CCWD. Transfers/exchanges would be made under these agreements only for a short-term period of one year or less. These agreements provide an alternate source of water during planned facility outages and for emergency mutual aid to the parties but would not be used in situations involving a shortage of water due to high demand or drought. Figure W-6 presents a map of these emergency interties for transfers/exchanges in EBMUD's service area and lists the agreed upon quantities for transfer/exchange with water service agencies during emergencies.

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

In the future the Freeport facility may also provide regional reliability benefits, as EBMUD could partner with other Bay Area water agencies to help them receive water that may otherwise be inaccessible to them given their own system constraints. To accomplish this, EBMUD could temporarily use the Freeport Project to deliver water to its treatment and distribution system in the East Bay, when capacity is available, on behalf of other local agencies, and existing interagency interties could be used 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 outage 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

EBMUD has two locations earmarked for connecting smaller interties (2.8 and 5.7 MGD) with Hayward's water system under a 2000 agreement, and three additional sites for treated water transfer through fire hydrants (2.1 MGD each) under a 1994 agreement. 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, at 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 the DSRSD added a third 1.4 MGD DSRSD intertie on Dougherty Road connected in 2007. The three intertie locations are shown in Figure W-6. The process and billing are outlined in an agreement similar to that with Hayward.

Agreements with CCWD

In 2002, EBMUD executed an agreement with Contra Costa Water District (CCWD) for emergency services. Per the agreement, intertie locations can be added, removed, or modified as mutually agreed upon by each agency. Currently two intertie locations are identified. Up to 1 MGD could be provided to CCWD at one location. The second location could allow transfer of up to 10 MGD to CCWD and up to 8 MGD to EBMUD. 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

In 2003, Freeport Regional Water Authority and SCVWD (now Valley Water) signed a settlement agreement in which EBMUD would make available to Valley Water 6500 AF of its 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.

4.4 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 Compliance and Enforcement section.

EBMUD has also developed water efficiency requirements for new water service. Section 31 of EBMUD's Regulations Governing Water Service to Customers (Appendix G) outlines the water efficiency measures required for new and expanded service. Applications for standard service require approval from EBMUD's Water Conservation Division. Section 31 sets water efficiency requirements for indoor fixtures including toilets and urinals, showerheads, faucets, and appliances. For outdoor water use, Section 31 includes requirements for the design and installation of landscaping and irrigation systems. Section 31 requires that ornamental turf areas shall be limited to no more than 25% of the total landscaped area, and that non-turf areas shall be native or climate- appropriate species. It also sets efficiency requirements for irrigation systems. Applicants are required to meet the requirements of local and State regulations including the Model Water Efficient Landscape Ordinance (MWELO). In addition, EBMUD requires weather-based controllers for all premises with 500 square feet or more of new irrigable landscape area. Depending on the size of the area to be irrigated, a dedicated irrigation meter may be required.

