MEDFORD WATER COMMISSION

Water Management and Conservation Plan

March 2009

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SECTION 1

Introduction

SECTION 1

Introduction

Overview

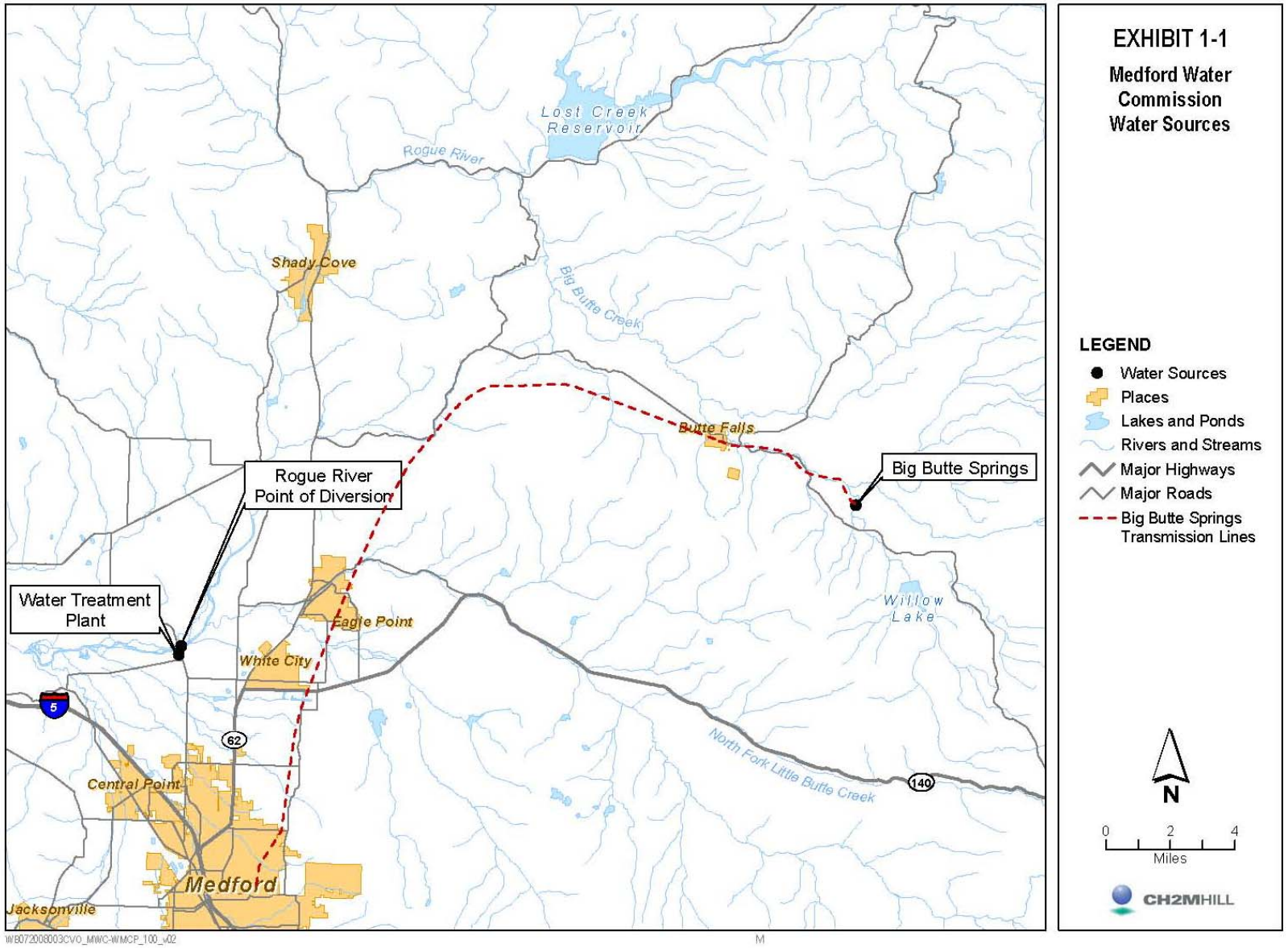
The Medford Water Commission (MWC) was established through the Medford City Charter to operate the public water system for the City of Medford. In addition to customers within Medford, MWC serves a limited number of individual customers outside the Medford city limits. MWC also provides water on a retail basis to customers within the unincorporated community of White City. The MWC system has been assigned the state and federal Public Water System Identification No. 4100513. The conservation and curtailment measures in this plan apply to these customers.

Additionally, MWC provides water on a wholesale basis to three water districts (Charlotte Ann, Elk City, and Jacksonville Highway) and five nearby cities (Cities of Central Point, Eagle Point, Jacksonville, Phoenix, and Talent). The number of water districts and of customers within water districts have been declining for decades, largely because portions of districts have been annexed into Medford, and the remainder of the district has dissolved. Customers no longer within districts become "outside" customers upon district dissolution. The most recent dissolution was the Kings Highway Water District, which dissolved in July 2008. While the MWC encourages these wholesale customers to adopt similar conservation and curtailment strategies, this plan does not directly apply to these customers.

This plan uses data through 2005 for population, production and consumption characteristics. The analyses occurred in conjunction with the preparation of MWC's July 2007 *Water Distribution System Facility Plan*, and were coordinated with regional level population and growth planning. It was determined that the 2005 data were representative of current conditions, and therefore did not warrant further updating.

Exhibit 1-1 is a map showing MWC's water sources. MWC's principal year-round source of water is the Big Butte Springs, located about thirty miles northeast of Medford and five miles east of the town of Butte Falls. The recharge area for the springs is approximately 56,000 acres, and includes the western slope of Mt. McLoughlin. The capacity from the springs varies from approximately 25 to 35 mgd depending on rainfall, snow pack, and groundwater conditions, but the transmission facility capacity limits withdrawal to a maximum of 26.4 mgd.

MWC uses the Rogue River as a supplemental source of water when demands exceed the Big Butte Springs capacity. This varies according to weather conditions, but currently the Rogue source tends to be used during portions of May through October. Water from the Rogue River is treated at the Robert A. Duff Water Treatment Plant (Duff WTP), which is located approximately three miles north of Medford city limits, near Touvelle State Park. Water from the Rogue River is withdrawn through an intake facility approximately 1,500 feet north of the Duff WTP. The current treatment capacity is 45 mgd.


Lost Creek Reservoir
Rogue River
Shady Cove
Big Butte Creek
Butte Falls
Rogue River Point of Diversion
Big Butte Springs
Water Treatment Plant
Eagle Point
White City
Willow Lake
5
62
140
North Fork Little Butte Creek
Central Point
Medford
Jacksonville
WB072008003CVO_MWC-WMCP_100_v02
M
EXHIBIT 1-1
Medford Water Commission Water Sources
LEGEND
Water Sources
Places
Lakes and Ponds
Rivers and Streams
Major Highways
Major Roads
Big Butte Springs Transmission Lines
N
0 2 4
Miles
CH2MHILL

In addition to Medford's Rogue River water rights, some of the cities served on a wholesale basis have acquired rights to additional water that can be withdrawn at the Duff WTP during the summer months. To date, water withdrawn for these cities has been stored water from the Lost Creek Reservoir, located approximately 20 miles upstream of MWC's Duff WTP. The reservoir contains approximately 465,000 acre feet of storage. Of this storage, 10,000 acre feet are allocated for municipal and industrial use.

Plan Organization

This Water Management and Conservation Plan (WMCP) fulfills the requirements of the Oregon Administrative Rules adopted by the Water Resources Commission in November 2002 (OAR Chapter 690, Division 86). It describes water management, water conservation and curtailment programs to guide the wise use and stewardship of the city's water supply.

The plan is organized into the following sections, each addressing specific sections of OAR chapter 690, Division 86:

Section	Requirement
Section 1 – Introduction	OAR 690-086-0125
Section 2 - Water Supplier Description	OAR 690-086-0140
Section 3 - Water Conservation	OAR 690-086-0150
Section 4 – Curtailment Plan	OAR 690-086-0160
Section 5 - Water Supply Element	OAR 690-086-0170

Affected Local Governments

The following governmental agencies may be deemed to be affected by this WMCP:

- City of Medford
- City of Central Point
- City of Eagle Point
- City of Jacksonville
- City of Phoenix
- City of Talent
- City of Ashland
- Charlotte Ann Water District
- Elk City Water District
- Jacksonville Highway Water District
- Medford Irrigation District
- Rogue River Valley Irrigation District
- Talent Irrigation District
- Jackson County
- Eagle Point Irrigation District (shares BBS water rights)

Thirty days prior to submitting this WMCP to the Oregon Water Resources Department (OWRD), the draft plan was made available for review by each affected local government listed above along with a request for comments relating to consistency with the local government's comprehensive land use plan. A sample of the letters requesting this input, along with any responses received are provided in **Appendix A**.

Plan Update Schedule

MWC anticipates submitting an update of this plan within 10 years of plan approval. As required by OAR Chapter 690, Division 86, a progress report will be submitted within five years from the approval of this plan.

SECTION 2

Water Supplier Description

SECTION 2

Water Supplier Description

Source

MWC uses water from two sources: Big Butte Springs and the Rogue River. Big Butte Springs is the commission's principle source of water, with water from the Rogue River being used as a supplemental source when demands exceed the spring's supply. Currently, the Duff Plant on the Rogue River operates during the months of May through October. This source will be required for longer periods to meet increasing demands as population increases within the region. Continuous use of the Rogue River supply is expected within 20 years.

The MWC uses a variety of water rights for the Big Butte Springs, which are detailed later in this chapter. This groundwater source provides exceptionally high quality water that is consistently cold, clear and requires minimal treatment. The springs capacity varies from approximately 25 to 35 mgd depending on rainfall, snow pack, and groundwater conditions, but the transmission facility capacity limits withdrawal to a maximum of 26.4 mgd. Water from the springs is disinfected and flows by gravity to reservoirs in the City of Medford.

The Rogue River, a surface water source with high quality water, is used seasonally pursuant to one water right for 100 cfs (64.6 mgd). Water from the Rogue River is treated to meet drinking water standards at the Robert A. Duff Water Treatment Plant (Duff WTP), which has a current treatment capacity of 45 mgd.

Water from these two sources blends within the distribution system, which includes nearly 440 miles of pipeline, twelve pump stations, and sixteen distribution reservoirs.

Interconnections with Other Systems

In addition to serving customers within the City of Medford, MWC also directly serves some customers in unincorporated areas, the largest group of which are within the White City Unincorporated Community boundary. Most of these outside customers were once within water districts that dissolved. MWC provides water to three remaining water districts: Charlotte Ann Water District, Elk City Water District, and Jacksonville Highway Water District. For the purposes of drinking water quality reporting, these districts fall under the MWC umbrella, rather than being considered separate water systems.

MWC provides treated water to five cities that are considered separate water systems beginning at the points of connection with the MWC system. These cities are Central Point, Eagle Point, Jacksonville, Phoenix, and Talent. Within this report, including all exhibits, the term "other cities" refers to these five city customers.

Intergovernmental Agreements

MWC has intergovernmental agreements with each of the water districts and cities it serves. The Cities of Phoenix, Talent and Jacksonville have acquired water rights to water stored in Lost Creek Reservoir, which MWC treats and transports for their use during the summer season. A summary of the contracts between MWC and the cities is contained in **Exhibit 2-1.** As part of their water supply contracts, the other cities served by MWC are all required to obtain water rights to meet their summertime demands, and will develop their own water management and conservation plans. Quantities sufficient to meet their 2020 summertime demands must be secured by 2015.

EXHIBIT 2-1
Summary of contracts between MWC and Cities.

City	Expiration Date	Maximum Rate of Use			
		Winter*		Summer*	
		GPM	MGD	GPM	MGD
Central Point	September 7, 2010	3,200	4.5	4,800	6.8
Eagle Point	April 12, 2010	900	1.3	2,100	3.0
Jacksonville	June 18, 2013	600	n/a	1,500	2.0
Phoenix	February 7, 2012	1,300	n/a	1,600	2.2
Talent	June 4, 2013	1,200	n/a	1,800	2.6

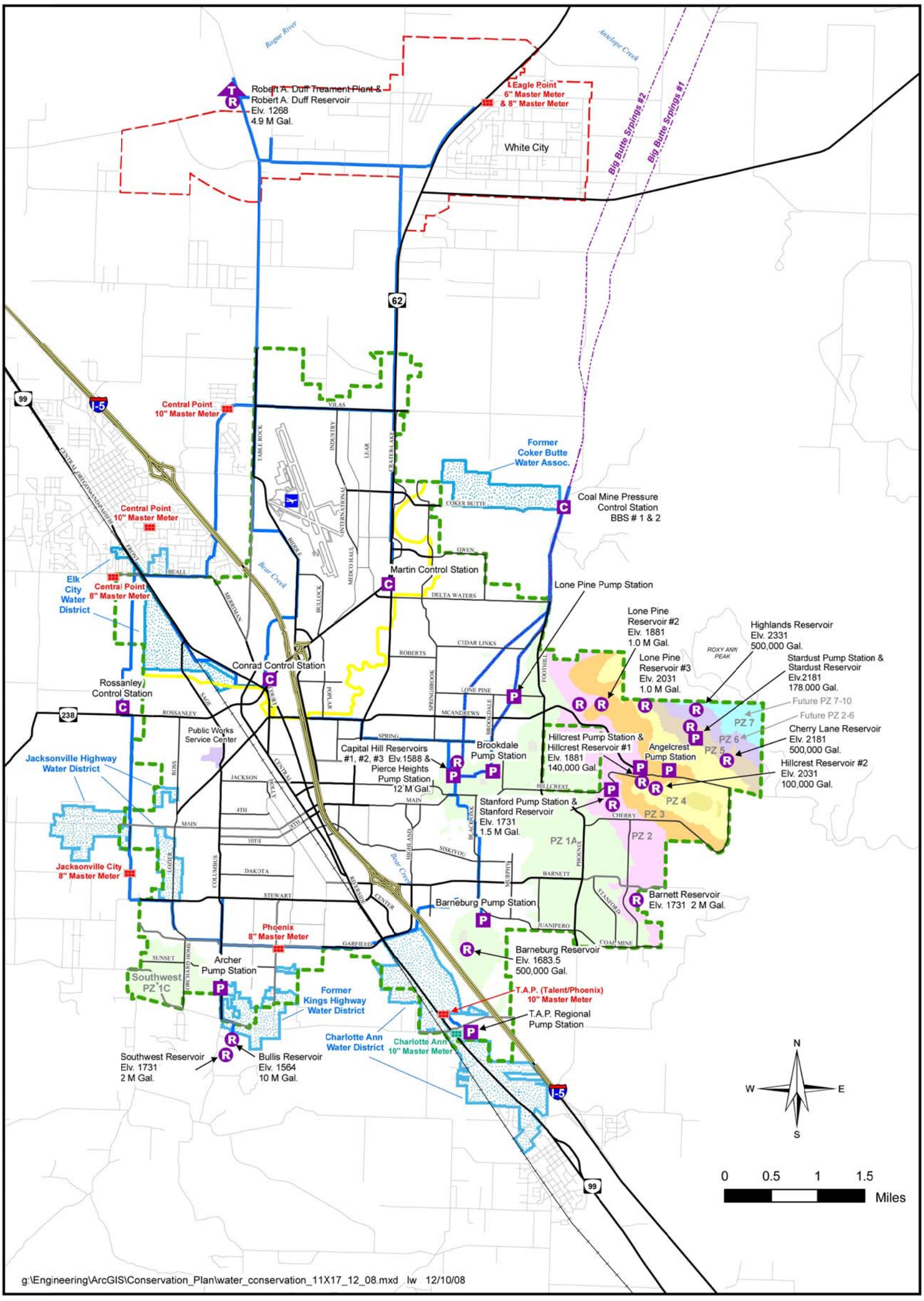
* For all cities except Phoenix, agreements specify the months that high use delivery rates apply are May through September, and low use months are October through April. Phoenix's contract has a breakdown of May through October and November through April.

