Humboldt Bay Municipal Water District
Urban Water Management Plan
2010

Humboldt Bay Municipal Water District
828 Seventh Street
Eureka, CA 95501

Prepared June 2011

Foreword

The Humboldt Bay Municipal Water District has prepared this Urban Water Management Plan (UWMP) in the format and order presented in the California Department of Water Resources' "Guidebook to Assist Water Suppliers to Prepare a 2010 Urban Water Management Plan" (Guidebook, March 2, 2011).

The level of water management planning and the details provided in this UWMP reflects the size and complexity of the District, including the number of customers served and the volume of water supplied. Unlike many regions in the state, the District has an abundant supply of water to fully meet the regional demand for water, not only in this planning period but beyond.

This abundant and reliable supply of water far exceeds the need for our wholesale municipal customers now and into the future. While the District understands that the Urban Water Management Planning Act has a focus on water conservation, the District has had the unique requirement in the past to supply two pulp mills. As will be discussed in this Plan, due to closures the District has lost these large industrial customers and the economic benefit that was derived from them to cover costs of operations and infrastructure replacement and improvements. This infrastructure is spread over a large geographic area and includes a dam and reservoir located 75 miles away from treatment facilities that are a part of the system that supplies our municipal customers.

Therefore, as part of the District's overall water planning process, this UWMP also addresses the need to find new customers for the supply of water that exists beyond the foreseeable need of our municipal customers in order to remain economically viable and to keep our water rates reasonable to these customers.

In some sections, tables of information suggested in the Guidebook are not applicable to this District. However, most of the tables from the Guidebook have been incorporated within this UWMP to keep continuity with the Guidebook and to help DWR in the review process. Placement of the tables in this report follows recommendation from the Guidebook, which generally falls into place by subject matter.

Table of Contents

Figures

Tables (38):

Appendix:

Appendix A

Urban Water Management Plan checklist, organized by subject

Appendix B

1. 60 Day Notification of UWMP Review and Adoption Hearing
2. Certificate of Publication of the Legal Notice of Public Hearing
3. District's Board Agenda Item to Conduct Public Hearing for the District's 2010 UWMP
4. Board Resolution Adopting the District's 2010 UWMP
5. Proof of Plan Submittal to DWR and other agencies
6. Documentation showing that Adopted UWMP was available for public review
7. Sample 2010 UWMP Municipal Work Group Meeting Agenda and Attendance (Sample Meetings)
8. Notification of Public Hearing to Agencies with Land Use Planning Authority and the District's Municipal Customers

LIST OF ACRONYMS AND ABBREVIATIONS

AFY	acre-feet per year
BMP	Best Management Practices
CSD(s)	Community Services District(s)
cfs	cubic feet per second
County	Humboldt County
GIS	geographic information system
HBMWD/District	Humboldt Bay Municipal Water District
HCPD	Humboldt County Planning Division
DMMs	Demand Management Measures
DWR	California Department of Water Resources
DOF	California Department of Finance
Guidebook	2010 UWMP Guidebook by DWR (March 2, 2011)
GPU	Humboldt County's General Plan Update
MG	million gallons
MGD	million gallons per day
PRA	Peak Rate Allocation
Plan	Urban Water Management Plan
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
UWMP Act	Urban Water Management Planning Act

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Introduction

This Urban Water Management Plan (UWMP) for the Humboldt Bay Municipal Water District (HBMWD or District) has been prepared in accordance with the California Urban Water Management Planning Act of 1983 (AB 797) (UWMP Act) as amended, including amendments made per the Water Conservation Bill of 2009 (SBX7-7) and AB 1420 (addressing Demand Management Measures, DMMs). The overall intent of the UWMP is to describe an urban water supplier's water supplies and demands, as well as conservation efforts. According to the UWMP Act, all water suppliers with more than 3,000 connections or distributing more than 3,000 acre-feet per year (AFY) of water shall complete an UWMP every five years ending in '5' and '0.' The 2010 UWMPs would normally have been due on December 31, 2010, but a six month extension was granted to provide more time for water suppliers to address new water conservation requirements adopted by the legislature as part of the Comprehensive Water Package. According to the California Department of Water Resources (DWR), adoption of the 2010 UWMP is due by July 1, 2011. This update was prepared and adopted during the spring of 2011. It contains all information required by the California Water Code, Division 6, Part 2.6. This is the sixth such plan prepared by the District. The last plan was submitted in December 2005.

The District operates a regional water system and provides service at the wholesale level. Since the early 1960s, the District has reliably supplied water to customers in the greater Humboldt Bay area of Humboldt County, California. The District provides treated, potable water for domestic and business use to seven municipalities (wholesale customers), as well as approximately 200 retail customers. From the early 1960s to the 1990s, the District also provided untreated surface water to two industrial customers (pulp mills). However, one of the larger pulp mills closed down in the 1990s and the last pulp mill unexpectedly ceased operation in 2009.

The data used for preparing this report comes primarily from the District's operational records. Figures relating to watershed runoff were obtained from the United States Geological Survey (USGS). Current and projected population figures for Humboldt County (County) are based on data from the California Department of Finance (DOF) with guidance from the Humboldt County Planning Department (HCPD). In some sections, tables of information suggested in the DWR Guidebook (Guidebook) are not applicable to the District. However, a majority of the tables from the Guidebook have been incorporated into this UWMP to help DWR's review process, even if they are not applicable to the District. The UWMP Checklist has also been included in Appendix A to support DWR's review process.

1. Plan Preparation

1.1 Coordination

The District collaborated with multiple local and stakeholder agencies in preparation of this UWMP. This effort was conducted to inform the agencies of the planning activities of the District, to gather quality data for use in this UWMP, and to coordinate with other regional plans and initiatives. To that end, the District worked with its four larger municipal customers that qualify as Urban Water Suppliers as defined by the Urban Water Management Plan Act: City of Arcata, City of Eureka, Humboldt Community Services District, and McKinleyville Community Services District. The District provided assistance and information needed by these agencies for the preparation of their UWMPs and they reciprocated. Meetings were conducted from January 2011 through June 2011 between the District and these agencies, which were called 2010 UWMP Work Group Meetings. Other local water suppliers in the area, including the District's three remaining wholesale customers and the City of Fortuna, were also invited to attend these meetings. Appendix B-7 shows a sample Work Group Meeting Agenda and signup sheet. All seven of the District's municipal customers were provided with copies of the District's adopted plan. The coordination activities mentioned above are summarized in Table 1.

Table 1
Coordination with appropriate agencies

Coordinating Agencies	Participated in developing the plan	Commented on the draft	Attended public meetings	Was contacted for assistance	Was sent a copy of the draft plan	Was sent a notice of intention to adopt	Not involved / No information
Arcata, City of	X	X		X	X	X	
Eureka, City of	X	X		X	X	X	
Humboldt CSD	X	X		X	X	X	
McKinleyville CSD	X	X		X	X	X	
Blue Lake, City of					X	X	
Fieldbrook Glendale CSD					X	X	
Manila CSD					X	X	
Humboldt County Community Development Services Department					X	X	
Humboldt County Planning Division		X		X	X	X	
Dept of Water Resources				X	X		

In addition to the above coordination efforts, notification was provided to local city and county land-use planning agencies prior to the UWMP public hearing that the District was in the process of reviewing and updating its UWMP. Appendix B contains a copy of the 60-day Notification (B-1).

1.2 Plan Adoption, Submittal, and Implementation

The District made its 2010 UWMP available for public review and held a public hearing to receive input. The District notified its municipal customers, the communities served, land-use planning agencies, and the County of Humboldt of the time and place of the public hearing (Appendices B-2 and B-8).

The District held its public hearing for the 2010 UWMP at its regularly scheduled Board meeting on June 9, 2011. Following the hearing, the District's Board adopted the UWMP as prepared. The following documents relating to the public hearing have been included:

- Certificate of Publication of the Legal Notice of Public Hearing (B-2)
- District's Board Agenda Notice of Public Hearing (B-3)
- Board Resolution Adopting the District's 2010 UWMP (B-4)

The District submitted its UWMP to the DWR, the California State Library, County of Humboldt, and the cities and community services districts within its service area. Proof of submittal of the plan is included (Appendix B-5).

After adoption of the 2010 UWMP, the District made the plan available for public review at its main office in Eureka, CA as well as on the District's website (www.hbmwd.com). Documentation showing that the adopted UWMP was available for public review is included (Appendix B-6).

The District implemented its 2010 UWMP as soon as it was adopted by the Board. The District continues to implement the sections laid out in this UWMP including the Water Shortage Contingency Plan (Section 5), the water wholesaler related Demand Management Measures (Section 6), and has a designated Water Conservation Coordinator to monitor the implementation of its 2010 UWMP.

2 System Description

2.1 Service Area Physical Description

2.1.1 Location

The District is located in Humboldt County and serves the greater Humboldt Bay region (Figure 1). The District was established in 1956 to provide municipal and industrial water for the area. The District's service area includes the most heavily populated and developed parts of the County.