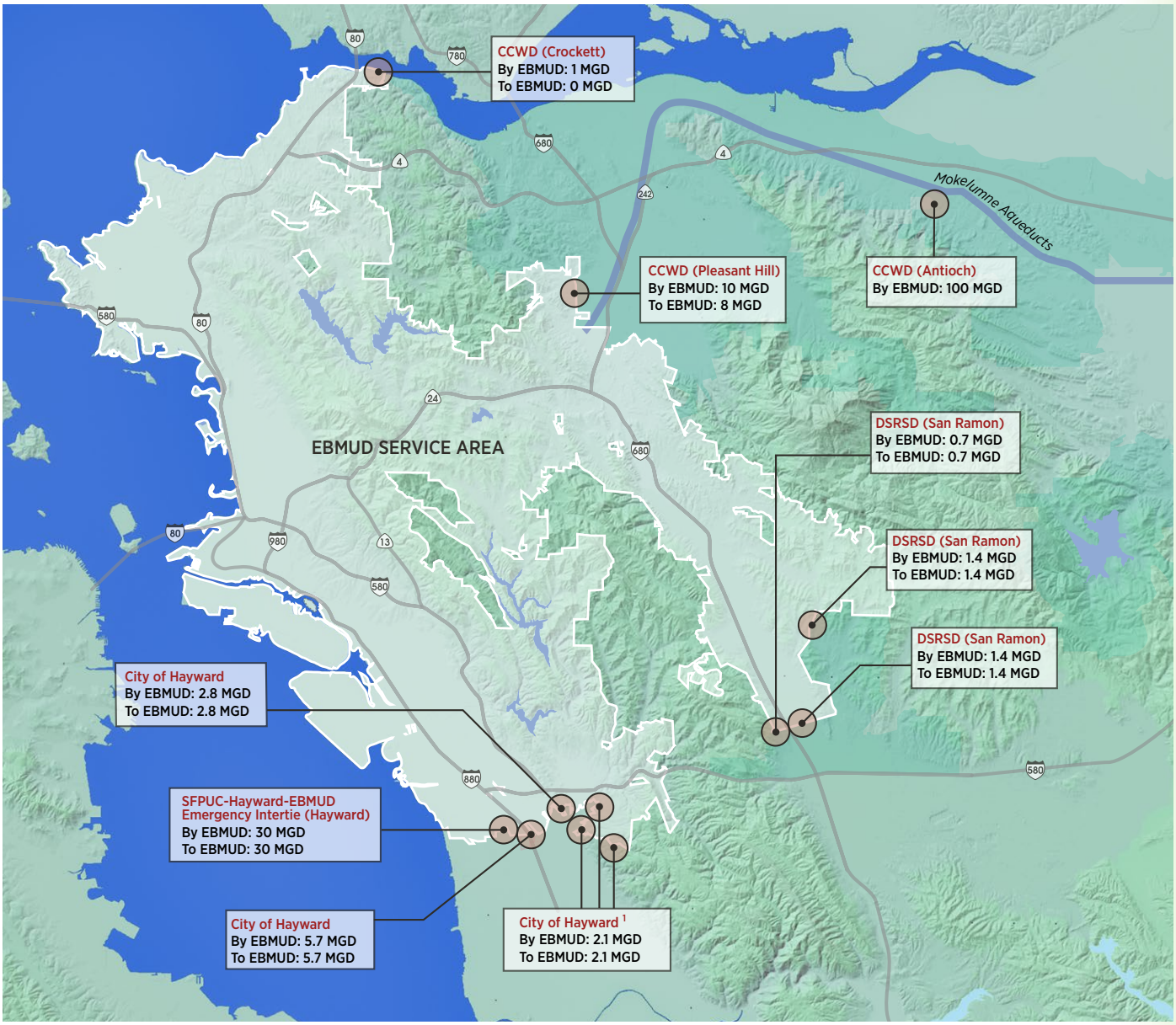
Water Consumption Reduction

EBMUD partners with its customers to cut back water use in significant and sustained ways during water shortage emergencies. EBMUD's new 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.

During the 2008-2010 drought, EBMUD developed a system whereby customers were given a particular allotment of water based on their past use. Customers who exceeded this allotment were charged an additional surcharge. In the 2014-2015 drought, EBMUD focused its efforts on education, public outreach, and providing information and tools to help customers conserve and did not implement water rationing with water allotments. In the future, EBMUD will consider community input and outreach approaches that align with the specific needs during that drought.

FIGURE W-6

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.

Water Use Reduction Targets

EBMUD's DMP recommends specific levels of voluntary or mandatory rationing based on the projected end of year total system storage. EBMUD's goal is to provide 85% reliability to customers.

EBMUD's ability to limit mandatory water use reductions to 15 percent depends upon the extent to which supplemental supplies are available and whether/how much USBR reduces CVP allocations in a given year. Supplemental supplies and CVP supplies may not always be available when needed as indicated by recent events. In 2014, USBR limited EBMUD to 50 percent of its CVP allocation, and in 2015 USBR was only able to provide EBMUD with a 25 percent CVP allocation. In extraordinary circumstances, such as when CVP or other supplies are minimally available or unavailable during an extreme drought, EBMUD may need to increase the rationing level above 15 percent in order to ensure adequate supplies the current and next year. For example, in 2015, EBMUD's Board declared a mandatory 20% water use reduction target due to extraordinary circumstances at the time and to meet the State's imposed water use reduction mandate.