Service Area Description

The Medford Water Commission's current service area shown in **Exhibit 2-2** includes the City of Medford, lands within the water districts and the White City Unincorporated Community. The boundaries of the other cities are not included in Exhibit 2-2. While they will continue to rely on the Commission's water rights during winter months, since each of them have or will be obtaining their own summer water rights, they are subject to submittal of their own WMCPs.

In 2005, the MWC water system served an estimated total population of approximately 120,000 people, with approximately 71,000 people inside the Medford city limits and 49,000 individuals outside the city limits. Within Medford city limits, over 21,000 accounts were residential (including both single and multi-family residences), and 2,300 were classified as commercial, industrial, or municipal accounts. Data through 2005 have been used throughout this plan to provide consistency with two of MWC's other recent planning documents: *Water Distribution System Facility Plan*, July 2007, and *Robert A. Duff Water Treatment Plant Facility Plan*, 2008. While some growth has occurred in since 2005, the 2005 data are still representative of the MWC system.

EXHIBIT 2-2
MWC Service Area and Water Facility Map



Legend

- Master Meters for Wholesale Cities
- Transmission Lines
- Urban Growth Boundary
- White City Boundary
- Water Districts Current or Dissolved
- PZ 1 Higher Elevation Pressure Zone
- Low Level Gravity Boundary
- Main Water Lines = > 20'

Water Commission Facilities

- C Control Station / Pump Station
- P Pump Station
- R Reservoir
- T Treatment Plant

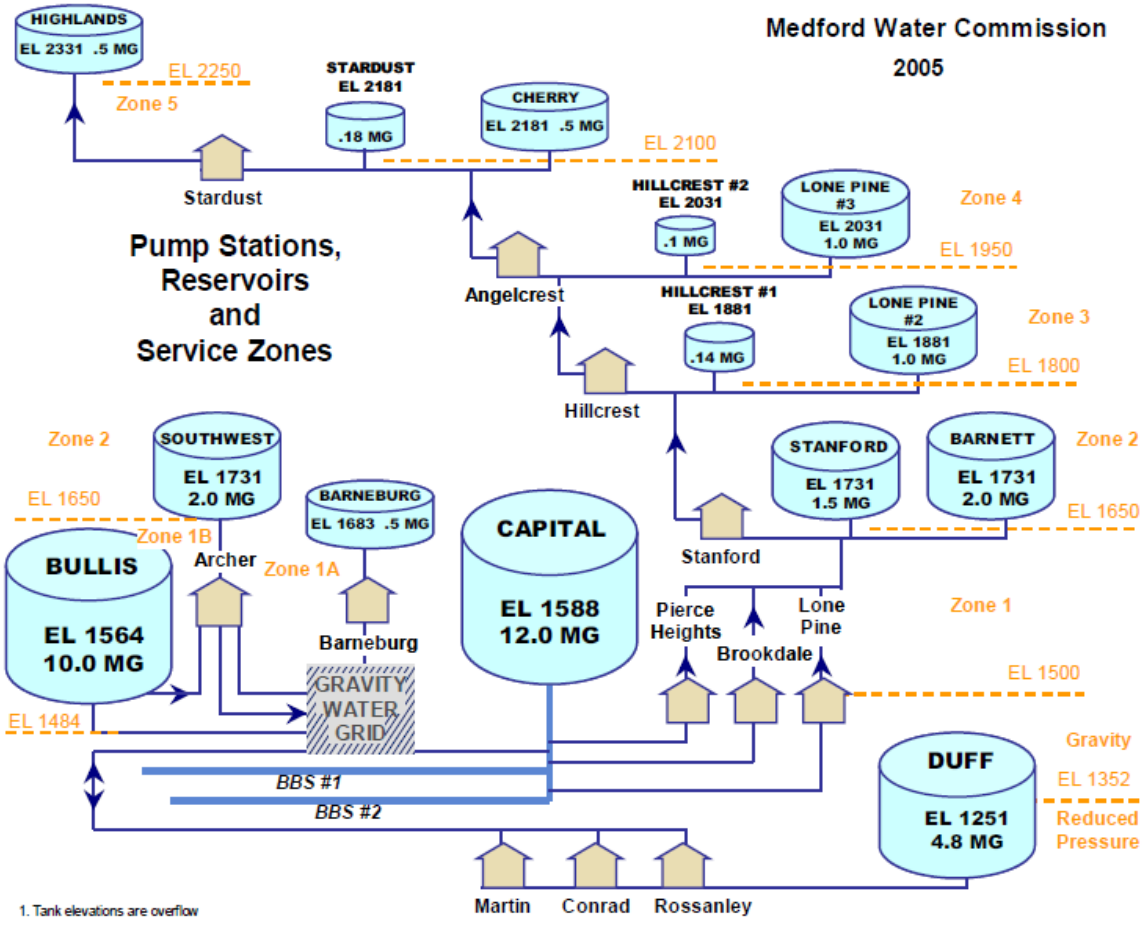
MEDFORD WATER COMMISSION

Medford Water Commission
Data produced by City of Medford, Jackson County
December 2008

System Description

Exhibit 2-3 presents a schematic of the distribution facilities for the Medford Water Commission. Water from the Big Butte Springs flows by gravity to Medford in two transmission lines with a combined capacity of 26.4 mgd. The transmission lines pass through different mountain summits, with the pressure in the lines being automatically controlled to maintain a full pipe by means of special back pressure control valves. The water from Big Butte Springs is chlorinated to meet drinking water standards.

EXHIBIT 2-3
MWC's Water Supply System Schematic



The water from Rogue River, which is a supplemental water source during summer months, is withdrawn through a screened intake structure just north of the Duff WTP. Treatment includes ozonation, coagulation, flocculation, sedimentation as necessary, followed by filtration, and disinfection. The treated water flows into a 42-inch transmission main leading to the distribution system in Medford, as well as into a 24-inch main which goes toward White City.

As illustrated in the schematic, MWC serves widely varying topographies with elevations ranging from 1,250 to 2,250 feet. To provide appropriate pressures and reliable service to all MWC customers, the system uses multiple pressure control stations, pump stations, reservoirs, and piping that interconnects the system.

MWC has sixteen reservoirs in service, including the Duff WTP clear well. Three reservoirs at Capital are the main receiving reservoirs for the system, being fed from the Big Butte Springs Transmission lines. The Capital and Bullis reservoirs provide storage for the Gravity Zone. All distribution reservoirs are located on hills, and therefore provide gravity storage for the respective service levels fed.

Exhibit 2-4 lists all reservoirs in service, including their service level, overflow elevation, material type, and volume. Only three reservoirs, Southwest, Barneburg, and Highlands, do not have backup storage capacity within the same service level.

EXHIBIT 2-4
MWC Reservoir Inventory

Name	Pressure Zone	Overflow Elevation (ft)	Volume (MG)	Material	Year Built
Capital[1]	Gravity Zone	1,588	12.0	Concrete	1-1908 2-1927 3-1945
Bullis	Gravity Zone	1,564	10.0	Concrete	1965
Barnett	Zone 1A	1,731	2.0	Concrete	1983
Stanford	Zone 1A	1,731	1.5	Concrete	1971
Barneburg	Zone 1B	1,684	0.5	Concrete	1959
Southwest	Zone 1C	1,735	2.0	Concrete	2000
Hillcrest No. 1	Zone 2	1,881	0.14	Concrete	1972
Lone Pine No. 2	Zone 2	1,881	1.0	Concrete	2005
Hillcrest No. 2	Zone 3	2,031	0.10	Concrete	1972
Lone Pine No. 3	Zone 3	2,031	1.0	Concrete	2006
Stardust	Zone 4	2,181	0.18	Concrete	1972
Cherry Lane No. 4	Zone 4	2,181	0.5	Concrete	1996
Highlands	Zone 5	2,331	0.5	Concrete	1996
Duff WTP Clearwell	Reduced Pressure	1,251	4.8	Concrete	1968
Total			**36.2**		

[1] The Capital Reservoir System has three tanks.

MWC has nine operating pump stations that supply water to service levels at higher elevations than the Gravity Zone. Additionally, there are three stations which perform dual functions depending upon time of year. During the summer months, they pump water coming from the Duff WTP into the distribution system. When water is being supplied only from the Big Butte Springs in the winter months, these facilities reduce the pressure for water flowing into the low level zone. The water transmission and distribution system has

approximately 440 miles of pipeline, which is upgraded and expanded annually to serve customers' growing demands. The majority of waterlines are made of either ductile iron (61 percent) or cast iron (32 percent). About 60 percent of the pipe is 6 and 8 inches in diameter.

Exhibits 2-5 and 2-6 provide inventories of existing pump stations and pipelines in the MWC system.

EXHIBIT 2-5

MWC Pump Station Inventory

Pump Station Name	Pressure Zone	Year Built	Pumps From	Pumps To (Reservoir and Overflow Elevation (ft))	Total Capacity (gpm)
Archer	Gravity Zone	1980	Bullis	Capital (1,588)	8,400
Lone Pine	Zone 1A	2005	Gravity Zone	Stanford and Barnett (1,731)	2,500
Brookdale	Zone1A	1970	Gravity Zone	Stanford and Barnett (1,731)	3,480
Pierce Heights	Zone 1A	1938	Gravity Zone	Stanford and Barnett (1,731)	2,000
Barneburg	Zone 1B	1959	Gravity Zone	Barneburg (1,684)	1,600
Archer	Zone 1C	1999	Gravity Zone	Southwest (1,735)	1,550
Stanford	Zone 2	1971	Zone 1 Reservoirs	Hillcrest #1 and Lone Pine No. 2 (1,881)	3,640
Hillcrest	Zone 3	1972	Zone 2 Reservoirs	Hillcrest #2 and Lone Pine No.3 (2,031)	2,490
Angelcrest	Zone 4	1972	Zone 3 Reservoirs	Stardust and Cherry Lane No. 4 (2,181)	1,800
Stardust	Zone 5	1995	Zone 4 Reservoirs	Highlands (2,331)	1,150

EXHIBIT 2-6

MWC Distribution System Pipe Inventory by Material Type[1]

Material	Length (miles)	Portion of All Pipe
Unknown	1	0.3%
Concrete Cylinder	1	0.3%
Cast Iron	138	31.5%
Ductile Iron	266	60.7%
Galvanized Iron	< 1	0.1%
PVC	5	1.2%
Steel	6	1.4%
Welded Steel	20	4.6%
Total	**440**	**100.0%**

[1] Transmission lines from Big Butte Springs to Coal Mine Station are not included in this inventory.

Records of Water Use

Terminology

Demand refers to total water production, or the sum of metered consumption (residential, commercial, industrial, and municipal), unmetered uses (for example, fire fighting or hydrant flushing), and water lost to leakage and reservoir overflow. For MWC, demand (production) is the total amount of water entering the distribution system from Big Butte Springs and the Duff WTP.

Hourly water demands fluctuate in response to water use patterns by residential, commercial, and industrial customers. These short-term demands are met by a combination of production (water entering the system) and withdrawals from the storage reservoirs.

Metered use or *consumption* refers to the portion of water use that is recorded by customer meters.

Connection refers to a metered connection of a customer to MWC's system.

Unaccounted for water (sometimes known as unbilled, or non-revenue water) refers to the difference between production and billed consumption. Unaccounted for water includes unmetered hydrant use, other unmetered uses, water lost to reservoir overflow, and leakage. Meter inaccuracies (both production and customer) also contribute to unaccounted for water.

Specific *demand* terms include:

- *Average day demand (ADD):* total annual production divided by 365 days
- *Maximum day demand (MDD):* the highest daily production during a calendar year
- *Maximum monthly demand (MMD):* the average daily demand during the calendar month with the highest total demand
- *Peak-hour demand (PHD):* the highest hourly demand during a calendar year

MDD is an important value for water system planning. The supply facilities (Big Butte Springs and the Duff WTP) must be capable of meeting the MDD. If the MDD exceeds the combined supply capacity on any given day, finished water storage levels will be reduced. Consecutive days at or near the MDD will result in a water shortage.

The most common units for expressing demands are million gallons per day (mgd). One mgd is equivalent to 695 gallons per minute (gpm) or 1.55 cubic feet per second (cfs). Units of million gallons (MG) are also used.