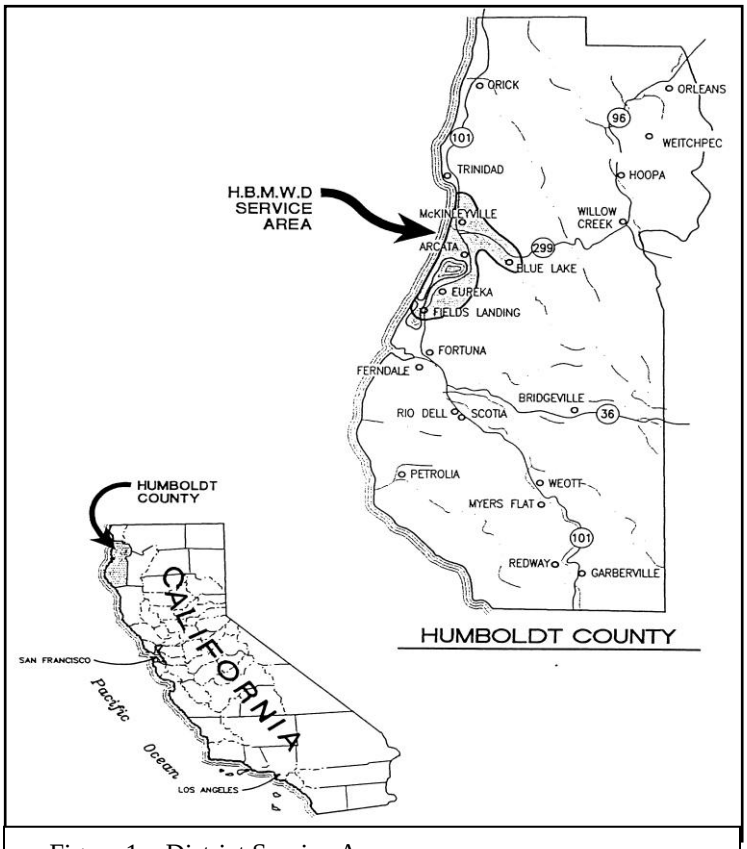
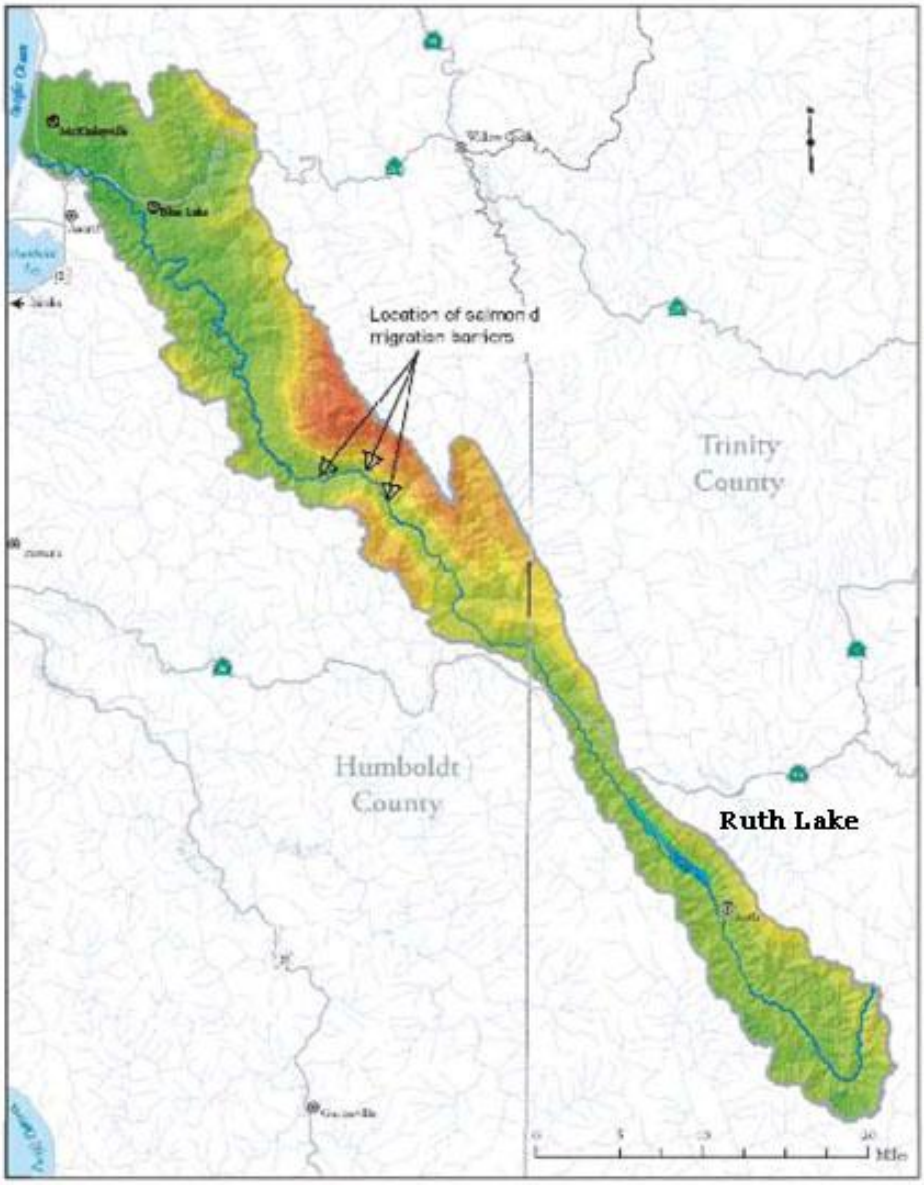


Figure 1 – District Service Area

2.1.2 Climate

Humboldt County's watersheds receive high annual rainfall. According to the National Oceanic and Atmospheric Administration (NOAA) and the Western Regional Climate Center (WRCC), rainfall at Eureka averages just less than 40 inches per year (data from 7/1/1948 to 9/30/2010). At Ruth, in Trinity County, where the District operates the R.W. Matthews Dam and the Ruth Reservoir, average rainfall is approximately 60 inches per year (data from 1/1/1930 to 7/31/1985). Some mountainous areas within the region often receive more than 100 inches of rain per year, mostly during the period from November to April. Figure 2 shows the mean annual precipitation in the Mad River Watershed.

Figure 2. Mad River Watershed Assessment: Mean Annual Precipitation



The following table shows average monthly rainfall, temperatures, and evapotranspiration (ETo) for the Ruth area.

Climate

Month	Std Mo Avg ETo (Evapotranspiration) (Inches)	Average Rainfall (Inches)	Average Temperature Min - Max (Fahrenheit)
Jan	1.24	11.6	26.6 – 44.9
Feb	1.96	9.7	29.4 – 51.3
Mar	3.10	8.4	30.8 – 57.3
Apr	4.80	4.1	33.2 – 64.7
May	6.51	2.0	37.7 – 73.0
Jun	7.80	0.7	42.6 – 81.6
Jul	8.99	0.2	46.0 – 91.0
Aug	7.75	0.3	44.4 – 90.4
Sep	5.70	1.0	40.2 – 84.3
Oct	3.72	3.5	35.2 – 70.1
Nov	1.80	8.3	31.2 – 53.7
Dec	0.93	11.1	28.4 – 45.5
Annual	54.3	60.8	35.5 – 67.3

Rainfall and temperature are from the Forest Glen weather data gathering station which is the closest station to the Ruth area. This information is provided by WRCC and NOAA under the U.S. Department of Commerce. The rainfall data is for the period from January 1, 1930 to July 31, 1985.

Evapotranspiration data for the Ruth area is from the statewide ETo Map and Table. This information is provided by the California Irrigation Management Information System (CIMIS) operated by the Office of Water Use Efficiency under the Department of Water Resources (DWR). According to DWR, evapotranspiration is the loss of water to the atmosphere by the combined process of evaporation, typically from soil and plant surfaces, and transpiration from plant tissues. The data above shows that more evapotranspiration occurs in the summer months versus the in winter months. Evapotranspiration is a good indicator of how much water is needed by the surrounding vegetation for healthy growth and productivity.

2.2 Service Area Population

The District used data from the California Department of Finance (DOF) to determine the estimated population served by the District. Guidance was also provided by staff at the Humboldt County Planning Division (HCPD) in regard to the County's General Plan Update (GPU) and district boundaries. HCPD staff used the GPU to help identify areas within the County that had higher growth rates, or more potential growth than others.

In 2007, DOF created a database with individual files for each county in the State containing population data for the year 2000 and population projections up to the year

2050. This database is titled, "Race/Ethnic Population with Age and Sex Detail, 2000-2050." Humboldt County's population projection through 2030 was taken from this database. The County's population estimates from 2010 through 2030 yield a projected average annual growth rate in Humboldt County of approximately 0.44%.

Staff at the HCPD helped to determine the District's service area population as a percentage of the County's population by using Census blocks and the County's geographical information system (GIS) for city and district boundaries. The result was that for 2010, the District's service area population is approximately 65% of the population of Humboldt County. Therefore, the District's population has been projected at 65% of the County's population through the year 2030 in 5-year increments (Table 2). Since the average annual growth rate in Humboldt County from 2010 to 2030 is projected to be 0.44%, the District's service area population is assumed to increase by 0.44% per year.

Table 2
Population — current and projected

	2010	2015	2020	2025	2030	Data source
Humboldt County Population	134,785	138,681	142,167	145,004	147,217	CA Department of Finance
Service area population (65% of County Population)	87,610	90,143	92,409	94,253	95,691	CA Department of Finance and Humboldt County Planning Department

2.3 Domestic and Industrial Water System

The District is a regional water wholesaler and is capable of delivering both potable water through its Domestic Water System, and untreated surface water through its Industrial Water System.