A 15 percent reduction overall can be achieved by applying different levels of conservation for each

customer category. Table W-8 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, the outdoor water use of each category, and the potential aggregate economic impact on the service area. Several factors are considered: drought management principles; analysis of historical consumption; and 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 could vary due to several factors, including methods of implementation and enforcement. Key assumptions and data for setting customer goals are:

1. Balancing water use reductions across customer categories based on four principles:
   - emphasizing reductions in non-essential uses of water;
   - avoiding and limiting impacts to the economy and the environment;
   - safeguarding water supplies for uses that meet public health 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 percent of indoor and outdoor demand by customer category.
3. Gauging customer response to water savings measures:
   - assessing the likelihood of achieving the 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.

TABLE W-8 — 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 2040 total demand.

4.5 EMERGENCY RESPONSE PLAN

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.

Consistent with EBMUD Policy 7.03 (Appendix G), 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 Emergency Response Plan for EBMUD's FERC 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 includes all National Incident Management System (NIMS) 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 District personnel assigned to the EOT will carry out the five SEMS functions (management, operations, planning, logistics, and finance; plus a public communication function added by EBMUD in 2014). 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 Operations Section Chief also works with the Planning Section to determine the needs for mutual aid/ assistance resources, the scope of work to be done, and the planning objectives to accomplish this work.

In October 2018, the America's Water Infrastructure Act (AWIA) Section 2013 (A-H) was signed into law. AWIA requires community drinking water systems to develop or update risk and resilience assessments (RRAs) and emergency response plans (ERPs). AWIA specifies the components each of the plans must address and establishes deadlines by which water systems must certify to EPA completion of the plans. Based on the number of District customers, EBMUD complete its initial RRA in September 2020. These plans will need to be re-certified every 5 years. AWIA does not specify any standards for the RRA or the ERP, but recommends the use of standards, such as the AWWA J100-10, to facilitate preparation of the RRA and ERP.

4.6 Mutual Assistance and Coordination with Other 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 (LADWP) and with the Las Vegas Valley Water District (LVVWD) 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 (CalWARN), 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.

4.7 Coordination Among Local, County, Regional, State, and Federal Governments

EBMUD and other special districts, such as schools and parks, are considered local government agencies, which coordinate resources and manage operations in an emergency at the local level and serve as an interface with their local Operational Area Offices of Emergency Services. In California, each county is responsible for maintaining these operational area offices. The state is divided into six regions, each of which is responsible for maintaining a Regional Emergency Operations Center (REOC). The State of California, which regulates SEMS, maintains the State Office of Emergency Services that oversees these REOCs and the Operational Areas, working out of the State Operations Center in Mather, California.

SEMS was mandated by Government Code section 8607 following the 1991 East Bay Hills Firestorm. Reimbursement for claims filed after a disaster requires that all EBMUD emergency plans, procedures, and training follow the SEMS regulations, and that they directly correlate with the EOP. The SEMS in California and the guidelines for training for all emergency responders roll up from the states to the federal government under the national response framework. Each state has a Principal Coordination Official assigned by the federal government to coordinate planning and response under the Emergency Support Functions established by the federal government.

In 1995, EBMUD partnered with 14 federal, state, and public agencies to develop procedures for obtaining potable water in an emergency. In 1996, this California Potable Water Task Force published a Multi-Agency Emergency Response Procedures for Potable Water Procurement and Distribution report. In 2007, EBMUD spearheaded the efforts of a working group that includes the eight largest water agencies in the Bay Area, Operational Area, and Bay Area Regional Emergency Management Agencies to update this document. Published in its second edition and formally adopted by the State of California for the first time, this document allows water agencies to request assistance from city, county, or regional SEMS response levels to acquire and distribute potable water during a state or local emergency in California. The Emergency Drinking Water Procurement document was last updated

in 2014. This helps water agencies that sustain heavy damage to focus on rebuilding and returning their system to a dependable level of service.