Average Day Demands

Exhibits 2-7 and 2-8 summarize annual average day demand (ADD) records for the overall MWC system for 2000 through 2005. The overall system represents both individual retail accounts, and sales to other cities and water districts. Values have ranged from 25.8 mgd to 28.9 mgd. The growth in the ADD has been steady throughout this period, averaging approximately 0.51 mgd increase per year as illustrated by the linear regression line in

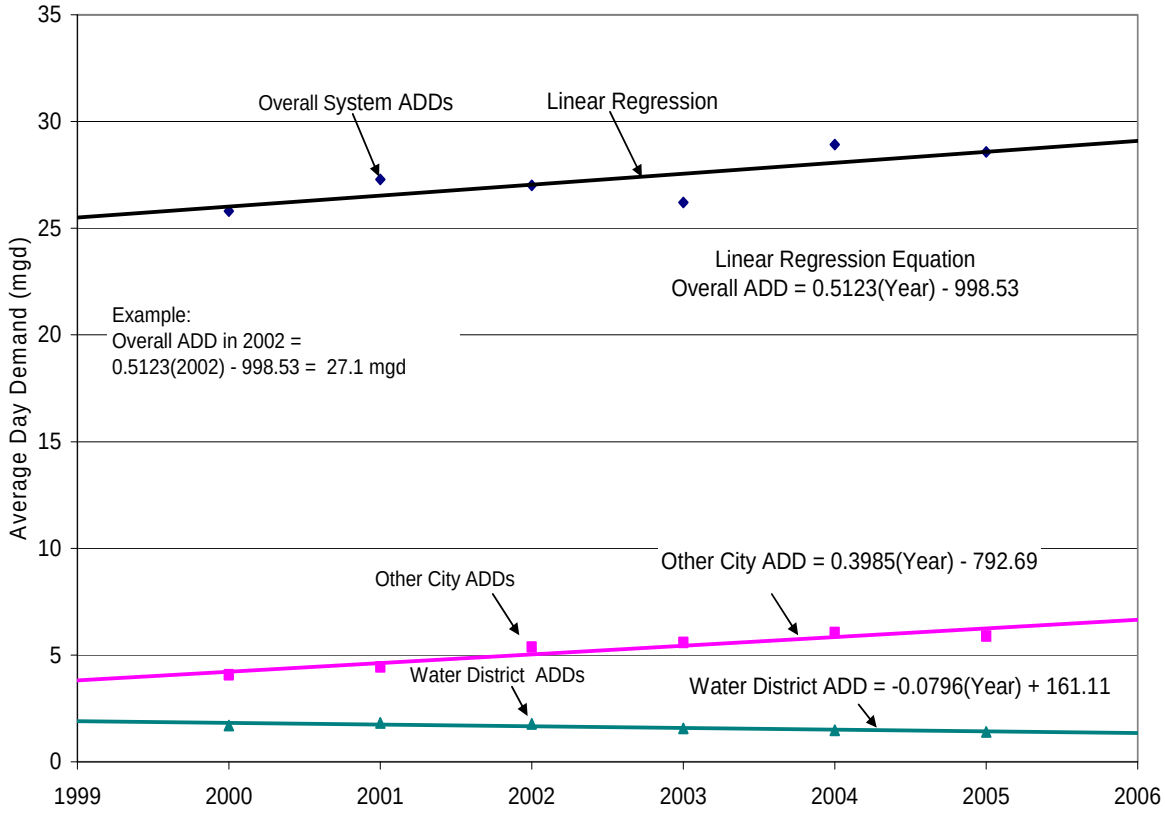
Exhibit 2-8. For the same period the ADD from other cities has increased at a rate of 0.40 mgd per year, and the ADD of water districts has decreased at a rate of 0.08 mgd per year.

EXHIBIT 2-7
MWC Average Day Demands (mgd)

Year	Overall System*	Other Cities	Water Districts
2000	25.8	4.1	1.7
2001	27.3	4.4	1.8
2002	27.0	5.4	1.8
2003	26.2	5.6	1.6
2004	28.9	6.0	1.5
2005	28.6	5.9	1.4

* "Overall System" equals the total production of the MWC system.

EXHIBIT 2-8
Historical Data and Linear Regressions on Average Day Demands for MWC (Overall System, Other Cities, and Water Districts)



Maximum Day Demands

Exhibits 2-9 and 2-10 summarize overall system MDD records for 1970 through 2005. Within the period 2000 to 2005, the MDD has ranged from a low of 50.3 mgd to a high of 59.7 mgd. The highest value of 59.7 mgd occurred August 4, 2005. Two linear regressions are provided in Exhibit 2-10. The long-term regression which uses all 22 years of available data indicates that the MDD has historically trended upward at the rate of 0.82 mgd per year. If only the last six years of data are considered, a short-term linear regression indicates that the MDD is increasing at a much higher rate of 1.63 mgd per year. This difference in long-term versus short-term rates of change in MDD may result from actual changes in demand patterns in recent years, or it may be an artifact of normal fluctuation in MDD. MDDs fluctuate from year to year because they are strongly influenced by weather patterns such as the following:

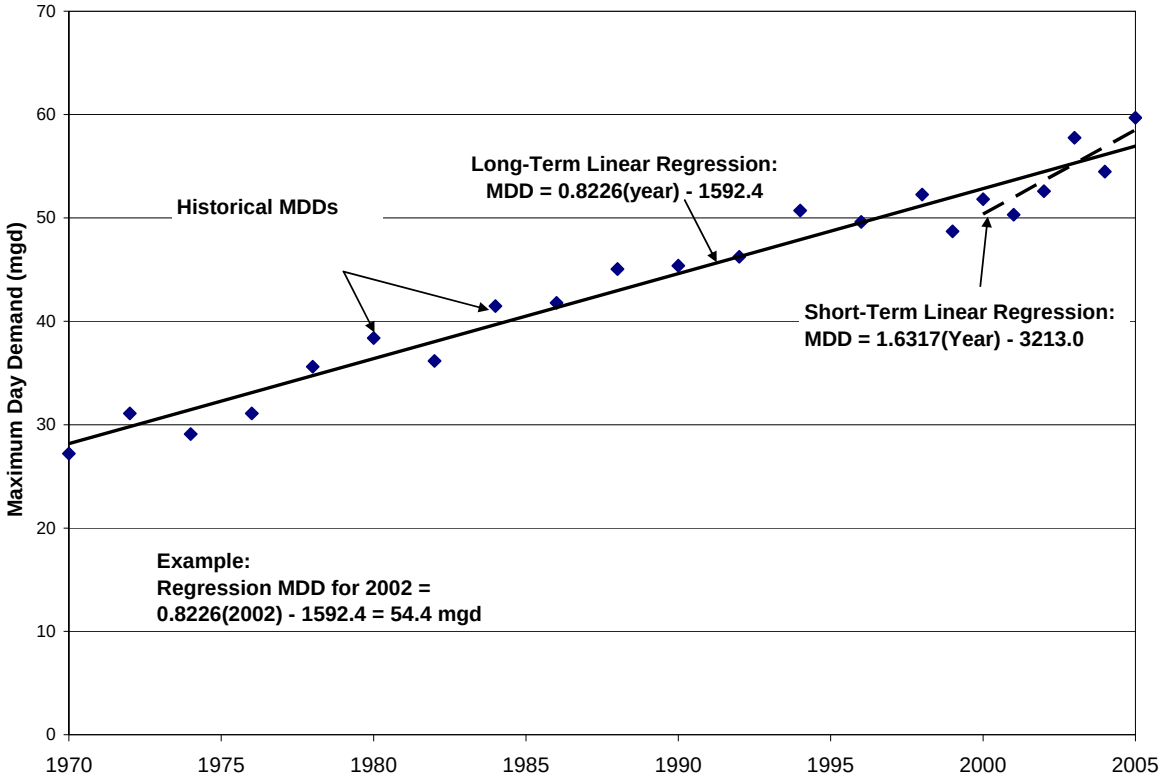
- Maximum temperatures
- The number of consecutive days at high temperatures
- When the high temperatures occur during the summer (For example, if high temperatures occur early in the summer, the demand may be higher because residents are more consistent in their outdoor irrigation. Later in the summer customers may not be as inclined to maintain green landscapes.)
- Overall rainfall levels during the summer
- Consecutive days without rainfall
- Number of new homes with new landscapes, since owners will generally take extra care to keep newly installed landscapes thoroughly watered

The records for MWC, displayed in Exhibit 2-10, show that within the last six years the MDD for a given year has varied from 2.1 mgd above the linear regression line (in 2005) to 3.9 mgd below the linear regression line (in 2001). An allowance of plus or minus 3.0 mgd from the projection curve provides an indication of the range of the MDD.

EXHIBIT 2-9
Maximum Day and Maximum Month Demands

Date	Year	MDD (mgd)	ADD (mgd)	Peaking Factor (MDD/ADD)	MMD (mgd)	Peaking Factor (MMD/ADD)
14-Jul	1970	27.2	12.6	2.2	23.3	1.8
7-Aug	1972	31.1	13.8	2.3	25.4	1.8
30-Jul	1974	29.1	14.1	2.1	23.8	1.7
3-Aug	1976	31.1	15.5	2.0	25.3	1.6
7-Aug	1978	35.6	16.1	2.2	26.1	1.6
28-Jul	1980	38.4	17.9	2.1	31.5	1.8
19-Jul	1982	36.2	17.8	2.0	29.6	1.7
16-Jul	1984	41.5	18.7	2.2	33.8	1.8
7-Aug	1986	41.8	20.8	2.0	37.4	1.8
20-Jul	1988	45.1	22.6	2.0	37.9	1.7
7-Aug	1990	45.4	23.5	1.9	38.6	1.6
22-Jun	1992	46.2	22.9	2.0	38.4	1.7
21-Jul	1994	50.7	23.7	2.1	43.2	1.8
13-Jul	1996	49.6	23.2	2.1	42.6	1.8
4-Aug	1998	52.3	23.0	2.3	44.2	1.9
3-Aug	1999	48.7	24.6	2.0	43.3	1.8
1-Aug	2000	51.8	25.8	2.0	43.8	1.7
10-Aug	2001	50.3	27.3	1.8	46.0	1.7
11-Jul	2002	52.6	27.0	1.9	45.0	1.7
29-Jul	2003	57.8	26.2	2.2	45.8	1.7
8-Aug	2004	54.5	28.9	1.9	49.8	1.7
4-Aug	2005	59.7	28.6	2.1	52.5	1.8
			Average	**2.1**		**1.7**

EXHIBIT 2-10
Historical Overall System Maximum Day Demand for MWC



Monthly Demands

MWC experiences considerably higher demands in the summer months, much of which is related to irrigation of landscapes. **Exhibits 2-11** through **2-13** illustrate this seasonal trend in water demand. **Exhibit 2-11** shows the system-wide monthly demand pattern from January 2000 to December 2005. **Exhibit 2-12** shows the system-wide average monthly demands as a percentage of annual demand for the same period. Historically, July and August have each averaged in excess of 14 percent of total annual demand. Demand during the four-month period from June through September has averaged 51 percent of total annual demand.

Exhibit 2-13 shows the 2005 monthly demand of other cities.[1] The peak demand for the other cities appears in July and August. The highest maximum monthly demand (MMD) for other cities totaled approximately 12 mgd in August of 2005.

Exhibits 2-14 and 2-15 show historical MMDs for other cities and water districts, respectively. As shown in Exhibit 2-14, total maximum month sales to other cities increased between the year 2000 and 2002, and then stabilized. Overall maximum month sales to water districts have declined somewhat over the last few years, largely because of annexation of portions of some districts into the City of Medford, and the dissolution of the Coker Butte Water Association. Upon annexation or dissolution, district customers become customers of the city of Medford or outside customers, with their water demands becoming reclassified

[1] To better correlate with other use data, this reflects month of use, not the following month when it was billed.

accordingly. To better capture recent trends, linear regression analyses generated from data from 2002-2005 were used to estimate 2005 demands from which future projections were made.

EXHIBIT 2-11
MWC System-wide Monthly Demand Pattern, 2000-2005

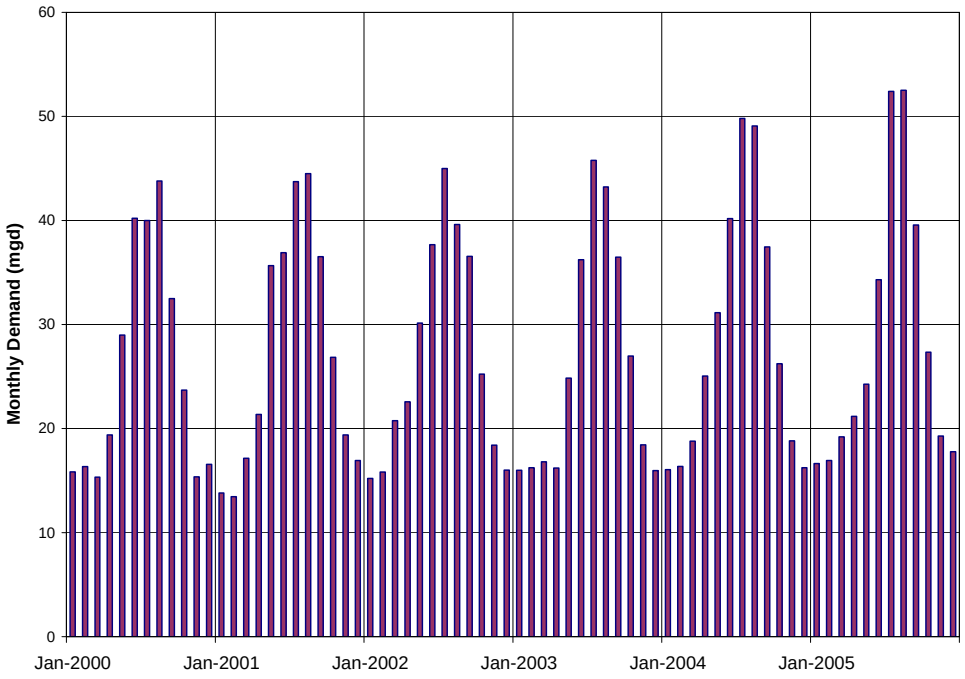


EXHIBIT 2-12
MWC Average Monthly Demand as Percentage of Annual Demand, 2000-2005