Via its Domestic Water System, the District delivers potable water to seven municipalities, who in turn, serve the residents, businesses and industries in the greater Humboldt Bay region. The District currently has wholesale contracts in place with these seven municipalities which were entered into in 1999. These seven municipalities are: City of Arcata, City of Blue Lake, City of Eureka, Fieldbrook Glendale CSD, Humboldt CSD, Manila CSD, and McKinleyville CSD. The District's Domestic Water System is capable of supplying approximately 20 million gallons of water per day (MGD) of treated drinking water.

The District's Industrial Water System is separate and distinct from its Domestic Water System. It is has been used for supplying untreated surface water to industrial customers. This Industrial Water System is capable of supplying 60 MGD of untreated water. As mentioned in the Introduction, the District delivered untreated water to two large industrial customers (pulp mills) for the majority of the time since the 1960s. One of the pulp mills closed in the 1990s and the remaining pulp mill ceased operation in 2009. With no existing industrial customer, the District has an opportunity to support future water supply needs.

3 System Demands

3.1 Baselines and Targets

The Water Conservation Bill on 2009 (SBX7-7) has a goal to achieve a 20 percent reduction in per capita water use statewide by 2020. Per capita use of water in the area is below national and state averages. Current production of treated drinking water for municipal purposes averages 10 MGD. This municipal use includes residential, commercial, industrial and agricultural uses of the water. Per capita water use rates in this region are low and likely benefit greatly from the moderate climate and abundant rainfall, as needs for agriculture and landscaping are often met with rainfall rather than municipal water.

Section 3 of the DWR Guidebook and the California Water Code 10608.20(e) state that "An urban retail water supplier shall include in its urban water management plan … due in 2010 the baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data." As the District is a *wholesale* water supplier and not an "urban retail water supplier," the baseline and urban water use target calculations do not apply to the District. Therefore, as a wholesale water supplier, the District does not have to develop an implementation plan for compliance with the Water Conservation Bill of 2009.

Although the District does not have to establish these baseline and water use targets, the District has supported and will continue to support its wholesale water customers (who are urban retail water suppliers) with their water conservation programs, and to help them achieve their Interim and Final urban water use reduction targets. Thus, Tables 13, 14, 15 in the Guidebook relating to the baseline and urban water use target calculations do not apply to the District.

3.2 Water Demands

The District is a regional water wholesaler and acts as a "retail urban water supplier" to less than 200 retail customers that use well below 3,000 AFY of water. Therefore, the District's number of retail customers and their annual water use does not meet the threshold criteria of the UWMP Act, which states that "urban water suppliers with more than 3,000 connections or distributing more than 3,000 AFY" are required to produce an UWMP. With this being the case, reporting of the following information does not apply

to the District: past, current and projected water use for end water users (such as single-family residential, multifamily, low-income, commercial, industrial, institutional and governmental, landscape, etc). UWMPs submitted by the District's wholesale municipal customers contain more detailed information about end water users. Therefore, the following tables from the Guidebook concerning water deliveries to end water users do not apply to the District: Tables 3, 4, 5, 6, 7, and 8.

Table 9 shows actual domestic water sales to the District's municipal customers in 2005 and 2010 and projected sales volumes for 2015, 2025 and 2030 in AFY. These demand projections were given to the District by the four larger municipal customers who are preparing UWMPs (City of Arcata, City of Eureka, Humboldt CSD, and McKinleyville CSD). All four municipal customers have developed their own annual usage growth rate to estimate their projected demands.

A unique situation is with Humboldt CSD, who receives water from three different sources; the District, its own wells, and the City of Eureka (this water is also supplied by the District). Therefore, the District's direct sales volumes to Humboldt CSD are just a portion of its total overall water supply. Sales to Humboldt CSD for 2005 and 2010 are actual volumes and the rest were estimated using Humboldt CSD's projected demands from Table 12 and multiplying those demands for each year by approximately 55% (the District's estimated portion of Humboldt CSD's water supply).

Demand projections for the smaller municipal customers (City of Blue Lake, Fieldbrook Glendale CSD and Manila CSD) were estimated using an assumed annual usage growth rate of 0.44%, which is the same as the projected County population growth rate indicated in Table 2.

Table 9
Sales to other water agencies (AFY)

Water distributed	2005	2010	2015	2020	2025	2030
Arcata, City of	1,942	1,819	1,674	1,764	1,865	1,960
Blue Lake, City of	268	356	364	372	380	389
Eureka, City of	4,373	4,856	4,977	5,101	5,229	5,360
Fieldbrook CSD	197	167	170	174	178	182
Humboldt CSD*	1,640	1,487	1,563	1,643	1,727	1,814
Manila CSD	144	194	199	203	207	212
McKinleyville CSD	1,761	1,700	1,768	1,783	1,811	1,832
Total	10,325	10,579	10,715	11,040	11,397	11,749

*Note: Humboldt CSD's projected sales volumes for 2015 to 2030 were estimated using Humboldt CSD's demand projections from Table 12 and multiplying those amounts by 55% (estimated portion of the District's sales volume for Humboldt CSD given its other sources).

The Industrial Water System is capable of supplying up to 60 MGD (67,200 AFY) of untreated water to industrial customers. From 2000 to 2008, when one pulp mill was in

operation, deliveries of industrial water averaged 14 MGD (15,700 AFY). Prior to its closing in 1993, a second pulp mill also purchased industrial water on a wholesale basis from the District. The closure of both pulp mills leaves the District with an abundant and reliable supply of water that far exceeds the need for the District's wholesale municipal customers now and into the future.

Given the loss of the industrial customer base, the District initiated a Water Resource Planning process in 2008. The District's Board created an Advisory Committee comprised of diverse stakeholders (municipal customers, environmental, fisheries/watershed, economic development, business/Chamber, real estate, tribal, and labor representatives). The Advisory Committee helped the District design a process to educate stakeholder groups and the community regarding this issue and its implications, and to solicit input regarding new water use options to address the District's unique situation.

The District and Advisory Committee completed a thoughtful, community-based planning process. Awareness of the District's unique situation was raised and valuable input received from stakeholder groups and the public. In 2010, the Advisory Committee presented its findings and recommendations to the District in a report titled "Advisory Committee Recommendations for Water Use Options Supported by a Community-based Planning Process." The Board accepted the Advisory Committee's report and recommendations. Since then, the District created a draft implementation plan titled, "Water Resources Planning: Implementation Plan to Evaluate and Advance Recommended Water Use Options" (Appendix C, WRP Implementation Plan). This plan includes important policies and implementation activities which will affect the District's future water demands and deliveries.

The District has established three goals to guide consideration of future water use options. The goals are:

- Protection of HBMWD's Water Rights – increase water use such that HBMWD maintains control of the water resource for the benefit of the community;
- Fiscal Sustainability – generate revenues to contribute to the current operation and maintenance of the regional water system, as well as upcoming costly capital replacement projects (given that the system is 50 years old);
- Environmental Sustainability – preserve the Mad River environment, and if possible, enhance it.

The Implementation Plan also establishes three water-use options that the District will consider, evaluate, and as appropriate, pursue. These options are as follows:

A. Local commercial, industrial or agricultural water sales, or any other viable water-use option within the District.

B. Transfer of water to another public agency outside of the District for an authorized "beneficial use" (e.g. municipal, industrial, environmental).

C. Dedicating some portion of the available water for in-stream flows in the Mad River. Such water would otherwise be in storage at Ruth reservoir for much of the year (i.e. summer and fall). This option is available pursuant to section 1707 of the California Water Code, which is intended to promote water transfers for the benefit of the environment.

The Implementation Plan establishes long-term objectives for developing new water demands for each water-use option mentioned above.

- For Option A, the objectives are to develop new local demands for raw water of 5 MGD by 2020 and 10 MGD by 2029.

- For Options B and C, the objective is to initiate transfers up to 40 MGD.

Table 10 shows additional water uses and losses to the District in AFY. This table shows the actual raw water use by the Industrial Water System in 2005. However, there were no industrial customers in 2010 and none assumed in 2015, therefore, 0 was entered for the raw water use in Table 10 for both years. As introduced above, the WRP Implementation Plan includes water-use objectives to develop new demands for raw water of 5 MGD or 5,600 AFY by 2020 and 10 MGD or 11,200 AFY by 2029. Therefore, 5,600 AFY was projected for raw water use in 2020 and 2025 and 11,200 AFY was projected in 2030.

Table 10
Additional water uses and losses (AFY)

Water use	2005	2010	2015	2020	2025	2030
Saline barriers						
Groundwater recharge						
Conjunctive use						
Raw water	14,902	0	0	5600	5600	11,200
Recycled water						
System losses						
Other - Approx 200 Retail Customers	528	517	600	600	600	600
Total	15,429	517	600	6,200	6,200	11,800

Table 10 also shows potable water use by the District's approximately 200 retail customers (actual use for 2005 and 2010). This table assumes no growth in the District's retail water usage from 2015 to 2030.

Table 11 shows the total water use by the District's wholesale and retail customers in 2005 and 2010 and projected into the future (2015, 2020, 2025, and 2030).