4.8 Seismic Risk Assessment and Mitigation Plan

New Water Code Section 10632.5 requires the 2020 UWMP to 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 Hazardous 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 of 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 2018 LHMP executive summary is located in Appendix I. The comprehensive LHMP is available on EBMUD's website at ***www.ebmud.com/files/8916/1194/8548/EBMUD_2018_LHMP.PDF***

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 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 and customer engagement about their water use. In some previous, statewide droughts, EBMUD has also benefited from "earned" media when statewide messaging and advertising reaches 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, bus exteriors, transit shelters and EBMUD billboards. EBMUD has also participated in regional advertising campaigns on radio and television when the messages were consistent with EBMUD's and donated billboard space for the statewide campaign. 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 tool to communicate to customers about drought.
- EBMUD initiates significantly more direct customer contacts and responds to significantly more inquiries from customers. Water conservation and field services staff distribute drought messages and water savings 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, nongovernmental 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.

6. CUSTOMER COMPLIANCE AND ENFORCEMENT

6.1 WATER USE RESTRICTIONS

EBMUD's Regulations Governing Water Service to Customers, included in Appendix G, 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. In addition, Section 28 may be added in response to state mandated water use reductions designed to address short-term statewide water shortages.

Section 29 details on-going 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 of 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. The rules and guidance in Section 28 are tailored to the specific drought stage. Enforcement actions can include extra meter readings, written warnings, installation of flow-restriction devices, and even discontinuance of water service. However, EBMUD would not discontinue water service during a pandemic. EBMUD updated Section 28 in 2014 and 2015 to reflect the state mandated restrictions on outdoor water use.

Section 28 prohibits certain uses of potable water during a water shortage emergency, including:

- Using potable water for decorative ponds, fountains, and other water features that do not recirculate water (this does not include swimming pools or spas);
- Washing cars, boats, trailers, aircraft, and other vehicles by hose without a shutoff nozzle;
- Washing sidewalks, driveways, or hard surfaces;
- Irrigating ornamental turf on public street medians; and
- Flushing sewers or hydrants with potable water.

Section 28 also states that irrigating turf and ornamental landscape with potable water is 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 is 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. EBMUD developed a Water Savings Team that patrolled the service area to respond to reports of water waste, place warning hangers on doors, and educate customers about wise water use. The team also assisted customers with conservation activities like identifying leaks and installing water-efficient fixtures and appliances.

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 investigates the reports and takes appropriate actions. In most cases, EBMUD only needs to report the situation to the responsible party, who then takes action to address the problem. If necessary, EBMUD can also proceed with enforcement.

EBMUD also developed two separate ordinances to control water use: an Excessive Water Use Penalty Ordinance (Ordinance No. 364-15) and a Water Theft Penalty Ordinance (Ordinance No. 368-17). The Excessive Water Use Penalty Ordinance only applies during Stage 3 or 4 droughts, whereas the Water Theft Penalty Ordinance is in place at all times. Copies of these ordinances are provided in Appendix G.

The Excessive Water Use Penalty Ordinance sets penalties for single-family residential (SFR) customers who use large volumes of water during declared droughts. If the Board declares a Stage 3 drought, SFR customers must not consume more than 120 hundred cubic feet (CCF) of water over a two-month billing cycle, or 60 CCF per month. Customers using in excess of this amount are charged a penalty of $2 per CCF above the allotted amount. During Stage 4 droughts, the maximum amount of water allowed before incurring a penalty drops to 80 CCF over a two-month billing cycle, or 40 CCF per month. The purpose of the ordinance is to prohibit excessive water use when the Board has declared a Stage 3 or Stage 4 drought and to authorize EBMUD to impose a financial penalty on customers who violate the Ordinance.

The Water Theft Penalty Ordinance prohibits the 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 drought declarations. This ordinance builds on existing EBMUD regulations related to water theft and give 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 for Drought Stages 3 and 4 has an appeals process. Appeals can be granted due to meter error, if the water is needed for health and safety reasons, or due to leaks. Section 28 of the Regulations, "Water Use During Water Shortage Emergency Conditions," says 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 in effect at all times, not just during droughts. 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 drought. 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.