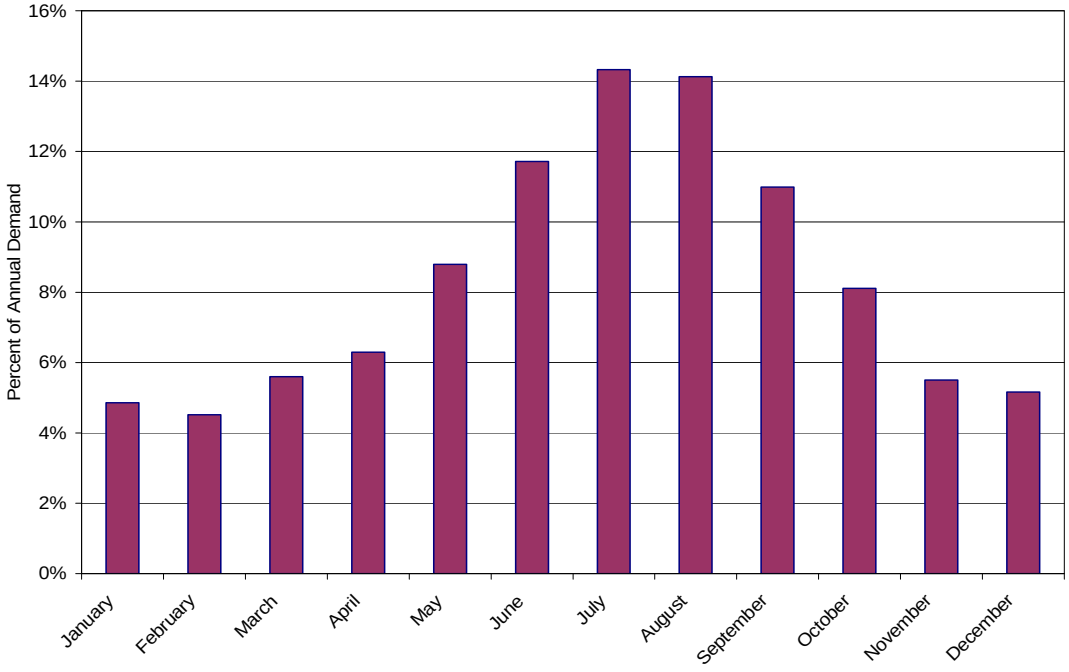


EXHIBIT 2-13
Monthly Demand for Other Cities, 2005

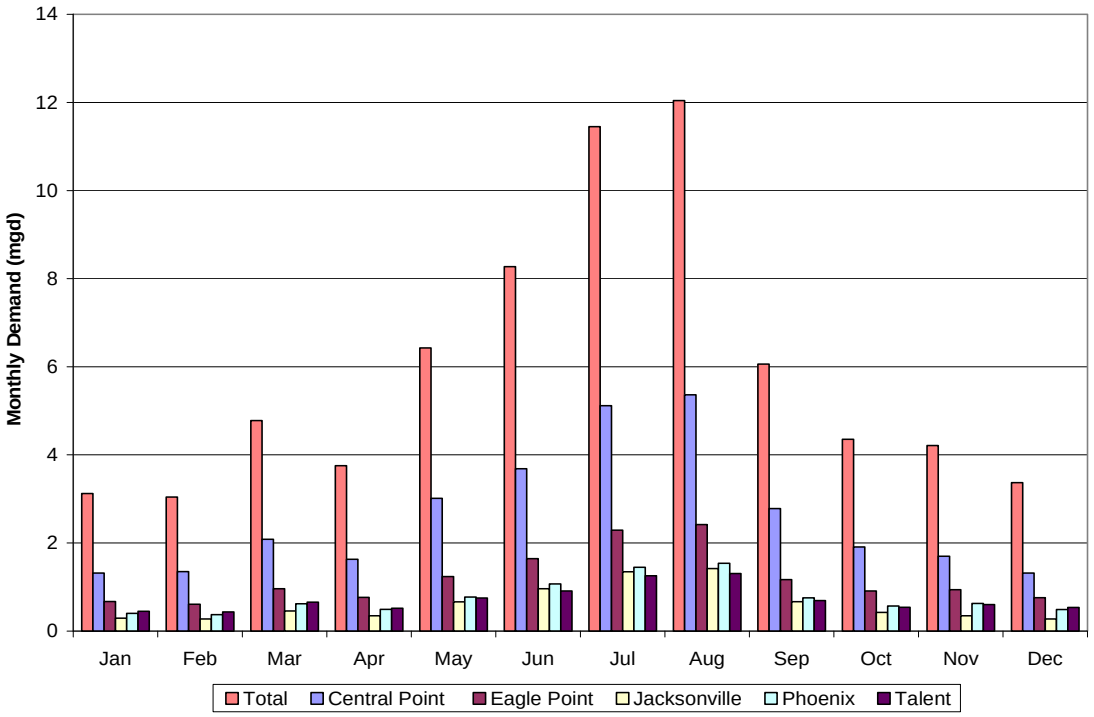


EXHIBIT 2-14
Historical Maximum Month Demand for Other Cities, 2000-2005

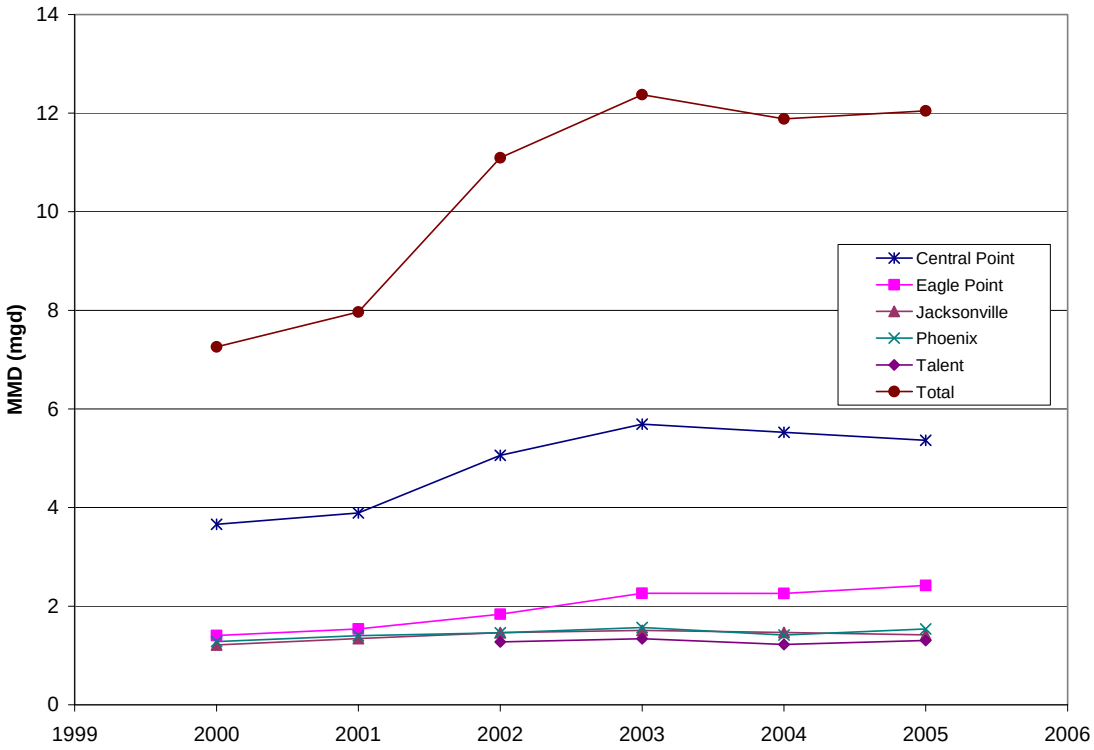


EXHIBIT 2-15
Historical Maximum Month Demand for Water Districts, 2000-2005

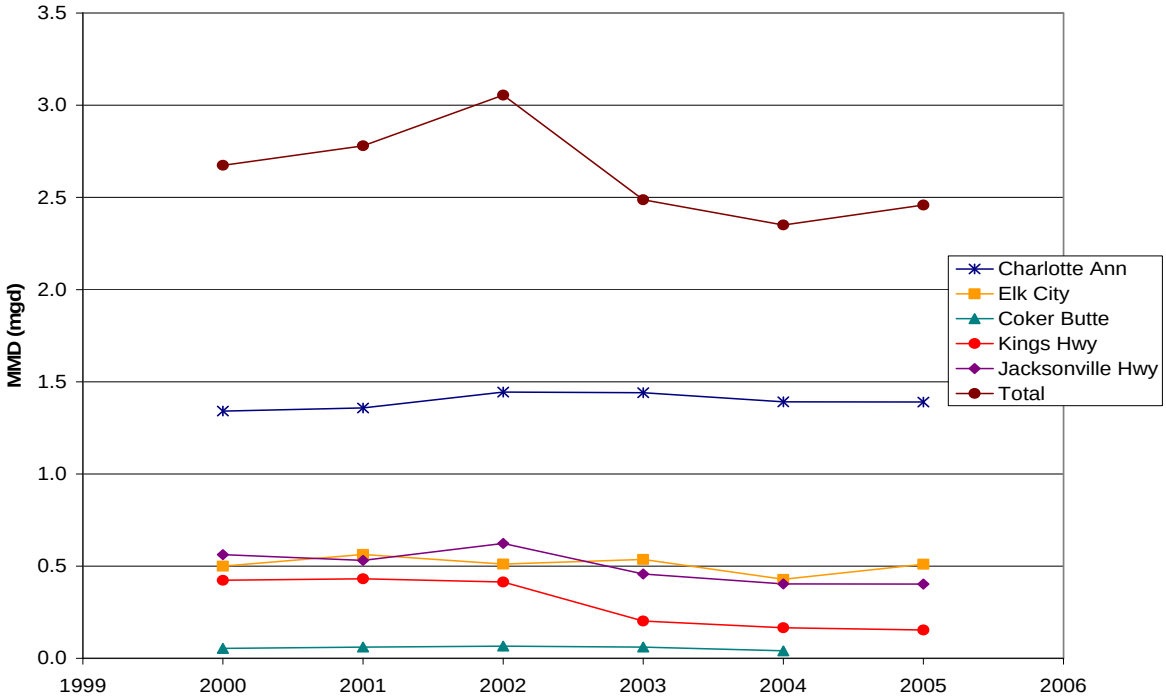


Exhibit 2-16 illustrates the overall system maximum monthly demand (MMD), from 2000 through 2005. This value has trended upward at a rate of approximately 1.6 mgd per year. The total increase was approximately 19 percent over the five-year period, which was nearly identical to population growth over the same time frame. The overall system MMD occurred in July in three of the years, and in August three of the years. Annual total MMD of the other cities and water districts for the same period also are shown in Exhibit 2-16.

As shown in **Exhibits 2-17** and **2-18**, Duff WTP is used seasonally to supplement production from Big Butte Springs with water from the Rogue River. Exhibit 2-17 shows monthly demand and the contribution of water from the Duff WTP from January 2000 to December 2005. Exhibit 2-18 presents the percentage contribution from Duff WTP. The maximum percentage of monthly demand contributed by Duff WTP was 58 percent of the July demand in 2003. The average June through September contribution from Duff WTP was 39 percent (2000-2005). From 2000-2005, Big Butte Springs have contributed 85 percent of the total annual production and the Rogue River has contributed 15 percent of total annual production. As demands increase in the coming years, the Rogue River is expected to contribute an increasingly greater percentage of annual demand.

EXHIBIT 2-16
Historical MWC Maximum Month Demands: Overall System, Other Cities, and Water Districts

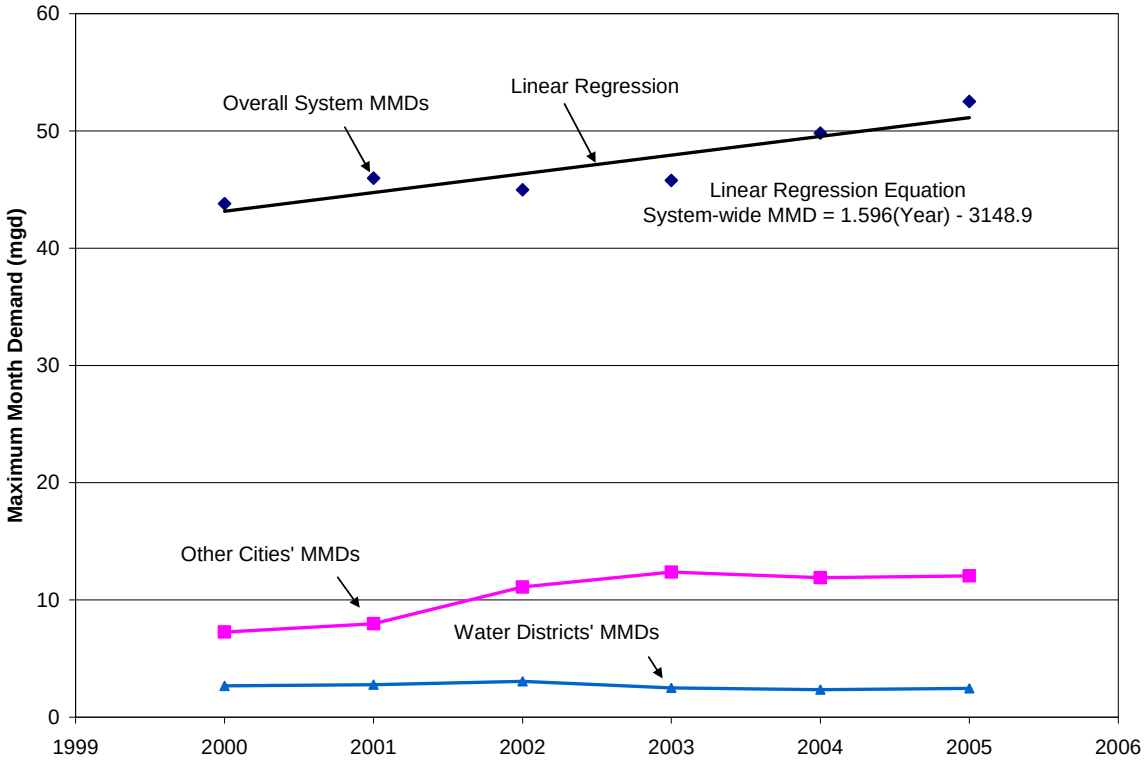


EXHIBIT 2-17
Monthly Demand Records and Contribution from Duff WTP, January 2000 - December 2005