Table 11
Total water use (AFY)

Water Use	2005	2010	2015	2020	2025	2030
Total water deliveries (from Tables 3 to 7)	0	0	0	0	0	0
Sales to other water agencies (from Table 9)	10,325	10,579	10,715	11,040	11,397	11,749
Additional water uses and losses (from Table 10)	15,429	517	600	6,200	6,200	11,800
Total	25,754	11,096	11,315	17,240	17,597	23,549

Table 11 indicates that between 2005 and 2010, Total Water Use has significantly been reduced from 25,754 AFY to 11,096 AFY. This reduction was due to the lost of the District's last remaining industrial customer in 2009. The water use projection for 2015 also does not include raw water use. However, the water use projections for 2020 to 2030 include the District's water-use objectives to develop new demands for raw water as stated earlier (Table 10). Table 11 shows that the District's total water use projection would increase in 2030 to approximately 23,549 AFY, which is close to the level of use in 2005, if the District is able to develop new demands for raw water in the future according to the WRP Implementation Plan.

3.3 Water Demand Projections

Table 12 shows water demand projections provided to the District by the four larger municipal customers (City of Arcata, City of Eureka, Humboldt CSD, and McKinleyville CSD), along with projections for the District's smaller municipal customers. As mentioned in Section 3.2 and noted in Table 9, Humboldt CSD receives water from three different sources and the District represents only one of those water supply sources. Therefore, Humboldt CSD's demand projections in Table 12 will not be equal to the District's sales volumes to Humboldt CSD in Table 9.

The District has long-term contracts in place with each of its seven wholesale municipal customers. These contracts have a 20-year term and will be in place through 2019. The wholesale municipal customers have an opportunity to extend these contracts up to ten years. These contracts define the terms and conditions by which the District provides water service to its customers. However, the District does not have contracted volumes with its municipal customers. Each municipal customer is designated a Peak Rate Allocation (PRA) which is measured in MGD. The PRA is the maximum daily use in any given calendar year and is reviewed annually by the District. The PRA may be adjusted during the contract term to ensure the municipal customer demands are fully satisfied.

Table 12 Retail agency demand projections provided to wholesale suppliers (AFY)							
Wholesaler	**Contracted Volume**	**Peak Rate Allocation (MGD)***	**2010**	**2015**	**2020**	**2025**	**2030**
Arcata, City of	N/A	3.25	1,819	1,674	1,764	1,865	1,960
Blue Lake, City of	N/A	0.50	356	364	372	380	389
Eureka, City of	N/A	7.00	4,856	4,977	5,101	5,229	5,360
Fieldbrook CSD	N/A	0.43	167	170	174	178	182
Humboldt CSD	N/A	2.90	2,725	2,864	3,010	3,164	3,325
Manila CSD	N/A	0.21	194	199	203	207	212
McKinleyville CSD	N/A	2.80	1,700	1,768	1,783	1,811	1,832

*Note: Peak Rate Allocation has been inserted into this table and is measured in million gallons per day (MGD).

The District's water supply projections provided to its municipal customers are discussed in Section 4 and shown in Table 16.

3.4 Water Use Reduction Plan

Section 3 of the DWR Guidebook, with reference to SBX7-7, states that "Retail water suppliers are to develop an implementation plan for compliance with the Water Conservation Bill of 2009," therefore, as a wholesale water supplier, the District does not have to develop an implementation plan for compliance with the Water Conservation Bill of 2009. However, the District will continue to implement and support programs and to work with its wholesale customers (the retail water suppliers) to help them achieve their water demand reduction goals and water use targets. The District holds monthly meetings with its wholesale customers and works with them to identify options to reduce water waste, improve water use efficiency, and educate the end users about conservation practices.

4 System Supplies

4.1 Water Sources

The source of water distributed by the District is from Ruth Lake, which is located in Trinity County (Figure 3). The Mad River. R.W. Matthews Dam, located at river mile 79, impounds water in Ruth Lake (Figure 4). The District manages releases from the dam to ensure sufficient supplies downstream throughout the year.

Figure 3 – Location Map of Ruth Lake

Figure 4 – R.W. Matthews Dam and Ruth Lake

At the District's Essex Operations Center located just northeast of Arcata, water is diverted and pumped to meet demand. Municipal water is pumped from an aquifer beneath the Mad River by four wells, called Ranney wells (Figure 5), situated within the riverbed at depths ranging from approximately 60 to 90 feet. Industrial water is diverted by a surface diversion facility.

The District has appropriative water rights permits from the State Water Resources Control Board through the year 2029 for surface water storage and diversion. These are Permit No. 11714 and Permit No. 11715 (Appendix D). Diversion is accomplished in different ways for different uses as mentioned earlier.

4.1.1 Supply

The District's water rights permits allow it to store and divert a combined 75 million gallons a day (MGD) from the Mad River. This totals 84,000 AFY, which represents 8.5% of the average annual runoff (982,600 AFY) of the Mad River Basin for the period from 1963 to 2010 (average annual runoff data provided by USGS at Gage Station 1148100 on the Mad River near Arcata, CA).

Figure 5 – Ranney Wells in Bed of Mad River

The City of Eureka (City) maintains water rights on the Mad River equivalent to 5.16 MGD. Under an agreement between the District and the City, the deliveries from the District to the City are considered to be deliveries of the City's water, emanating from its own water rights, not those of the District. Deliveries to the City in excess of the City's water rights are considered deliveries of the District's water.

Because the District's water supply capability is determined by its water rights and existing facilities, the projected supply is 75 MGD (84,000 AFY) as shown in both Table 16 and Table 17.

Table 16 Water supplies — current and projected (AFY)					
Water Supply Sources	**2010**	**2015**	**2020**	**2025**	**2030**
Other - Mad River Storage & Diversions	84,000	84,000	84,000	84,000	84,000
Total	**84,000**	**84,000**	**84,000**	**84,000**	**84,000**

For Table 16, the District does not purchase its water from another wholesaler and its primary source is from the Mad River storage and diversions (Table 17).

Table 17 Wholesale supplies — existing and planned sources of water (AFY)					
Wholesale sources	**Contracted Volume**	**2015**	**2020**	**2025**	**2030**
Mad River Storage & Diversions	n/a	84,000	84,000	84,000	84,000

4.2 Groundwater

At the District's Essex Operations Center, municipal water is pumped from the aquifer beneath the Mad River by four Ranney wells (Figure 5). The water that is pumped by the Ranney wells is continually recharged by surface water from the Mad River which is released from Ruth Lake pursuant to the District's water rights permits. Therefore, the District does not pump or deliver groundwater and both tables 18 and 19 are not applicable to the District.

Table 18 (not applicable to District) Groundwater — volume pumped (AFY)						
Basin name(s)	**Metered or Unmetered**	**2006**	**2007**	**2008**	**2009**	**2010**
Mad River Lowland Subbasin	n/a	0	0	0	0	0
Total groundwater pumped		0	0	0	0	0
Groundwater as a percent of total water supply		**0%**	**0%**	**0%**	**0%**	**0%**

Table 19 (not applicable to District) Groundwater — volume projected to be pumped (AFY)				
Basin name(s)	**2015**	**2020**	**2025**	**2030**
Mad River Lowland Subbasin	0	0	0	0
Total groundwater pumped	0	0	0	0
Percent of total water supply	**0%**	**0%**	**0%**	**0%**

Although the District does not pump groundwater, in 2006, the District completed a Groundwater Study of the aquifer in the Essex Reach of the Mad River in the vicinity of the Ranney Wells. This study was done to support the District's Capital Improvement Plan, and in particular, to better understand the basin hydrology and the interactions between the Ranney wells and the surrounding environment for the projects proposed. The site studied was the Mad River Groundwater Basin which is located in the North Coast Hydrologic Region. This basin is not adjudicated. It is composed of the Mad River Lowland Subbasin (Basin #1-8.01) and the Dows Prairie Subbasin (Basin #1-8.02), as defined by DWR. There is no present or anticipated overdraft in the two subbasins. The specific location of the study is the Holocene River Channel Deposits in the Mad River Lowland Subbasin. The Study was conducted in accordance with Assembly Bill 3030 and was used to produce the District's Ground Water Management Plan (GWMP) (Appendix E).

The District does not have any current or planned additions to its Domestic or Industrial Water Systems for a groundwater supply.

4.3 Transfer Opportunities

As mentioned in previous sections, the District lost its last industrial customer for its Industrial Water System in 2009. As discussed in Section 3.2, the District developed a draft WRP Implementation Plan that addresses the loss of its customer base and established three water-use options the District will consider and as appropriate, pursue. One option is the transfer of water for use outside of the District's existing service territory to another municipality for a "beneficial use." This option has the potential to transfer up to 40 MGD or 44,800 AFY of water (pursuant to the demand objectives of the other two options). Table 20 lists this proposed volume to be transferred.

Table 20
Transfer and exchange opportunities (AFY)

Transfer agency	Transfer or exchange	Short term or long term	Proposed Volume
unknown at this time	transfer	combination	up to 44,800
Total			up to 44,800

A Transfer Agency (or agencies) is unknown for at this time because the District is still at the beginning of the planning process and is evaluating all the water use options as categorized in the draft WRP Implementation Plan.

4.4 Desalinated Water Opportunities

Due to the abundant fresh water supply, development of desalinated water is not a necessary or cost effective option for the District. Therefore, the District is not considering development of desalinated water supplies within the planning horizon of the 2010 UWMP.

4.5 Recycled Water Opportunities

The District is a regional water wholesaler and does not operate or have any authority over wastewater collection and treatment in the area. Some of the District's larger municipal customers provide both water and sewer services to their customers. Information about these systems and their water recycling programs may be found in their UWMPs. Therefore the following tables—Tables 21, 22, 23, 24, and 25 dealing with recycled water are not applicable to the District.