6.2 DROUGHT RATES

Water sales typically account for over 80 percent of EBMUD's operating revenues. The balance includes revenues from a variety of sources such as fees and charges, taxes, hydropower sales, and interest. EBMUD also sells bonds to assist with funding capital activities. EBMUD maintains cash reserves and has a policy of maintaining a debt service coverage ratio of at least 1.6 times coverage.

EBMUD rates and charges are designed to meet its revenue requirements for its water and wastewater systems, to recover the expenditures identified in its operating and capital budgets, and to meet Board policy goals. To determine the appropriate rates needed to recover its expenditures, EBMUD engaged an independent rate consultant in 2015 and in 2019 to perform cost of service (COS) studies on the water and wastewater systems. Based on its COS studies, EBMUD sets its rates based on capital investments, operating expenses, payment of debt service, and maintenance of sufficient reserves. Capital investments are typically large, multi-year projects that can involve significant construction. Capital projects including water system reliability improvements, seismic upgrades, and investments in supplemental supply can help EBMUD prepare for emergencies and droughts. Short-term costs associated with drought management and conservation program activities are also covered.

In 2014, the EBMUD Board and staff participated in a series of workshops exploring long-term financial stability for the organization. The goal of the workshops was to consider and discuss elements of the long range financial plan and cost of service study including underlying assumptions, financial risks, and financial policies aimed at mitigating risks. The results of these efforts laid the groundwork for the development of EBMUD's current budget and rates.

One of the main challenges identified was the need to develop a strategy for dealing with the financial impacts of drought. Drought leads to increased costs such as public outreach, conservation programs, additional staff resources, and the purchase, delivery, and treatment of supplemental supplies. In addition, reduced customer water use can decrease revenues.

As an outcome of the workshops, EBMUD developed a staged system of drought rates which have been developed in tandem with EBMUD's regular rates since fiscal year 2016. Following are additional details on the financial impacts of droughts and how the new rate structure helps EBMUD to mitigate those impacts.

Specific drought surcharges were adopted along with EBMUD's regular rates and charges in 2015, following a process which complied with the requirements of Proposition 218 and other applicable laws. The drought surcharge provides funds to cover EBMUD's water shortage related costs, including the costs of purchasing and delivering supplemental supplies, increased treatment costs, increased conservation and public outreach messaging, increased customer account management services, and revenue loss due to reduction in water use. EBMUD developed drought surcharges of up to 8 percent, 20 percent and 25 percent on the volumetric charges during water shortage Stages 2, 3 and 4, respectively. The drought surcharges correspond to increasingly severe stages of water shortages and are charged on each unit of water used during the billing period. The amount of the drought surcharges in each stage was developed to recover the anticipated drought costs at each stage, including the cost of supplemental supplies (purchase, treatment and delivery), costs of water shortage-related customer service, drought management activities, and lost revenue from reduced water sales. The drought surcharge may be imposed by the Board of Directors at the time or after a specific drought stage has been declared in accordance with EBMUD's Drought Management Program Guidelines.

The board approved drought surcharges do not impose a drought surcharge for Stage 1 when only voluntary customer demand reductions are being implemented. EBMUD's DMP as described in this WSCP allows for supplemental supplies to be acquired during Stage 1; the additional costs of the supplemental supplies delivered will be funded from EBMUD's operating revenues, reserves or rate stabilization fund.

In tandem with the new drought rates, EBMUD also adopted an excessive use penalty for single family residential (SFR) customers who use excessive amounts of water when EBMUD has declared a stage three or stage four drought. This penalty was discussed in the previous section.

EBMUD also established a non-monetary supersaver recognition program for the SFR customer class starting at stage three to recognize customers who use 4ccf or less per month (e.g., 100 gpd or less). The bill insert thanks customers for reducing their use and encourages sustained efforts.

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

CVP Contract

EBMUD executed a contract with United States Bureau of Reclamation for delivery of Central Valley Project water. Chapter 1 Section 1.4.3 of the UWMP provides in-depth discussion of this contract.

8. FINANCIAL CONSEQUENCES OF WSCP

Specific drought surcharges were adopted along with EBMUD's regular rates and charges in 2015, following a process which complied with the requirements of Proposition 218 and other applicable laws. 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 supplemental supplies, increased treatment costs, increased conservation and public outreach messaging, increased customer account management services, and revenue loss due to reduction in water use. Section 6.2 above provided detail information pertaining to drought surcharges.