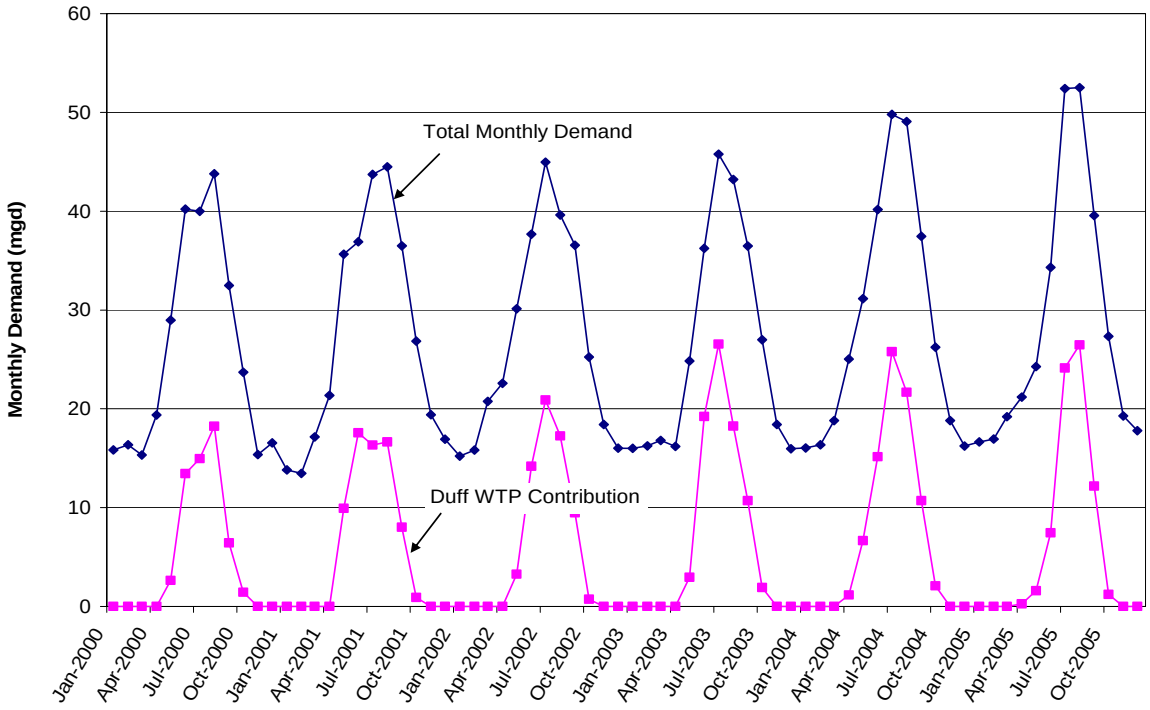
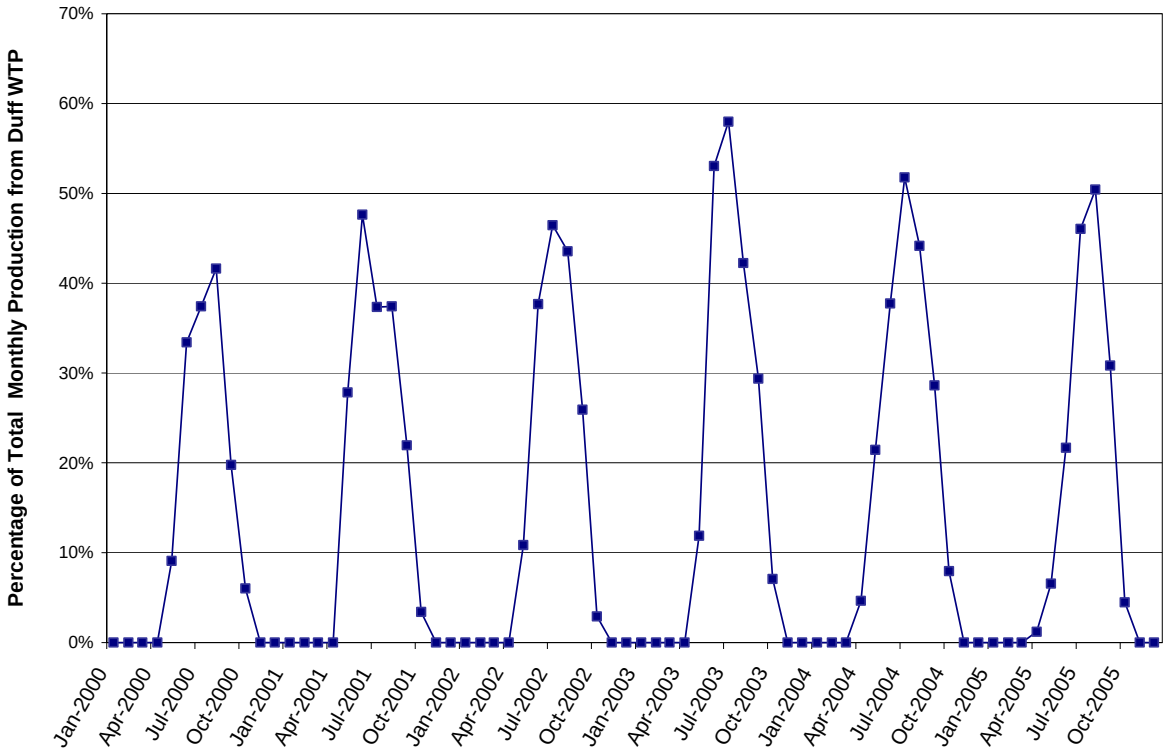


EXHIBIT 2-18
Percentage of Total Monthly Production from Duff WTP

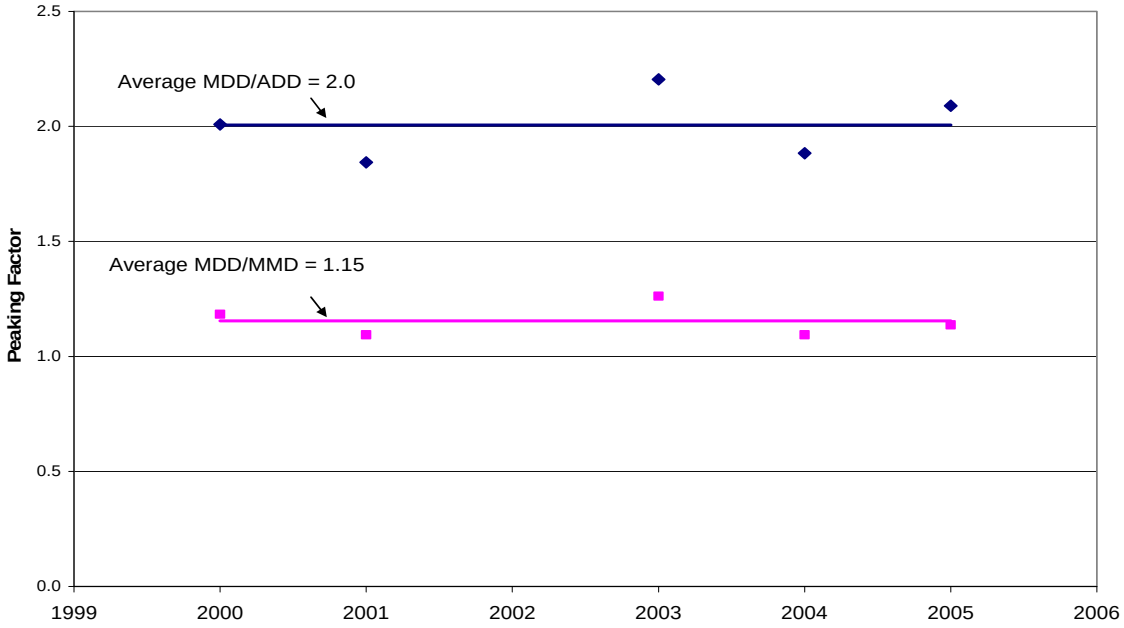


Peaking Factor

Peaking factor, the ratio of the maximum to average day demand (MDD/ADD), helps describe peak summer use within the system**. Exhibit 2-19** illustrates the history of MWC's peaking factors. The overall system MDD/ADD has ranged from 1.8 to 2.2 and averaged 2.0 over the period 2000-2005. This range of peaking factor is approximately the same as the MDD to ADD peaking factors used in the MWC's 1999 *Water System Facility Plan*. The system-wide MDD to MMD peaking factor has averaged 1.15 over the same period.

MDD data for individual wholesale customers (other cities and water districts) are not available because master meters serving these customers are read monthly rather than daily. Therefore, MDD values for these wholesale customers were estimated by multiplying the MMD values of the wholesale customers by the overall system MDD/MMD peaking factor.

EXHIBIT 2-19
MWC System-Wide Peaking Factors (2000-2005)



Per Capita Demands

Per capita demands equal the total metered water use plus unaccounted for water (total water production), divided by the service population. Since demand includes use by commercial, industrial, and municipal customers as well as residential customers, the per capita value exceeds the amounts of water actually used by a typical individual. MWC serves a variety of customers including communities with different mixes of residential, commercial, and industrial components. This diversity of water users is reflected in the varied per capita demand values of individual communities. The per capita demand values are important because they are used for projecting future water use.

Exhibit 2-20 shows the estimated service area populations for cities and water districts, and the retail customers for 2005. Populations served within White City (an unincorporated community whose businesses and residences are served as outside customers), the water districts, and individuals outside city limits were estimated by MWC staff based on census data, account data, and field investigation. Service area populations for the cities were estimated by adjusting the certified population estimates from Portland State University's Population Research Center to account for households not receiving water but within city boundaries, or receiving water but outside of boundaries. The service area population for White City was similarly reduced from census data to account for households within the community boundary that do not receive water service.

EXHIBIT 2-20
Determination of MWC Service Area Population for 2005

		Adjustments to Population					
	2005 Population Estimate[2]	Housing Units Served Outside Limits	Housing Units Not Served Inside Limits	Net Housing Units Served	Average Household Size From 2000 U.S. Census	Population Adjustment	2005 MWC Service Area Population[1]
Central Point	15,640	0	3	-3	2.69	-8	15,632
Eagle Point	7,585	12	0	12	2.82	34	7,619
Jacksonville	2,490	74	6	68	2.15	146	2,636
Medford	70,855		130	-130	2.47	-321	70,534
Phoenix[3]	4,660					-228	4,432
Talent	6,255	35	0	35	2.39	84	6,339
White City[2]	7,070						7,070
Other outside customers[2]	760						760
Water Districts[2]	3,861						3,860
Total							**118,882**

[1] Service area population accounts for only those households receiving water service. Therefore, households outside of a given boundary that receive water service are added, and households within the boundary that do not receive water service are subtracted.

[2] Population values for cities were obtained from the Portland State University Population Research Center. Populations for White City, water districts, and other outside customers were estimated by MWC staff from census data, account records and field surveys.

[3] Adjustment accounts for population within the City of Phoenix that receives water from the Charlotte Ann Water District. Population was computed based on census data, updated through field surveys of new housing units, rather than being based solely on the number of housing units as was done for other entities.

The 2005 ADD values predicted from linear regressions of historical ADDs are presented in **Exhibit 2-21**. For the City of Medford and outside customers, ADD was estimated as the metered consumption plus a proportionate amount of the total unaccounted for water to represent total demand. Adding unaccounted for water to the metered consumption of retail customers resulted in the data from all customers being consistent, because wholesale customers' per capita demand includes unaccounted for water.

EXHIBIT 2-21
Estimated 2005 Per Capita Demands of MWC Customers

	2005 MWC Service Area Population[1]	Linear Regression Trendline ADD 2005 (mgd)	Estimated 2005 Per Capita ADD (gpcd)[2]	MMD/ADD (Average 2002-2005)	Estimated 2005 Per Capita MMD (gpcd)[3]	Estimated 2005 Per Capita MDD (gpcd)[4]
Central Point	15,632	2.71	174	2.1	361	415
Eagle Point	7,619	1.21	158	2.0	321	369
Jacksonville	2,636	0.63	241	2.3	547	629
Medford	70,534	17.33	246	1.9	463	532
Phoenix	4,432	0.76	170	2.0	337	387
Talent	6,339	0.72	114	1.8	201	232
White City	7,070	4.02	568	1.6	934	1,074
Other outside customers	760	0.43	568	1.6	934	1,074
Water Districts	3,860	1.43	370	1.7	614	707
System-wide Values	**118,882**	**29.2**	**246**	**1.7**	**418**	**481**

[1] Service area population accounts for only those households receiving water service. Therefore, households outside of a given boundary that receive water service are added, and households within the boundary that do not receive water service are subtracted. Service area population from Exhibit 3-22

[2] Per capita ADD = Linear Regression Trendline ADD/ Service area population

[3] Per capita MMD = Per capita ADD x MMD/ADD peaking factor specific to customer

[4] Per capita MDD = Per capita MMD x overall system MDD/MMD peaking factor. The overall system MDD/MMD = 1.15.

[5] ADD values for these retail customers are based on billing data plus a proportionate share of unaccounted for water.

Per capita demands for the other cities, water districts, and retail customers, as well as the overall system per capita demands were estimated by dividing the 2005 ADDs by the respective estimated 2005 service area populations. Per capita MMD values were estimated from historical peaking factors specific to the different communities or customer groups. As previously noted, because customer meters are not read daily, MDD values are not known for individual cities or other customer groups. Therefore MDD values were estimated by multiplying MMD values by the overall system MDD/MMD peaking factor of 1.15.

Because of the region's very hot, dry summer season, peak demands are significantly higher than average demands. Maximum day per capita demands range considerably between the entities identified in Exhibit 2-21 because of differences in the percentage of commercial, institutional and industrial customers. The majority of the region's industrial customers are located within White City and in the outside customer group. Because these two entities have a high percentage of industrial use and relatively low populations, they have the highest maximum day per capita demands. Water Districts and the City of Medford also have large commercial and industrial sectors. In addition, the City of Medford houses the

majority of the region's institutional customers, including two hospitals and most state and county government offices. Therefore, maximum day per capita demand is higher for these entities than for other cities which are predominantly residential, and don't have significant commercial and industrial enterprises.

While MWC shares demand data with the cities it serves, and encourages improved efficiency where warranted, each of the cities has or is in the process of obtaining summer water rights in their own names, and are responsible for their own water management activities, including preparation of Water Management and Conservation plans.

City of Medford Demand Factors

As noted above, per capita demand factors presented thus far include all metered water use plus unaccounted for water for all categories of demand (residential, commercial, industrial, municipal). In 2005, the City of Medford's metered consumption accounted for 79 percent of retail sales. Therefore, 79 percent of the unaccounted for water was added to the metered consumption to estimate demand.