4.6 Future Water Projects

As previously discussed, the District has an abundance of water to supply its customers. This abundance of water will be available to the District in average, single-dry, and multiple-dry water years as will be discussed in the following sections. Therefore, no new water supply projects that create a brand *new source of supply* are planned or deemed necessary at this time. Table 26 (Future water supply projects) is not applicable.

5 Water Supply Reliability & Water Shortage Contingency Planning

5.1 Water Supply Reliability

Throughout the years, there have been studies that refer to the District's water source and its reliability. Bechtel Corporation was retained in the 1950s to perform various water supply studies and to complete the design and specifications for the original regional water system. During this time, Bechtel completed a detailed operations study of the reservoir storage to determine the safe yield of the original project pursuant to the District's downstream diversion requirements and the requirements in the District's water rights permits. The study was done on the basis of a 75MGD average annual diversion rate at Essex. Existing prior water rights downstream of Ruth Lake were incorporated into this study. Bechtel confirmed the safe yield of the reservoir to be 75 MG, assuming the driest period of record they studied (1923-1924). Bechtel reported "The Mad River Development will utilize the available supply and by storage regulation make this supply available for year-round diversion at Essex. The firm supply made available at Essex is measured by the amount of water the District can divert under its permits in the driest year on record 1923-1924." *(*Reference: *Engineering Report on Mad River Development, Bechtel Corporation, October 1960)*

Subsequent to Bechtel's operations study, DWR calculated the safe yield of Ruth reservoir to be very close to what Bechtel had determined *(Reference: Bulletin No. 142-1, North Coastal Hydrographic Area).* The State also used the 1923-24 drought period in its determination.

These hydrological conditions were supported by subsequent studies by DWR, the U.S. Army Corps of Engineers, Bechtel Corporation, and Winzler and Kelly Engineering. In a study by DWR titled "Office Report on Preliminary Investigation of Mad River," DWR acknowledges that the Ruth Lake area where the District keeps its storage supply has "heavy and frequent precipitation." DWR also said in the report that the mean seasonal

runoff of the Mad River as measured at Arcata at the time (1958) was 750,000 AFY, which is far more than the District's permitted 84,000 AFY and the actual projected water demands from its customers as shown in Table 12.

The U.S. Army Corps of Engineers also discusses the mean seasonal runoff of the Mad River in their 1968 report titled, "Interim Review Report for Water Resources Development, Mad River, California." The report states that the variation in annual runoff has ranged from a low of 280,000 AFY in the lowest year recorded at the time, to a high of 1,746,000 AFY in the year of the highest runoff recorded at the time. It also states that the minimum five-year average annual runoff was 650,000 AFY. These average annual runoff amounts show that the District has ample supply to support its customer demands. The report also describes the local climate in that it is typical of coastal areas of California with a large percentage of the rainfall occurring during major storms during the winter months of November through March. It reports that the average annual precipitation over the basin ranges from about 40 inches along the coastal plains to more than 70 inches in the central part of the basin, with an estimated basin average of approximately 63 inches.

In 1977, Winzler and Kelly Engineering did a drought deficiency analysis of R.W. Matthews Dam with then current data (including the drought of 1977) and determined the safe yield to be approximately 67 MGD (75,040 AFY), 8 MGD less than projected by Bechtel. Although the safe yield projected by Winzler and Kelly was slightly less than the one projected by Bechtel Corporation, it still far exceeds the District's current and projected demands from its wholesale customers (Table 12).

Furthermore, the results from the above studies by DWR, U.S. Army Corps of Engineers, Bechtel Corporation, and Winzler and Kelly Engineering are supported by the District's historical data. From the District's historical data, on average, Ruth Lake begins the water year on October 1 with approximately 31,000 AF of water, 64% of its 48,030 AF capacity. Most rainfall in the area occurs between November and April. In every year but one since 1969, there has been at least one large storm during this period, bringing 3 to 9 inches of rain over a seven-day period. This is almost always sufficient to fill the reservoir to capacity. There has only been one water year (1976/77) in which the reservoir was not filled to capacity. The average reservoir volume on May 1 (the end of the usual rainy season) is approximately 47,700 AF, over 99% of capacity. This storage allows the District to supplement low flows until the rains begin again in the fall. Seasonal or climatic shortages are only likely to occur after two consecutive rainy winter seasons with severely reduced rainfall and runoff (well below 50% of normal). This has not happened in the history of the District.

5.1.1 Inconsistent Water Sources

As seen from the discussion of water supplies above, the District's sole source of water (the Mad River) has been very consistent and there is no need to replace or supplement this source. Table 29 (Factors resulting in inconsistency of supply) is not applicable.

Table 29 (not applicable to District) Factors resulting in inconsistency of supply						
Water supply sources	**Specific source name, if any**	**Limitation quantification**	**Legal**	**Environmental**	**Water quality**	**Climatic**
Mad River Storage & Diversions	Ruth Reservoir					

5.2 Water Shortage Contingency Planning

5.2.1 Plan Overview and Coordination

5.2.1.1 Overview

The District provides potable water on a wholesale basis from its Domestic Water System to the cities of Arcata, Eureka, and Blue Lake; and to the Humboldt, Manila, Fieldbrook Glendale and McKinleyville Community Services Districts (CSDs). Retail water service is provided to less than 200 customers who are generally located closer to the District's distribution system than to any other municipal water service. Raw water for industrial use from its Industrial Water System is available for any future industrial customer.

Wholesale water is provided to the District's customers under long-term contracts. These contracts specifically assert the District's right, in accordance with the California Water Code, to suspend the water delivery requirements of the contracts if the District's Board declares that an actual or potential water shortage exists, or if all wholesale customers and the District mutually agree to implement this Water Shortage Contingency Plan. During the 1976/77 drought, which was the only declared water emergency in the history of the District, it was the policy and practice of the District to set maximum use targets for its wholesale municipal customers, allowing them to choose how to meet those targets. Since the wholesale industrial customers could not operate effectively at significantly reduced water consumption levels, they were required to repair leaks and increase the efficiency of their water use. A reservoir capacity was set at which all deliveries to the industrial customers would cease. Fortunately, capacity did not fall to that level.

This plan operates on the same principles. The municipalities will retain responsibility for control of allotments provided under the provisions of this plan. Any potential wholesale industrial customers will face the reductions outlined in each action stage. The District's 200 retail customers will be treated in accordance with the action stages of this plan.

5.2.1.2 Coordination

Coordination in implementing this Water Shortage Contingency Plan is assured through the activation of the Water Task Force. The first task force was formed in 1977. This

task force would be convened as necessary to address drought conditions or other significant events which could result in a supply shortfall. It is composed of representatives of the District and each of its wholesale customers. The committee's responsibilities include:

1. Review the status of the water supply and forecasts.
2. Recommend specific actions in accordance with this plan and each entity's own water shortage plan.
3. Assure that priority of allocations meets legal requirements of consistency and non-discrimination.
4. Coordinate media releases and public announcements.
5. Coordinate interaction with regulatory agencies such as the California Departments of Water Resources, Fish and Game, and California Department of Public Health.
6. Review and make recommendations about requests for waivers from, or exceptions to, actions taken pursuant to this plan.

5.2.2 Stages of Action

There are five defined drought action stages (Table 35). These stages may be implemented with or without a formal declaration of a water emergency by the District's Board of Directors. In the event circumstances merit or require a declaration of a water shortage emergency, it is the intent of the District to rely on this plan to provide the primary framework to deal with such an emergency. The triggers attached to each stage are not intended to be absolute. Circumstances not currently foreseeable may dictate moving to a higher action stage before the trigger levels for that stage are reached. Conversely, action stage implementation may be postponed or suspended if there is sufficient natural flow in the river to meet downstream needs. Action stages will be terminated, in consultation with the Water Task Force, as rain, runoff, and lake levels permit.

5.2.3 Stages and Conditions

Table 35 shows the rationing stages to address water supply shortages.

Table 35
Water shortage contingency — rationing stages to address water supply shortages

Stage No.	Water Supply Conditions	% Shortage
Stage 1	Controlled Release from Storage	
Stage 2	Optimizing Available Supply	
Stage 3	General Reduction	10% to 15%
Stage 4	Usage Allocations	16% to 30%
Stage 5	Rationing	50%

As the District, through its Water Resource Planning efforts, plans to service wholesale industrial water users in the future, the following stages and conditions assume that the District still is operating at normal levels prior to loss of its wholesale industrial customers. Without wholesale industrial customers, triggering of these stages would not occur as quickly and there would be lower flow requirements in the river.

- **Stage 1 – Controlled Release from Storage**
  This means releasing from storage only the amount of water needed for instream and water supply purposes.

- **Stage 2 – Optimizing Available Supply**
  Reduction of peaking by wholesale industrial customers (if there are any industrial customers), resulting in narrower production ranges and a lower flow requirement in the river.
  General voluntary water conservation measures with the municipalities, including public education efforts encouraging water conservation.

  Consideration to implement Stage 2 will be triggered when the volume in Ruth Lake falls to 65% of capacity (31,200 AF) and the accumulated rainfall in the Ruth area is 70% or less of the historical average (49 inches). Other triggers to be considered are damage to system by flood, earthquake or other destruction; and accidental or intentional toxic spills in supply. The Water Task Force will review the trigger data and make recommendations regarding actual implementation of Stage 2.

- **Stage 3 – General Reduction**
  All wholesale and retail customers of the District will be required to reduce usage by 10% to 15% over the previous two-year average actual use. It is estimated that this will save between 2.7 MGD and 4.0 MGD, or up to 370 AF per month, based on actual usage (including previous average industrial use).