8.1 IMPACT OF REDUCED SALES ON REVENUES & EXPENDITURES

Implementation of a DMP entails added costs for EBMUD. Costs include paying for additional temporary personnel and equipment resources, supplemental 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. Employing temporary staff increases EBMUD's labor costs. EBMUD also hired an advertising agency to create drought campaigns to encourage customers to cut back their water use.

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 do onsite interviews. EBMUD may also offer free conservation- related devices to customers or participate in/organize seminars and workshops aimed at teaching customers how to conserve water. 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 to purchase and install low-flush toilets, 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 supplemental 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 Freeport Project or the Bayside Groundwater project.

Table W-9 provides estimates of the costs associated with stage 2 through 4 droughts. For each stage, there are costs for the purchase, transmission, treatment, and storage of additional water, added staff to implement the DMP, and lost revenue due to rationing.

8.2 EBMUD DROUGHT RATE STRUCTURE

As said in Section 6.2, EBMUD held a series of public workshops on Long-Term Financial Stability. In June 2015, EBMUD's Board of Directors adopted a staged system of drought rates and the Excessive Water Use Penalty Ordinance. The specific drought surcharges are adopted along with EBMUD's regular rates and charges, following a process which fully complies with the requirements of Proposition 218 and other applicable laws. On April 26, 2016, the Board suspended the implementation of the Excessive Water Use Penalty Ordinance based on a reduction in potable water use and EBMUD's improved water supply projections.

The drought surcharge raises funds necessary to cover EBMUD's water-shortage related costs, including revenue to cover the costs of purchasing and delivering supplemental supplies, increased treatment costs, increased conservation and public outreach messaging, increased customer account management services, and revenue loss due to conservation.

Table W-5 in Section 4 shows when the drought surcharge would first be applied and the corresponding percent increases throughout the various drought stages.

Proposition 218 notification requirements control the schedule for selecting and implementing drought

TABLE W-9 **DROUGHT COST IMPACTS**

ITEM	STAGE 2 SIGNIFICANT	STAGE 3 SEVERE	STAGE 4 CRITICAL
PURCHASE, TRANSMISSION, & TREATMENT OF ADDITIONAL WATER	$15,750,000	$42,412,500	$55,800,000
STORAGE COSTS	$6,100,000	$6,100,000	$6,100,000
CUSTOMER RELATED COSTS (ADDITIONAL STAFF, PUBLIC INFORMATION)	$2,300,000	$3,250,000	$3,250,000
REVENUE LOSS	0-15% OF BASELINE VOLUME REVENUE	15% OF BASELINE VOLUME REVENUE	20% OF BASELINE VOLUME REVENUE
CUSTOMER SURCHARGE	UP TO 8%	UP TO 20%	UP TO 25%

NOTES
Costs derived from EBMUD Water and Wastewater Cost of Service Study, April 2015.
Costs shown are based on FY2016. Costs are developed for each budget cycle and actual costs and revenue loss are based in market and customer behaviors.

rates and charges. Consequently, EBMUD must consider options for drought rate structures prior to the anticipated start of a drought program. EBMUD's goal in developing the drought surcharges was to increase its ability to successfully manage water supplies by having a set of drought surcharges that, having already gone through the Proposition 218 process, could be implemented quickly.

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 (CIS) 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.

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 experience include process improvement, risk management, identifying constraints and uncertainties. This reflection and evaluation facilitate EBMUD to make continuous improvement in refining response actions.

EBMUD also has a Drought Committee made up of managers and senior management who convene as necessary to address drought related problems and responses. Under the direction of the Drought Committee, the DMP guidelines were updated in 2015 and 2016. For this update of the UWMP, the Drought Committee recommended reviewing the DMP guidelines once again as discussed in Section 4 to refine based on the recent drought as well as to reflect new legislation. This evaluation and assessment support the refinement process that EBMUD takes to ensure WSCP is prepared adequately and implemented as an adaptive management plan to provide guidance leading up to and during a water shortage situation.

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