Residential Per Capita Demand Factors

The overall per capita ADD for the City of Medford in 2005 was estimated at 246 gpcd, as shown on Exhibit 2-21. From billing data, single-family residential use represents 56 percent and multi-family use represents 16 percent of the total consumption within city limits. According to the *City of Medford Comprehensive Plan, Housing Element, 1995*, single-family residents represent 70 percent of the population and multi-family residents represent 30 percent of the population. Therefore, the single- and multi-family residential per capita demands may be estimated as follows:

- Single-family average daily per capita demand = 0.56(246 gpcd)/0.7 = 197 gpcd
- Multi-family average daily per capita demand = 0.16(246 gpcd)/0.3 = 131 gpcd
- A peaking factor of 2.0 was used to adjust ADD per capita to MDD per capita.

Commercial and Industrial Demand Factors

Both commercial and industrial water demand within the City of Medford averaged 1.5 gpm per acre (2,160 gpd per acre). This was computed by dividing water demand by existing commercial and industrial enterprises by the occupied land area in each customer class to obtain average day demand factors, in gallons per minute per acre. This factor is comparable to commercial and industrial demand factors from other Oregon communities.

Consumption and Unaccounted for Water

Consumption is equal to the metered water use within the system. All customers served by MWC are metered. The difference between production and metered consumption (wholesale and retail) divided by production equals the percent of unaccounted for water. The causes of unaccounted for water include meter inaccuracies, reservoir overflows due to operational constraints, unmetered use, and leakage.

Exhibit 2-22 lists annual total production and consumption, and percent of unaccounted for water for the period 2000-2005, and **Exhibit 2-23** displays the percentage of unaccounted for water, graphically**.** In 2005, the reported unaccounted for water rate was 12.3 percent.

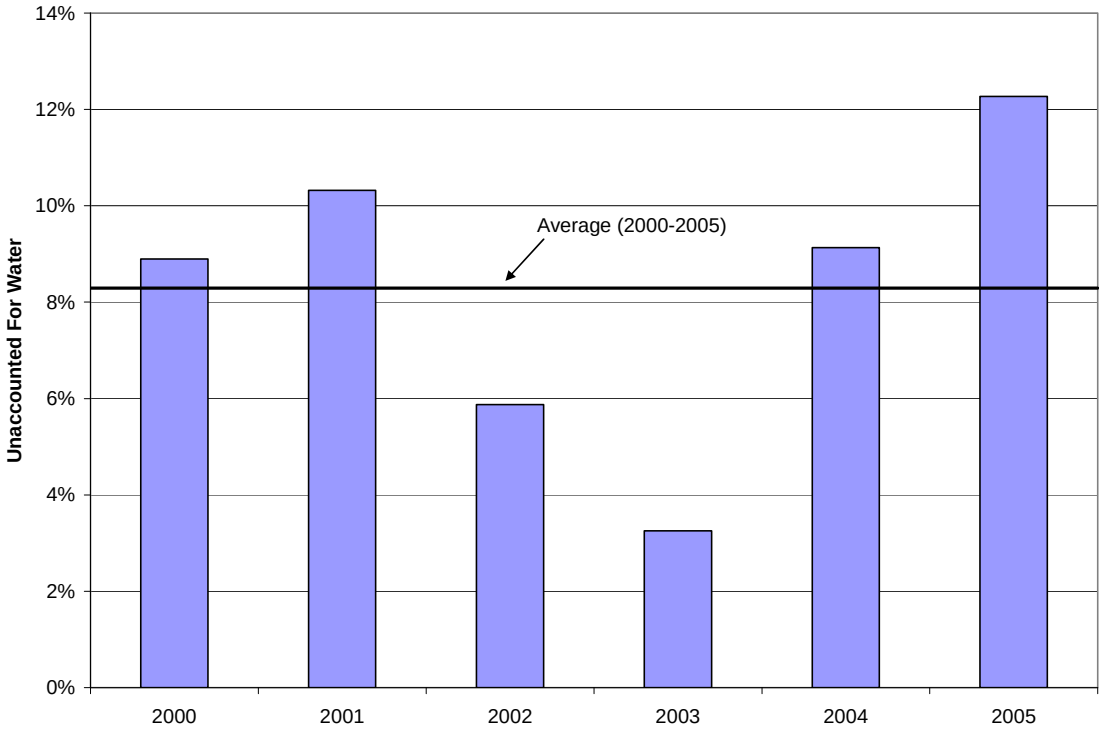
Subsequent investigation indicated that telemetry associated with new reservoirs and a pump station had not been properly integrated into the audit, and the actual unaccounted for rate was below 10 percent. Procedures for annual water audits will continue to be monitored and improved.

The average rate of 8.3 percent over this period is a very favorable rate, and is below the 10 percent target of the Oregon Water Resources Department (OWRD) for municipal systems. Using the average rate of 8.3 percent, approximately 2 million gallons per day were not accounted for in 2005.

EXHIBIT 2-22
Unaccounted for Water, 2000-2005

Year	Total Production (MG)	Total Metered Consumption (MG)	Unaccounted for Water
2000	9,418	8,580	8.9%
2001	9,959	8,932	10.3%
2002	9,857	9,278	5.9%
2003	9,563	9,252	3.3%
2004	10,555	9,591	9.1%
2005	10,429	9,149	12.3%
Average			**8.3%**

EXHIBIT 2-23
MWC System-Wide annual Unaccounted for Water



Customer Characteristics and Use Patterns

A tabular summary of annual consumption by customer type for MWC's entire system is shown in **Exhibit 2-24**. This information is presented graphically in **Exhibits 2-25** and **2-26**.

EXHIBIT 2-24
MWC Overall System Metered Consumption (MG), 2000-2005

Year	Residential	Commercial	Industrial	Municipal	Other Cities and Water District	Total
2000	3,895	1,319	1,134	123	2,109	8,580
2001	4,068	1,405	1,038	134	2,286	8,932
2002	4,174	1,395	959	137	2,614	9,278
2003	4,119	1,342	1,040	141	2,610	9,252
2004	4,338	1,411	956	134	2,752	9,591
2005	4,041	1,380	945	121	2,662	9,149
Average (2000-2005)	**4,106**	**1,375**	**1,012**	**132**	**2,505**	**9,130**
Percentage of Use	**45%**	**15%**	**11%**	**1%**	**27%**	**100%**

EXHIBIT 2-25
MWC System-Wide Annual Metered Consumption (Volume)

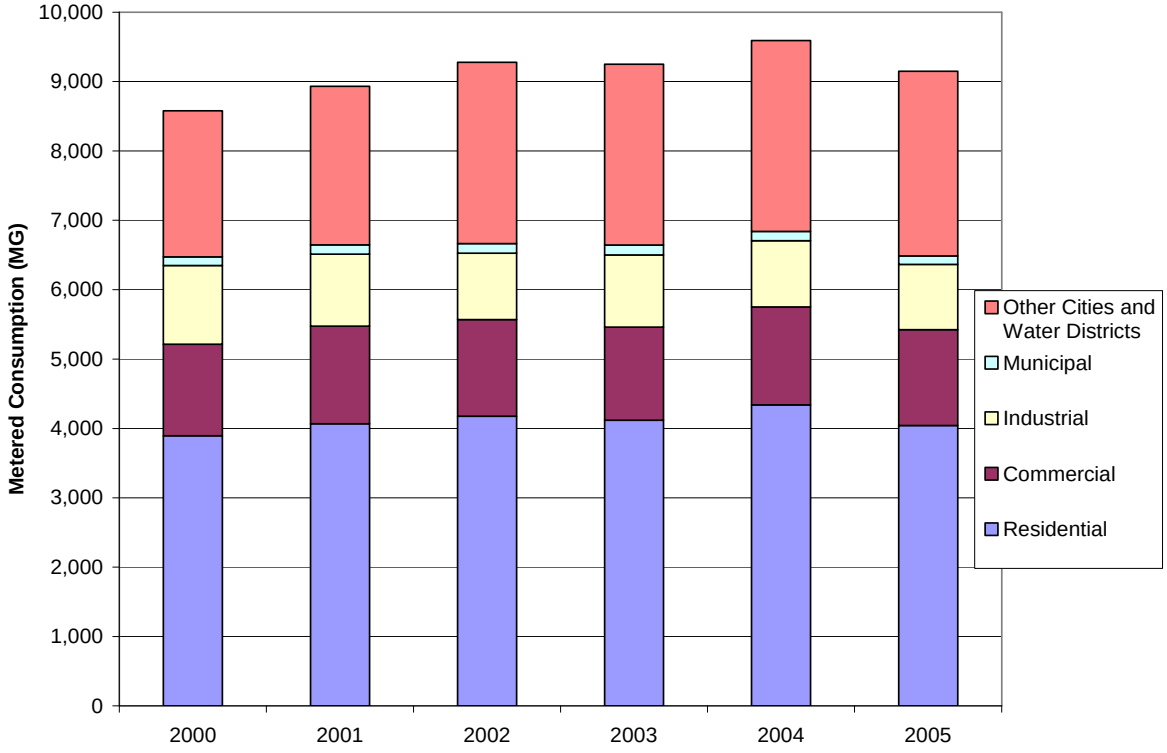
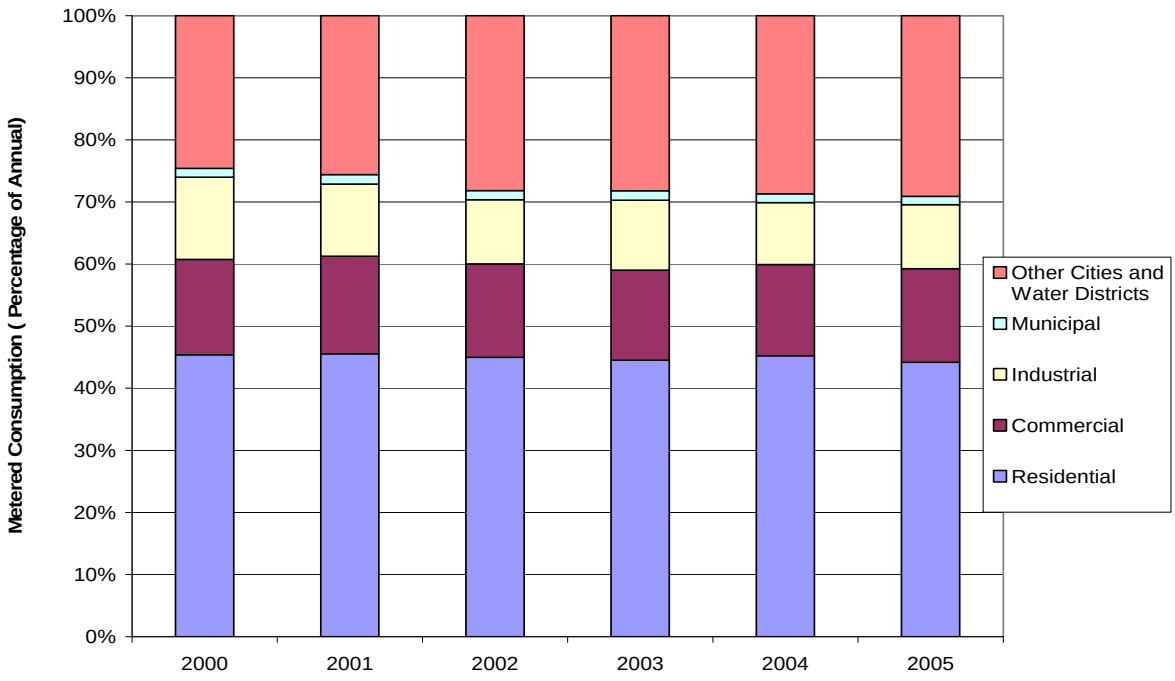


EXHIBIT 2-26
MWC System-Wide Annual Metered Consumption (Percent)



Commercial, industrial, and municipal uses are classifications used by MWC for billing purposes. Residential use is the sum of single-family and multi-family residential accounts within MWC's service area. Other cities and water districts receive water from MWC on a wholesale basis.

As shown in these exhibits, residential use accounted for approximately 45 percent of total metered sales by MWC in recent years. The percentage of industrial sales has declined slightly over the period from 13 percent in 2000 to 10 percent in 2005. Commercial and municipal use remained steady at approximately 15 percent and 1 percent respectively, and wholesale consumption (other cities and water districts) increased from 25 percent in 2000 to 29 percent in 2005, averaging 27 percent for the period.

Exhibit 2-27 summarizes the largest 15 individual industrial and commercial water accounts (excluding other cities) for 2005. These accounts represent approximately 13 percent of all retail water sales.

EXHIBIT 2-27
MWC's Largest Individual Water Accounts (Inside, Water District, and Outside Customers), 2005

Customer Type	Annual Volume (MG)
Industrial	174
Industrial	122
Commercial	120
Industrial	99
Industrial	87
Industrial	51
Industrial	50
Industrial	44
Industrial	39
Commercial (Hospital)	38
Industrial	37
Industrial	36
Industrial	34
Commercial (Hospital)	33
Commercial (244 units)	32
	994

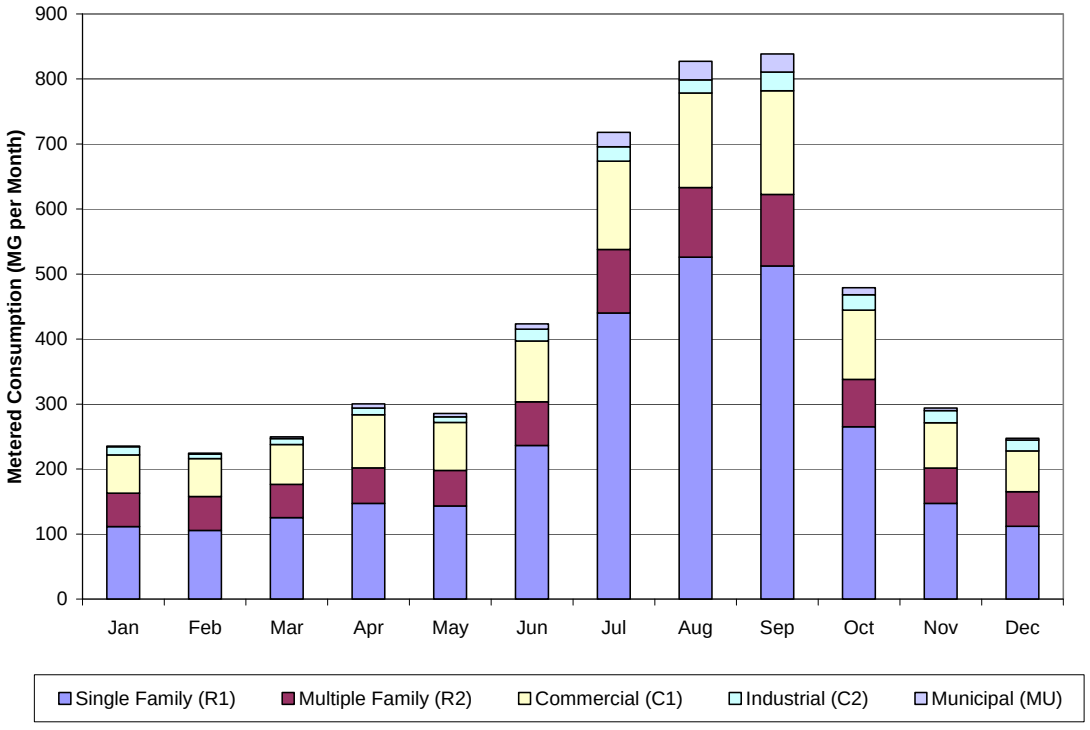
Exhibit 2-28 summarizes annual metered consumption by customer category for customers within the City of Medford. For this sub-group of retail customers, single-family residential use has averaged 56 percent and multi-family use has averaged 16 percent of all metered consumption for a total residential percentage of 72 percent within the City of Medford. Industrial consumption within the city limits has been relatively low at only 4 percent, while commercial consumption has averaged 21 percent and municipal use has averaged 3 percent.