  Consideration to implement Stage 3 will be triggered when Ruth Lake reaches 40% of capacity (19,200 AF) and accumulated rainfall is 60% or less of historical average (42 inches). The Water Task Force will review the trigger data and provide input regarding actual implementation of Stage 3.

- **Stage 4 – Usage Allocations**
  Wholesale industrial water usage (if there were any industrial customers) will be limited to a maximum of 80% of the previous two years of actual average use. Each wholesale industrial customer will provide certification that water use is being optimized and that wasteful use of water is not occurring.
  Use allocations reflecting 16% to 30% reductions will be established for the municipalities and retail customers using the previous two years actual average usage. The specific reduction will be determined on a biweekly basis based on rate of supply reduction, weather and other relevant factors. It is estimated that this will save between 4.0 MGD and 6.6 MGD, or up to 610 AF per month over current usage.

Consideration to implement Stage 4 will be triggered when Ruth Lake reaches 30% of capacity (14,400 AF) and accumulated rainfall is 50% or less of historical average (35 inches). The Water Task Force will review the trigger data and provide input regarding actual implementation of Stage 4.

- **Stage 5 – Rationing**
  Wholesale industrial water usage (if there were any industrial customers) will be limited to the amounts required for human consumption, sanitation, and fire protection. No water will be available for industrial processes. Municipal and retail customer usage will be reduced on a basis of up to 50% as may be determined by the rate of use of available supply and weather conditions. It is estimated that this will save up to 21 MGD, or 1,930 AF per month over current usage.

  Consideration to implement Stage 5 will be triggered when Ruth Lake reaches 25% of capacity (12,000 AF) and accumulated rainfall for the Ruth area continues at 50% or less of historical average (35 inches). The Water Task Force will review the trigger data and provide input regarding the actual implementation of Stage 5.

5.2.4 Projected Effect of Action Stages on Water Supply Durability

A primary goal of any Water Shortage Contingency Plan is to ensure, to the greatest extent possible, that the water supply will last until it can be replenished. To examine how well this plan might achieve that goal, some supply duration analyses have been performed. These analyses compare how long the water supply in the reservoir will last both with and without implementation of the plan. The calculations assume that no rainfall or other inflows to the reservoir occur and do not take into account minimum releases required for fish and wildlife, as these vary throughout the year. These analyses also assumed that the District was operating both its domestic and industrial systems and used a domestic water delivery of 11 MGD and an industrial water delivery of 16 MGD, totaling deliveries of 27 MGD. Flows for other water rights on the river were included; these total 1.585 MGD. Also, the calculations assumed that the action stages were put into effect as soon as the reservoir volume trigger point is reached and that the maximum reductions for each stage are implemented.

The analyses computed the number of days the supplies would last starting from the Stage 2 trigger point, which is when the lake reaches 65% of capacity (31,200 AF). If no reductions were made and the current delivery level of 27 MGD was maintained, this supply would last 352 days.

If the plan were followed as described above, the various stages would be implemented as follows:

- Stage 2 would be implemented immediately. This stage doesn't require any reductions; deliveries would be maintained at the current level of 27 MGD.
- Stage 3 would be reached on day 136 when the reservoir reached 40% of capacity (19,200 AF). This would lead immediately to 15% reductions to both municipal and industrial customers. This would reduce the production rate to 23 MGD.

- Stage 4 would be reached on day 199 when the reservoir reached 30% of capacity (14,400 AF). This would lead immediately to 30% reductions in municipal deliveries and 20% reductions in industrial deliveries. This would reduce the production level to 21 MGD.
- Stage 5 would be reached on day 235 when the reservoir reached 25% of capacity (12,000 AF). This would lead immediately to 50% reductions in municipal deliveries and reduce industrial water usage to amounts required for human consumption, sanitation, and fire protection (called 95% reduction for this analysis). This would reduce the production level to 8 MGD.
- Once in Stage 5, the supplies would last another 493 days, running out on day 728.

So, in this analysis, the duration of supplies more than doubled (from 352 days to 728 days) through the implementation of this Water Shortage Contingency Plan. An increase in normal water deliveries, especially the District's entry into additional wholesale contracts for industrial water, would reduce the duration of the supplies.

If the above analyses were tested with the current scenario of a normal domestic water delivery of 9.90 MGD with no industrial water delivery, the supply would last 885.4 days with deliveries being maintained at 11.49 MGD (including flows for other water rights in the river). Therefore, the District could continue delivering water to its seven municipal customers at a steady rate for approximately 2.42 years without triggering Stage 2 of the Water Shortage Contingency Plan.

5.2.5 Catastrophic Supply Interruption Plan

The District's Emergency Operations Plan (EOP) provides the overall response procedures for catastrophic supply interruptions. The EOP further provides specific procedures for power outages and for security incidents. The District's Emergency Action Plan (EAP) provides response procedures for catastrophic supply interruptions involving the R.W. Matthews Dam and Reservoir (Ruth Lake) at Ruth, such as an earthquake. The District's Operations Plan (OP) provides procedures for system failures. Hazardous materials incidents are covered by numerous response plans depending on the nature of the incident.

Preparation Actions for a Catastrophe

Possible Catastrophe	Summary of Actions/Plans
Regional Power Outage	Emergency Operations Plan-Power Outage Procedures
System Failure	Operations Plan for Water Supply, Treatment, and Distribution System
Earthquake	Emergency Operations Plan/ Emergency Action Plan (R.W. Matthews Dam at Ruth)
Hazardous Material Spill	Hazardous Materials Response Plans
Acts of Terrorism	Emergency Operations Plan-Security Procedures/ Emergency Action Plan (R.W. Matthews Dam at Ruth)

5.2.6 Analysis of Revenue Impacts of Reduced Sales During Shortages

Each wholesale customer must gage the revenue and expenditure impact of the action stages. The expenditure and revenue impacts on the District are negligible since the wholesale rates are designed to cover costs incurred by the District in producing and distributing the water. With less water to produce, there would be less expense incurred by the District. Therefore, expenditures and revenues for costs directly related to the amount of water produced (e.g. costs for power for pumping) will both decrease as deliveries of water are curtailed. If the shortage were to continue for a prolonged period, the District could reduce staff in order to cut costs as the District would not be producing and distributing water at normal levels. The District also has a reserve account to act as a buffer to cover fixed costs for a short period of time if the District were to need it.

5.2.7 Prohibitions, Consumption Reduction Methods, and Penalties

As noted earlier in this plan, each wholesale customer is responsible for adopting plans to implement the reductions in water use called for by the action stages outlined above. Effectiveness of this plan will be monitored on a daily basis using continuously metered data from Ruth Lake and the metered connections to all wholesale municipal and industrial customers.

Tables 36 (Water shortage contingency — mandatory prohibitions) shows examples of prohibitions and the stage when those prohibitions become mandatory. These prohibitions assume that the District is operating at normal levels prior to loss of its industrial customers.

Table 36
Water shortage contingency — mandatory prohibitions

Examples of Prohibitions	Stage When Prohibition Becomes Mandatory
Maximum usage (peaking) by wholesale industrial customers	2
Wholesale industrial water usage more than 80% of previous two years of average use	4
Wholesale industrial water usage other than amounts required for human consumption, sanitation, and fire protection	5
Wholesale and retail customer usage more than 50% of previous two years of actual average usage	5

Table 37 (Water shortage contingency — consumption reduction methods) shows the consumption reduction methods and the stages when the method takes effect. This table also shows the projected percentage reduction from Stage 3 through Stage 5, when the consumption reduction methods are required.

Table 37 Water shortage contingency — consumption reduction methods		
Consumption Reduction Methods	**Stage When Method Takes Effect**	**Projected Reduction (%)**
Release from storage only amount of water needed for in-stream and water supply purposes	1	
General voluntary water conservation measures with wholesale customers	2	
Public education efforts encouraging water conservation	2	
Require all wholesale and retail customers to reduce usage	3	10% to 15%
Require all wholesale and retail customers to reduce usage further	4	16% to 30%
No water for industrial processes and reduce wholesale and retail customer usage up to 50%	5	50%

The District does not have any penalties or charges in place at this time, therefore, Table 38 (Water shortage contingency — penalties and charges) does not show any penalties or charges. The District's Board of Directors reserves the right to adopt penalties for non-compliance with various action stages, but feels it is not necessary to do so at this time. Penalties will be considered when a water shortage emergency is actually declared.

Table 38 Water shortage contingency — penalties and charges	
Penalties or Charges	**Stage When Penalty Takes Effect**
District does not have any penalties or charges at this time	N/A

5.2.8 Draft Ordinance and Use Monitoring Procedure

To determine the actual reductions in use of water during a water shortage, the District will use its Supervisory Control and Data Acquisition (SCADA) system to monitor distribution to its customers on a daily basis. In the event of a power outage, the District has two auxiliary power generators as standby power sources. The first generator is a 35 kW (kilowatt) generator and the second is a 2 MW (megawatt) generator. Therefore, the SCADA system will continue operating during power outages and continue monitoring distribution.

A copy of the District's draft Water Shortage Contingency Resolution for Declaring a Water Shortage Emergency and Implementing the District's Water Shortage Contingency Plan is attached to the District's UWMP in Appendix F.