EXHIBIT 2-28
City of Medford Annual Metered Consumption

Year	Single Family (MG)	Multiple Family (MG)	Commercial (MG)	Industrial (MG)	Municipal (MG)	Total (MG)
2000	2,771	798	1,073	215	123	4,981
2001	2,909	812	1,134	190	134	5,180
2002	2,974	830	1,140	207	137	5,288
2003	2,934	823	1,101	240	141	5,239
2004	3,125	850	1,143	198	134	5,451
2005	2,872	826	1,108	196	121	5,123
Average (2000-2005)	**2,931**	**823**	**1,116**	**208**	**132**	**5,210**
Percentage of Use	**56%**	**16%**	**21%**	**4%**	**3%**	**100%**

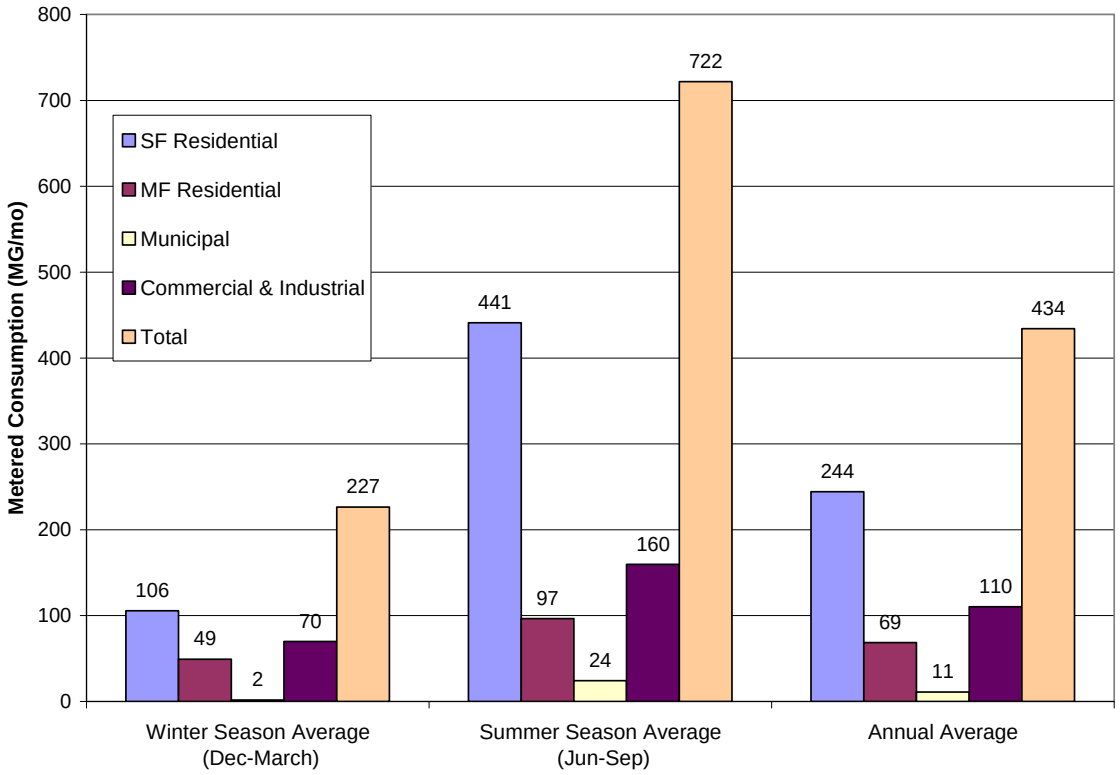
Exhibit 2-29 shows the 2005 monthly metered consumption by customer category for the City of Medford. As shown, metered consumption increases for all categories in the summer months, but particularly residential and municipal. Peak months are June through September, with December through March representing the period during which no outdoor use occurs. The "shoulder" months of April, May, and October, and November reflect transitions between seasons. Water use in these transitional periods may reflect some irrigation, or seasonal changes in commercial and industrial water requirements.

EXHIBIT 2-29
Monthly Metered Consumption by Category for Customers within the City of Medford, 2005



Seasonal trends are further illustrated in **Exhibit 2-30** in which shows the average monthly consumption for single-family residential, multi-family residential, municipal, and commercial and industrial customer classes by season for the period 2000-2005. As noted, for the purpose of comparing peak use rates with base usage, the summer season was defined as June through September. Single-family residential consumption rates are approximately 4 times greater during the summer as during the winter. Municipal consumption also shows a marked increase during the summer as a result of irrigation of parks and recreational areas. Commercial and industrial water use also increased, but to lesser extents, during the summer. Some of this may be explained by irrigation, and some by the nature of a manufacturer. For example, food processing facilities require greater volumes of water following the harvest season.

EXHIBIT 2-30
City of Medford Average Monthly Consumption by Season and Customer Category (2000-2005)



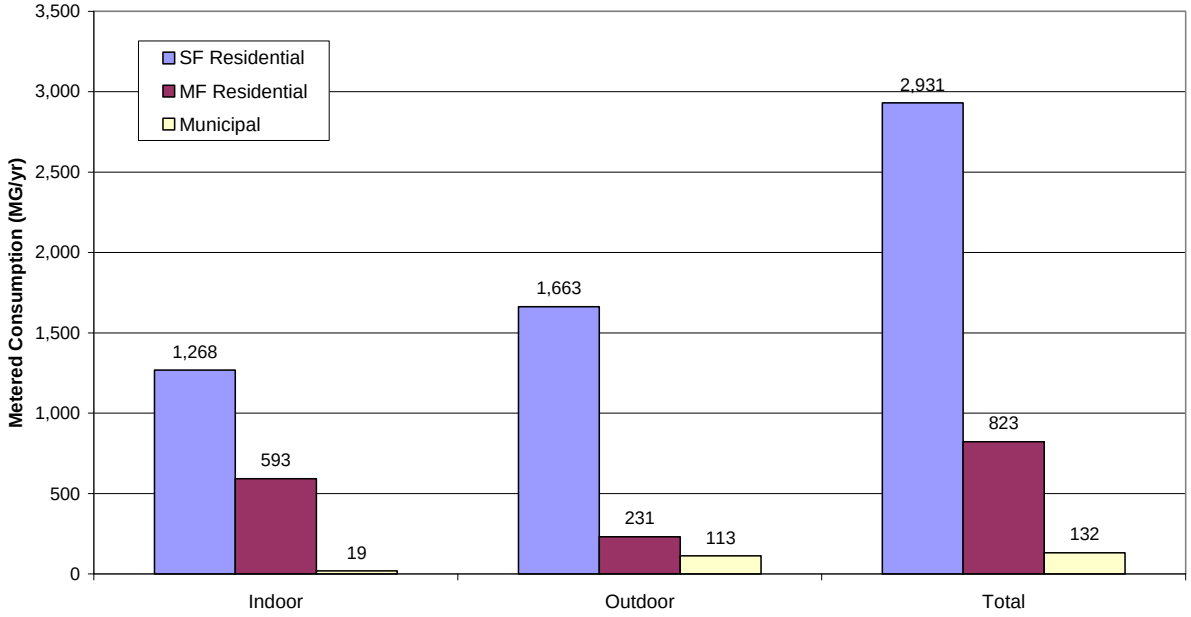
The total average monthly consumption for the summer months was 722 MG per month (23.2 mgd) compared to an annual average of 434 MG per month (14.0 mgd) and a wet season average of 227 MG per month (7.3 mgd). A dry season to wet season ratio of approximately 3.1 (722/227 = 3.1) is typical of water utilities that provide a high proportion of summer water supply to meet demands for outdoor irrigation and seasonal manufacturing requirements.

If wintertime consumption is assumed to be representative of annual indoor water use (or at least to exclude outdoor irrigation) for residential and municipal customers, the winter season average rates of 106 MG per month for single-family residential customers, 49 MG per month for multi-family residential customers, and 2 MG per month for municipal use

can be applied to a 12-month period to determine the average annual indoor use. Under this assumption, water used for irrigation is the difference between total use and the calculated indoor use.

Exhibit 2-31 presents the average annual indoor and outdoor use by category for the period 2000 through 2005. Outdoor use represents approximately 57 percent of annual use by single family residences, 30 percent of use by multi-family residences, and 86 percent of municipal use. This suggests that conservation efforts targeting outdoor use by single family residential customers and the city could reduce peak season water demands. Conservation efforts targeting indoor water consumption may also prove beneficial.

EXHIBIT 2-31
City of Medford Average Annual Indoor and Outdoor Metered Consumption; Select Customer Categories (2000-2005)



Water Rights

Water Law Introduction

Under Oregon water law, with few exceptions, the use of public water (both ground and surface water) requires a water right permit from the OWRD. The administration of water rights by OWRD is based on the doctrine of prior appropriation. Under this doctrine, in times of shortage the first person to have obtained a water right permit (the senior appropriator) is the last to be limited in low water conditions. The date of application for the water right permit usually establishes the priority date or place in line of an appropriator. In water-short times, the senior appropriator can demand the full amount of their water right regardless of the needs of junior appropriators. If there is surplus beyond the needs of the senior appropriator, the next most senior appropriator can take as much as needed to satisfy their right and so on down the line until there is no surplus. A state officer (OWRD Watermaster) oversees which junior appropriators must stop using water so that senior users can be satisfied.

The right to use water is typically first granted in the form of a water use permit. The permit describes the priority date, the amount of water that can be used, the location and type of water use, and often a number of water use conditions. The permit allows the water user to develop the infrastructure needed to put the water to full beneficial use – a requirement of Oregon water law. Upon development and utilization of the permitted water, a report called a Claim of Beneficial Use (COBU) can be filed. Once it is approved by OWRD, a water right certificate is issued confirming the status of the right. Obtaining a water right certificate is the best way to ensure the protection of the use. Municipal water use certificates are not subject to cancellation because of non-use.

Water right permits typically have timelines for making full beneficial use of the water. If more time is needed than provided in the permit, the permit holder may request an extension of time from OWRD. In the past, extensions of time were routinely granted by OWRD. Under current rules, an extension of time may involve an analysis of what would happen to state and federally listed fish species if the undeveloped portion of the permit were to be used.

Medford Water Commission Water Rights

MWC is a semi-autonomous agency wholly owned by the City of Medford. It was created in 1922 through an amendment to the city charter for the specific purpose of operating the water system on behalf of the City of Medford. In this capacity, MWC is authorized to use the waters of the Big Butte Creek Watershed and the Rogue River for municipal use through six water rights, summarized in **Exhibit 2-32 and 2-33**. MWC also holds a number of irrigation rights in the Big Butte Creek Watershed, described in **Exhibit 2-34**.

The City of Medford holds some additional water rights for use in a city-owned park and for use of wastewater effluent. These water rights are not related to the operation of the drinking water system, are not administered by MWC, and consequently are not addressed within this plan.

Municipal rights

Big Butte Creek Watershed

MWC has five water rights in the Big Butte Creek Watershed that authorize diversion from Big Butte Springs and Four Bit Creek, as well as from storage in Willow Creek Reservoir. MWC's oldest, or most senior water right, and the only one with a water right certificate, is a 1915 right for 30 cfs (19.4 mgd) from Big Butte Springs (Certificate 53323). MWC's next oldest water right dates from 1923, again for 30 cfs (19.4 mgd) from Big Butte Springs (Permit S-6703). In 1925, the Oregon Legislature also allocated all remaining unappropriated water within the Big Butte Creek drainage to Medford (ORS 538.430). Subsequently, MWC acquired a water right permit enunciating this legislative action but without identifying any specific quantity (Permit S-6884). MWC obtained additional permits in 1949, and subsequently completed construction of Willow Creek Reservoir. Permit R-1118 allows storage of up to 10,000 acre-feet in the reservoir, and Permit 20177 allows MWC to take 95 cfs from storage (to mitigate impacts to downstream rights held by Eagle Point Irrigation District which share the same priority as MWC's rights), and to take 7 cfs (4.5 mgd) from Big Butte Springs on Willow Creek.

All of MWC's one certificated water right has been beneficially used. Of the 30 cfs (19.4 mgd) under Permit S-6703, approximately 10.8 cfs (7.0 mgd) have been beneficially used. Neither the statutorily-withdrawn water authorized for use under Permit S-6884 nor the 7 cfs authorized under Permit S-20177 have been beneficially used to date.

About 46 cfs (29.7 mgd) of water have been diverted from storage in Willow Creek Reservoir (Permit 20177) in exchange or substitution for water authorized under Eagle Point Irrigation District rights with concurrent priority dates. Water stored in the reservoir is supplied to the district during the irrigation season in exchange for higher-quality water taken from Big Butte Springs by MWC. MWC's storage permit allows impoundment of 10,000 acre-feet, but the reservoir's current capacity is limited to 8,320 acre-feet.