5.3 Water Quality

As discussed above, drinking water delivered by the District is drawn from wells located in the Mad River. These wells draw water from the sands and gravel of the aquifer

located under the riverbed. The gravel and sands through which the water is drawn provides a natural filtration process which yields source water for the District's regional drinking water system that is of very high quality. Furthermore, the results from the District's ongoing water monitoring and testing program indicate that the District's water quality is very high and meets safe drinking regulatory standards, as has consistently been the case over the years.

The only water quality issue occasionally encountered by the District in the past was turbidity. Generally, turbidity in the Ranney Well source water has been very low and meets the turbidity standards set by the California Department of Public Health (CDPH). However, during or following severe winter storm events, turbidity in the source water could rise beyond the standards set by CDPH. In the late 1990s, an extremely heavy "El Nino" rainy season caused a prolonged series of storms that raised turbidity in the source water to such a level that CDPH became concerned that it could potentially interfere with the disinfection process, and therefore, pose a threat to public health. In 1997, CDPH directed all of the Public Water Systems in the Humboldt Bay area (the District and its wholesale municipal customers) to address the wintertime turbidity issue and to meet the turbidity standards established by CDPH. The District initiated a process with its seven municipal customers to determine the most cost effective way to meet the State's requirement. The solution was to design and construct a regional Turbidity Reduction Facility (TRF). The TRF was completed in April 2003 and now operates during the winter storm season to reduce higher turbidities in accordance with the State's standards.

As the District's ongoing water monitoring and testing program indicates that the District's water quality has been and continues to be very high and with the turbidity issue taken care of by the TRF, the District does not foresee any current or projected water supply impacts resulting from water quality. Therefore, Table 30 (Water quality – current and projected water quality impacts) shows zero water quality impacts throughout the 20-year UWMP planning horizon.

Table 30
Water quality — current and projected water supply impacts (AFY)

Water source	Description of condition	2010	2015	2020	2025	2030
Mad River Storage & Diversions		0	0	0	0	0

5.4 Drought Planning

As stated in earlier sections, the District has permitted rights for 84,000 AFY of water to supply its wholesale customers. Table 11 shows that the highest projected total water demand for the District's wholesale customers in 2030 (which includes the District's demand objective for raw water of 11,200 AFY, per Option A of the Implementation Plan), is approximately 30% of this permitted water supply. With this in mind, the following sections will provide data for each of the following water year types: normal,

single dry, and multi-dry. Supply and demand comparisons for each water year type will also be discussed.

Table 27 captures the specific base water years that each type of water year falls into.

Table 27 Basis of water year data	
Water Year Type	**Base Year(s)**
Average Water Year	1989
Single-Dry Water Year	1977
Multiple-Dry Water Years	1990, 1991, 1992

5.4.1.1 Normal Water Year

During a normal water year, the Ruth Lake area averages 69.8 inches of rainfall, about 173,000 AF of water flow into the reservoir via the Mad River, and the average runoff for the watershed near the District's diversion facilities at Essex is 982,600 AFY (over the entire record period from 1963 to 2010). The average annual runoff data was provided by USGS at Gage Station 1148100 on the Mad River near Arcata, CA. As shown in Table 27, the Water Year ending in 1989 was considered an average water year because the average runoff for the watershed that year was 985,364 AFY, which is close to the average annual runoff for the watershed as provided.

5.4.1.2 Single Dry Water Year

The water year ending in 1977 was the driest recorded for the District, far drier than any other. Rainfall in the Ruth area was 29 inches, or 41% of normal (69.8 inches). Flows into the reservoir were 26,000 AFY, or 15% of normal (173,000 AFY). The runoff for the watershed measured near the District's diversion facilities was 109,107 AFY, or 11% of normal (982,600 AFY). The average reservoir volume for the water year was 21,000 AF, which is 44% of capacity (48,030 AF) and 51% of normal (41,000 AF). The reservoir was drawn to 13,000 AF, or 27% of its capacity (48,030 AF) at the end of the water year.

Fall storms arrived in November 1977 and quickly refilled the reservoir. This water year was severely dry throughout the entire state of California and was a very exceptional year in the District's history:

- In 47 years of records, it was the only year in which rainfall was less than 50% of normal (69.8 inches).
- It was also the only year in which the reservoir was not filled to capacity.
- Total flows into the reservoir via the Mad River were half the value of the next driest year.
- Runoff for the watershed and average reservoir volume were each 60% of the next driest year.

5.4.1.3 Multiple Dry Water Years

The three water years between October 1989 and September 1992 represent the driest multiple years recorded for the District:

- Rainfall for this period averaged 42 inches per year, or 60% of normal.
- Of the three water years, the driest year for rainfall was water year 1990/1991 with 37 inches, or 53% of normal.
- Flows into Ruth Lake via the Mad River averaged 69,000 AFY, or 40% of normal (173,000 AFY).
- The runoff for the watershed above the District's diversion facilities was 371,300 AFY, or 37% of normal (982,600 AFY).
- Despite the diminished rainfall and runoff, rainfall was more than sufficient to refill the reservoir each year.
- Reservoir volume during this period averaged 37,000 AF which is 77% of capacity (48,030 AF) and 90% of normal (41,000 AF).

5.4.1.4 Comparing Supply Reliability with Different Water Year Types

Table 28 shows the runoff amounts for the normal, single dry and multiple dry water years. This table also shows the single dry water year runoff and each of the three multiple dry water years runoff amounts as a percentage of the normal water year's runoff amount. As expected, the single dry water year runoff has the lowest percentage when compared to the percentage of the other three years. However, although the single dry water year runoff amount was only 11.1% of the normal water year amount, this 109,107 AFY is still enough to satisfy the District's permitted supply amount of 84,000 AFY should the District need it. Therefore, the other watershed runoff amounts in the multiple dry water years (ending 1990, 1991, 1992) will also meet the District's permitted supply as well as they are all more than the District's permitted supply amount of 84,000 AFY (Table 28).

Table 28
Supply reliability — historic conditions (AFY)

Average / Normal Water Year	Single Dry Water Year	Multiple Dry Water Years		
		1990	1991	1992
982,600	109,107	571,815	371,340	282,794
Percent of Average/Normal Year:	11.1%	58.2%	37.8%	28.8%

To project multiple dry water year supply conditions into the future, the historic runoff values from the multiple dry water years ending in 1990, 1991 and 1992 were used. These three water years were the only three consecutive multiple dry water years in the District's recent history. Therefore, the watershed runoff for water year 2011 is projected as 571,815 AFY (same as in 1990), for 2012 as 371,340 AFY (same as 1991) and for 2013 as 282,794 AFY (same as in 1992). Since these projected multiple dry water year supply values are the same as the historic values for 1990, 1991 and 1992, the projected watershed runoff amounts will also meet the District's permitted supply as well.

Table 31 Supply reliability — current water sources (AFY)				
Water supply sources	**Average / Normal Water Year Supply**	**Multiple Dry Water Year Supply**		
		Year 2011	**Year 2012**	**Year 2013**
Mad River Storage & Diversions	982,600	571,815	371,340	282,794
Percent of normal year:	100.0%	58.2%	37.8%	28.8%

Table 32 shows the difference between supply and demand as projected in five year increments from 2015 through 2030 under normal water year conditions. Under normal year conditions when the watershed runoff is approximately 982,600 AFY, there is more than enough water to meet the District's permitted water right of 84,000 AFY, and therefore, meet demands. This difference between supply and demand is shown both as a percentage of supply and as a percentage of demand. As a percentage of supply, the difference in 2015 is approximately 87%, which does not include any potential demands for raw water use. The difference as a percentage of supply is reduced in 2030 to approximately 72%. This reduction in 2030 is due to the District's goal of developing new demands for raw water use by 2030 as shown in Table 10. As a percentage of demand, the difference amount was approximately 642% in 2015 and is reduced to approximately 257% by 2030, which is also due to the District's goal of developing new demands for raw water use by 2030. This shows that during the normal year, the District has more than enough supply to meet demand as projected into the future.

Table 32 Supply and demand comparison — normal year (AFY)				
	2015	**2020**	**2025**	**2030**
Supply totals (from Table 16)	84,000	84,000	84,000	84,000
Demand totals (From Table 11)	11,315	17,240	17,597	23,549
Difference	72,685	66,760	66,403	60,451
Difference as % of Supply	86.5%	79.5%	79.1%	72.0%
Difference as % of Demand	642.4%	387.3%	377.4%	256.7%

The watershed runoff for the single dry water year was 109,107 AFY as shown in Table 28. As this amount is more than the District's permitted water supply of 84,000 AFY, the District still has the 84,000 AFY of water available as it does during a normal water year. Therefore, Table 33 shows the same calculations as in Table 32 for the normal water year condition showing the supply totals as 84,000 AFY from 2015 through 2030. The data shows that the District has more than enough water supply to meet demand, even in a single dry water year situation.

Table 33 Supply and demand comparison — single dry year (AFY)				
	2015	2020	2025	2030
Supply totals	84,000	84,000	84,000	84,000
Demand totals	11,315	17,240	17,597	23,549
Difference	72,685	66,760	66,403	60,451
Difference as % of Supply	86.5%	79.5%	79.1%	72.0%
Difference as % of Demand	642.4%	387.3%	377.4%	256.7%

For the multiple dry water year scenario, Table 31 projects the multiple dry water year supply amounts as 571,815 AFY (for 2011), 371,340 AFY (for 2012), and 282,794 AFY (for 2013). As these supply amounts are larger than the District's permitted supply amount of 84,000 AFY, the District is able to maintain its water supply during these consecutive dry water years as well. Therefore, Table 34 also shows the District's water supply projections for multiple dry water years as its permitted amount of 84,000 AFY for 2015 through 2030. The data shows that the District has more than enough water supply to meet demand, even during multiple dry water years.

Table 34 Supply and demand comparison — multiple dry-year events (AFY)					
		2015	2020	2025	2030
Multiple-dry year first year supply	**Supply totals**	84,000	84,000	84,000	84,000
	Demand totals	11,315	17,240	17,597	23,549
	Difference	72,685	66,760	66,403	60,451
	Difference as % of Supply	86.5%	79.5%	79.1%	72.0%
	Difference as % of Demand	642.4%	387.3%	377.4%	256.7%
Multiple-dry year second year supply	**Supply totals**	84,000	84,000	84,000	84,000
	Demand totals	11,315	17,240	17,597	23,549
	Difference	72,685	66,760	66,403	60,451
	Difference as % of Supply	86.5%	79.5%	79.1%	72.0%
	Difference as % of Demand	642.4%	387.3%	377.4%	256.7%
Multiple-dry year third year supply	**Supply totals**	84,000	84,000	84,000	84,000
	Demand totals	11,315	17,240	17,597	23,549
	Difference	72,685	66,760	66,403	60,451
	Difference as % of Supply	86.5%	79.5%	79.1%	72.0%
	Difference as % of Demand	642.4%	387.3%	377.4%	256.7%

6 Demand Management Measures

6.1 DMMs

The area served by the District is one of the few regions of California with a local abundance of water. This has meant that droughts, while just as severe climatically, have not led to the same level of supply shortfall as in many other regions. This does not mean that the District or its residents are unaware or unconcerned about the importance of water conservation.

Because supplies are sufficient to meet current and projected demand and per capita use is low, implementing additional Demand Management Measures (DMMs) beyond those that are required of the District as an urban water wholesaler is not economic for the District.

Throughout the Work Group meetings and entire process of completing this UWMP, the District has asked the four larger wholesale customers (who were also working on their UWMPs) if there were any programs or any assistance they need from the District with regards to helping them achieve their water use targets. The District has also offered its assistance on any DMM programs that the wholesale customers may have. At this point, none of the wholesale customers have identified any specific program or assistance they need from the District with regard to helping them achieve their water use reduction targets or DMM programs. However, the District will continue to support and work with its wholesale customers to help them achieve their water use targets and DMMs. If any of the wholesale customers identifies a program to help them achieve their water-use targets or DMMs in the coming months or years, the District will consider and implement as appropriate.

6.1.1 DMMs Required by Wholesale Urban Water Suppliers

DWR requires wholesale urban water suppliers to address the following DMMs, which also comply with DMMs stated in AB 1420 of 2007 (compliance needed for any water management grant or loan made to an urban water supplier and awarded or administered by DWR, State Water Resources Control Board (SWRCB), or California Bay-Delta Authority (CBDA) or its successor agency). The wholesale urban water supplier DMMs are as follows (labeled according to Guidebook):

- (C) System water audits, leak detection, and repair
- (D) Metering with commodity rates for all new connections and retrofit of existing connections
- (J) Wholesale agency programs
- (K) Conservation pricing
- (L) Water conservation coordinator

6.1.1.1 (C) System Water Audits, Leak Detection, and Repair

The District has meters on all services and sources. Analog meters at the wholesale customers' delivery points are read monthly. Totalizers connected to the District's

control system measure and record production rates as well as delivery rates to all wholesale customers. These readings are taken continuously and are monitored at all times by the District's Water Plant Operators. Large differences between production volumes and the total volume delivered to customers are immediately obvious and are addressed. Furthermore, totalizer readings and analog meter readings are compared each month and discrepancies addressed. Analyses have been made of the data from the production totalizers, the wholesale customer delivery totalizers, and the analog meters at the wholesale customers' delivery points. All readings were within 10% of one another, which is not significant, especially considering that each meter and totalizer used has an accuracy tolerance of 2% to 5%. Further, this analysis showed that unaccounted water is consistently less than 10% of production, the American Water Works Association standard for distribution systems.

The control system, by making data available in real time, not only helps the District detect problems in its distribution system, it can benefit municipal customers as well. For example, one of the municipal customers developed a large leak in their pipeline in between the District's delivery point and the municipality's storage reservoir. A tremendous spike in the delivery rate to the municipality developed rapidly and was noticed by the District's Water Plant Operator, resulting in earlier detection of the leak than might otherwise have occurred. The District will continue to monitor production and delivery rates at all times and immediately investigate significant discrepancies.

6.1.1.2 (D) Metering with commodity rates for all new connections and retrofit of existing connections

The District is primarily an urban wholesale water supplier and services seven municipal customers, and prior to 2009, also directly serviced an industrial water user. At this time, the District does not anticipate any new wholesale connections. If a new wholesale customer were to join the District, the connection would be metered. The existing connections to the District's wholesale customers are metered and monitored regularly for leaks and waste. Any issues dealing with leaks and waste, along with other water related topics are discussed at the District's monthly Muni-Meetings, which the District implements as part of its Wholesale Agency Programs (see next section 6.1.1.3 below). The District conducts regularly scheduled flow testing, calibration and maintenance of all its wholesale water meters. This ensures that the meter readings are accurate and helps the District and its wholesale customers monitor for leaks and waste. The District's wholesale customers (urban retail water suppliers) will conduct review of their own metering and retrofit programs for end users in their UWMPs.

6.1.1.3 (J) Wholesale Agency Programs

The District and its wholesale customers work together to identify options to reduce water waste, improve water use efficiency, and educate the end users about conservation practices. These efforts occur during the monthly "Muni-Meetings" coordinated and hosted by the District. The municipal customers attend these monthly meetings, which are the forum that is intended to foster this type of partnership between the retail agencies and the District. Examples of recent coordination efforts are described below:

- The District recently hosted an UWMP development workshop series at which an expert in the field of UWMP development presented.

- The District provides educational material and water use data to the wholesale customers for distribution to the end users, to assist the wholesale agencies in understanding their demand.

- Conservation topics are discussed at the monthly Muni-Meetings and, when practical, the District assists the wholesale agencies with the development of their respective UWMPs.

6.1.1.4 (K) Conservation pricing

The District has individual wholesale contracts with each of its wholesale customers. These contracts include both a fixed fee component and a variable-fee component based on water use. The variable fee component is a uniform rate set for each wholesale customer that is charged per volume of water used. A set peak rate has also been allocated to each wholesale customer so that they cannot continually exceed that peak rate without discussing this amount with the District and negotiating a new peak rate. The current rate structure between the District and its wholesale customers encourages conservation by providing the wholesale customers a means to reduce water costs with reduction in water use.

6.1.1.5 (L) Water Conservation Coordinator

In compliance with this DMM, the District has designated a Water Conservation Coordinator, whose responsibilities include program management, tracking, planning and reporting on implementation of the DMMs. The Water Conservation Coordinator for the District is its Program and Regulatory Analyst.

6.1.1.6 Public Outreach and Education

The District supports initiatives to inform the public about water conservation. Financial contributions are made regularly to the California Water Awareness. In the past, the District has supported and developed public outreach and awareness programs through radio, news papers, and public access television.

District personnel at the Essex Operational Center give tours of the water production and treatment facilities to students. These tours have varied from the most basic water awareness talks for kindergarten classes to technical presentations for graduate engineering classes. Personnel have also assisted individual high school and university students with their projects relating to either the water system or the Mad River. The District enjoys the opportunity to work with students as it is rewarding to all involved and helps to disseminate awareness of water as a valuable resource and to practice conservation.

In the future, the District will continue efforts to raise public awareness of water conservation issues with its wholesale customers (urban retail water suppliers) by helping

to develop and co-fund public awareness programs through radio, news papers and other media.

7 Section 7 - Climate Change

7.1 Climate Change

In the California Water Plan (2009), an assessment of the impacts of global warming on the State's water supply was conducted using a series of computer models that incorporated decades of scientific and historic research. Model results indicate increased temperature, reduction in Sierra Nevada mountain snow depth, early snow melt, and a rise in sea level. These changing hydrological conditions could affect future planning efforts, which are typically based on historic conditions.

Difficulties that may arise include:

- Hydrological conditions, variability, and extremes that are different than current water systems were designed to manage
- Changes occurring too rapidly to allow sufficient time and information to permit managers to respond appropriately
- Special efforts or plans required to protect against surprises
- Uncertainties

In July 2006, DWR issued "Progress on Incorporating Climate Change into Management of California's Water Resources," as required by Executive Order S-3-05, which instituted biennial reports on potential climate change effects on several technical resource areas, including water resources. This report describes the progress made in incorporating current climate change data and information into existing water resources planning and management tools and methodologies. The report, whose purpose is to demonstrate how various analytical tools currently used by DWR could be used to address issues related to climate change, focuses on assessment methodologies and preliminary study results from four climate change scenarios.

Future studies will include DWR working with other agencies to incorporate climate change information into the management of the State's water resources. Additional climate change scenarios will be developed and analyzed, with the goal of providing them to water resource planners to utilize in making water operations and management decisions. DWR states that the preliminary results in this current report are not sufficient by themselves to make policy decisions regarding water resources.

Recently, the District has made inquiries to the local NOAA office in regards to the impacts of global warming to our local water supply at Ruth Lake. Our water supply gets replenished mostly through precipitation and does not rely heavily on snow melt as with other parts of California. The Meteorologist in Charge stated that there are currently no computer models to model the impacts of global warming in our region.