In summary, MWC's authorized diversions for municipal use from the Big Butte Creek watershed (including from stored waters) total 162 cfs (104.7 mgd) plus the amount of water that may ultimately be available under permit S-6884 and the associated legislative withdrawal. Of these existing water rights, current maximum beneficial use is approximately 87.3 cfs (56.4 mgd). MWC is currently seeking extensions of time for its water rights in the permit status.

Rogue River

MWC holds a 1954 municipal water use permit (Permit S-23210) for withdrawing 100 cfs (65 mgd) from the Rogue River about three miles north of Medford's city limits. This source supplies the Duff WTP. The current capacity of the Duff WTP is 45 mgd. MWC plans to expand the plant capacity to 65 mgd in approximately 2012. This would reach the initial design capacity for this facility, and would equal the full use of Permit S-23210. However, since this facility also treats water associated with water rights held by other cities served, further expansion of the Duff WTP will be needed to fully exercise MWC's Rogue River water rights. Pursuant to projections in MWC's Facility Plan, further plant expansion will be needed by approximately 2021.

A summary of the average monthly withdrawals from the BBS, Rogue River, and Willow Creek/Lake for the period 2003 to 2007 is presented in **Exhibit 2-33**.

EXHIBIT 2-32
Summary of Municipal Water Rights

Source	Priority Date	Water Right Information	Allowable River Withdrawal (cfs) or Storage (acre-feet)	Allowable River Withdrawal (mgd)	Type(s) of Beneficial Use	Max. Withdrawal to Date		Average Diversions For 2007		Authorized Date for Completion
						Rate (cfs)	Annual Quantity (ac-ft)	Monthly (ac-ft)	Daily (cfs)	
Big Butte Creek Watershed[1]										
Big Butte Creek.	21-Aug-1915	App: S-10119 Permit :S-6704 Cert: 53323	30 cfs	19.4	Municipal	30	20,526	2,327	38.5	n/a
Big Butte Springs	20-Oct-1923	App: S-8092 Permit: S-6703	30 cfs	19.4	Municipal purposes, inc. irrigation and fire protection	10.8	7,401			1-Oct-2000 19.2 cfs undeveloped portion of the permit in the OWRD extension process
Big Butte Creek and tributaries & Big Butte Springs	28-May-1925	App: S-10120 Permit: S-6884	"All remaining unappropriated water."	n/a	Municipal	0	0	0	0	1-Oct-2000 41.0 cfs undeveloped portion of the permit in the OWRD extension process
Willow & Four Bit Creek[2]	17-Oct-1949	App: R-24210 Permit: R-1118	10,000 acre-feet	n/a	Municipal, inc. domestic, industrial, irrigation, sewer, fire protection	n/a	8,320	n/a	n/a	1-Oct-1998 1,680 acre-feet undeveloped portion of the permit in the OWRD extension process.
Big Butte Springs, Willow Creek, Four Bit Creek, and Reservoir[2]	17-Oct-1949	App: S-24211 Permit: S-20177	102 cfs (7 cfs from Big Butte Springs & 95 cfs from water stored in Willow Lake Reservoir under Permit R-1118)	65.9	Municipal (Exchange with EPID)	46.5	6720	400	6.6	1-Oct-1998 55.5 cfs of undeveloped portion of the permit in the OWRD extension process.
Rogue River[3]										
Rogue River[4]	22-Oct-1954	App: S-29527 Permit: S-23210	100	64.6	Municipal	Total: 68 Net: 56	8,076 6,567	673 547	11.1 9.0	1-Oct-2000 32.0 cfs undeveloped portion of the permit in the OWRD extension process.
		Total[5]	**262**	**169.3**						

[1] No fish species listed on state or federal endangered species lists occur in proximity to Big Butte Springs or Willow and Four Bit Creeks. Threatened coho occur several miles downstream from points of diversion. Willow Creek is on DEQ's 303(d) list for temperature from RM 0 to 4.5. Big Butte Creek from RM 0 to 11.6 is on DEQ's 303(d) list for dissolved oxygen, E-coli, and temperature. There are no critical groundwater areas in the vicinity.

[2] Water impounded per Permit R-1118 and released under Permit S-20177 is not used for MWC potable water supply. This water is released for use by Eagle Point Irrigation District in exchange for maximum use of Big Butte Springs' water by MWC.

[3] At the point of diversion, the Rogue offers spawning and rearing habitat for threatened coho. It is six miles upstream from the nearest 303(d)-designation (for temperature). The Rogue River is 303(d) designated for fecal coliform from RM 0 to 27.2 year-round and from RM 94.9 to 110 during the summer. There are no critical groundwater areas in the vicinity.

[4] Total Rogue River withdrawals represent all water withdrawn at Duff Treatment Plant, and include water withdrawn under water rights held by Jacksonville, Phoenix and Talent. Net withdrawals do not include the water used by these three entities.

[5] Total allowable river withdrawal excludes the unquantified amount from Big Butte Creek under Permit S-6884.

EXHIBIT 2-33

MWC's Average Monthly and Annual Water Withdrawals for the Period 2003-2007

	Big Butte Springs		Rogue River (Duff WTP)				Willow Creek/Lake	
			Total Withdrawals[1]		Net Withdrawals[1]			
Month	Monthly (MG)	Average Daily (mgd)	Monthly (MG)	Average Daily (mgd)	Monthly (MG)	Average Daily (mgd)	Monthly (ac-ft)	Average Daily (ac-ft/d)
January	614	19.8	0	0.0	0	0.0	0	0.0
February	562	19.4	0	0.0	0	0.0	0	0.0
March	658	21.2	0	0.0	0	0.0	0	0.0
April	742	24.7	10	0.3	10	0.0	0	0.0
May	759	24.5	171	5.5	101	1.1	0	0.0
June	792	26.4	445	14.8	348	16.7	376	12.5
July	818	26.4	768	24.8	653	22.4	1,611	52.0
August	813	26.2	673	21.7	568	15.3	1,910	61.6
September	782	26.1	370	12.3	301	8.0	1,655	55.2
October	808	26.1	51	1.7	51	2.1	23	0.7
November	741	24.7	0	0.0	0	0.0	0	0.0
December	655	21.1	0	0.0	0	0.0	0	0.0
Average Annual	**8,744**	**23.9**	**2,488**	**6.8**	**2,033**	**5.5**	**5,575**	**15.2**

[1] Total Rogue River withdrawals represent all water withdrawn at Duff Treatment Plant, including water withdrawn under water rights held by Jacksonville, Phoenix and Talent. Net withdrawals are calculated by subtracting water used by Jacksonville, Phoenix, and Talent.

Other Rights

As shown in Exhibit 2-34, MWC also holds eight certificated water rights primarily for irrigation of 717 acres in the vicinity of Big Butte Springs. These rights were attached to properties acquired by the commission through its watershed protection program. The most senior right dates from 1905 and the most junior right dates from 1920. Combined diversion allowed under these rights during the summer irrigation season totals approximately 9 cfs (5.8 mgd). Currently, the lands are irrigated to produce hay for local sale. MWC is considering transferring these rights to municipal use in the future. Average monthly and daily diversion data for these rights is not available.

EXHIBIT 2-34
Summary of Irrigation Water Rights

Water Right Application/ Permit/ Decree/ Certificate	Source	Priority Date	Type of Beneficial Use	Max. Authorized		Max. Withdrawal to Date		Average Monthly Diversion for the Previous Year	Authorized Date for Completion
				Rate (cfs)	Duty (ac-ft/ac)	Rate (cfs)	Duty (ac-ft/ac)		
Rogue River Decree Cert: 15846	Four Bit Creek	1905	Irrigation	0.42	4.5	0.42	Up to 4.5	Not Available	n/a
App: S-5269 Permit: S-3283 Cert: 9821	Four Bit Creek	11/27/1916	Irrigation and domestic	0.40	4.5	0.40	Up to 4.5	Not Available	n/a
App: S-5744 Permit: S-3550 Cert: 5107	Two Springs Tributary to Four Bit Creek	10/17/1917	Irrigation, livestock and domestic	1.83	4.5	1.83	Up to 4.5	Not Available	n/a
App: S-5823 Permit: S-3579 Cert: 4898	Four Bit Creek	11/2/1917	Irrigation	3.13	4.5	3.13	Up to 4.5	Not Available	n/a
App: S-7336 Permit: S-4637 Cert: 6740	Willow Creek	6/10/1920	Irrigation	1.63	4.5	1.63	Up to 4.5	Not Available	n/a
App: S-7613 Permit: S-4854 Cert: 7434	Four Bit Creek	11/12/1920	Irrigation	1.0	4.5	1.0	Up to 4.5	Not Available	n/a

Aquatic Resource Concerns

A number of anadromous fish species are present in the Big Butte Creek watershed, including Chinook and coho salmon and winter and summer steelhead. Only coho are listed as threatened (under the federal Endangered Species Act). However, the limit to their distribution is several miles downstream from MWC's Big Butte Springs diversions; coho are not present in the diversion reaches proper. According to the Oregon Department of Environmental Quality's (DEQ) web site[2], Big Butte Creek is listed on the Oregon Department of Environmental Quality's 303(d) list as water quality limited for dissolved oxygen, *E. Coli*, and temperature from its mouth to the junction of the North and South Forks—some seven river-miles downstream of Big Butte Springs. The stream reaches near Big Butte Springs are not listed on the 303(d) list. Willow Creek is on DEQ's 303(d) list as water quality limited for temperature from its mouth to river mile (RM) 4.5.

The Upper Rogue River supports a wide array of anadromous fish, including spring and fall Chinook salmon, coho salmon, and summer and winter steelhead. Again, only coho are listed as threatened (under the federal Endangered Species Act). The reach of the Rogue River at the Duff WTP is important for coho spawning and rearing. The Rogue River is listed on the Oregon Department of Environmental Quality's 303(d) list as water quality limited for temperature from its mouth to roughly river mile 125, which is about six miles downstream from MWC's point of diversion. The Rogue River is also on DEQ's 303(d) list for fecal coliform from its mouth to RM 27.2 and from RM 94.9 to RM 110.7. The diversion reach is not listed on the 303(d) list.

These resource concerns are summarized in Exhibit 2-32.

Evaluation of Water Rights/Supply

As measured by water rights and source capacity, MWC is well-positioned to meet its long-term water supply needs. Supply constraints are imposed not by water rights capacity, but by current infrastructure. These constraints include the 26.4 mgd capacity of the transmission pipelines from Big Butte Springs, and the 45-mgd capacity of the Duff WTP.

MWC's municipal rights are senior in priority to many users in the Rogue River Basin, especially in terms of its Big Butte Springs source, where it has some of the oldest rights in that drainage. Based on the OWRD web-based water right information system, the only downstream user of any size in the Big Butte Springs drainage is Eagle Point Irrigation District. In the Rogue River adjudication (a court process to define water rights pre-dating the state permit process), the district was assigned an identical priority date as MWC for using the waters of Big Butte Creek. A cooperative arrangement between the two parties resulted in the Willow Creek Reservoir exchange system described above, thus making Big Butte Springs a very reliable source. MWC's supply standing was also buttressed by the law the Oregon Legislature passed in 1925 that designated the remainder of the water in the Big Butte Creek drainage for Medford's use. This is a strong protection that only a relatively few municipalities can claim. Consequently, only during drought conditions is the source stressed to the point where curtailment may be required.

[2] http://www.deq.state.or.us/wq/assessment/rpt0406/results.asp

MWC's 1954 diversion from the Rogue River represents its newest right, though it is now over fifty years old. According to OWRD Assistant Regional Manager Bruce Sund, this source is quite reliable, with little, if any, water use restrictions historically. An instream right is established on the Rogue River above Gold Ray Dam, but because of its junior priority date (1959), it has not affected operation of MWC's Duff WTP.

MWC is securing the strength of its supply position by pursuing water use as allowed under its permits and working to obtain water right certificates. As summarized in Exhibit 2-32, MWC is in the permit process for five of its rights. It has diverted water under four of these (S-6703, S-6884, S-20177, S-23210) and is evaluating future use under (S-6884). MWC is working with the OWRD to provide information needed to maintain progress in developing the sources authorized under its water rights and as necessary to obtain extensions of time to develop the uses.

Big Butte Springs is a plentiful source of water, varying from approximately 25 to 35 mgd depending on climatic conditions. MWC's water rights allow full use (approximately 43 mgd) of this source, even exceeding what may be available naturally on an average basis. However, only 26.4 mgd currently can be conveyed through MWC's twin transmission lines. MWC continues to evaluate additional use of the Big Butte Creek drainage. This may occur through additional use of Big Butte Springs as allowed under S-20177 (which would require additional pipeline capacity), or potentially through additional winter storage or changes to existing points of diversion that may allow more use of the drainage's unappropriated water (which is estimated to range between 30 and 50 cfs (20 to 32 mgd) during the summer low-flow period). At such time as replacement of the transmission main(s) from the Big Butte Springs becomes appropriate from a maintenance standpoint, enlarging their capacity and further springs development may also be considered. While the springs output might at times be insufficient to fill enlarged pipelines during the summer months, increased pipeline capacity could enable this high quality source to meet growing winter demands during high flow months.

MWC's allowed diversion from the Rogue River (approximately 65 mgd) is currently limited by a treatment plant capacity of 45 mgd. Since water rights held by the cities of Jacksonville, Phoenix and Talent are also processed at Duff WTP, MWC water rights treated at this facility are further reduced. MWC places a higher priority on increasing this capacity to meet most of its growing demand, rather than on any near-term expansion of Big Butte Springs facilities.

In summary, MWC has developed about 100 of the 169 mgd allowed under its water rights certificates and permits. Approximately 69 mgd remains in yet-to-be-fully-developed water right permits, excluding the unquantified water right permit based on the legislative withdrawal of Big Butte Creek.

SECTION 3

Water Conservation

SECTION 3

Water Conservation

Although this is its first formal Water Management and Conservation Plan, MWC has been engaged in conservation activities for more than fifteen years. In conjunction with this plan, MWC reviewed and analyzed current and potential future conservation activities summarized in **Appendix B**. **Exhibit 3-1** summarizes MWC's conservation program benchmarks, both required and optional, that MWC plans to pursue during the period of 2009 through 2013. A discussion of the MWC's review and analyses of conservation measures also follows.

EXHBIT 3-1
MWC Summary of 5-year Conservation Benchmarks, 2009-2013

Objective/OWDR Requirement	Proposed Action(s)	Start Date/Frequency
Water Audits		
Perform annual water audits	Continue and refine annual water audits.	Ongoing
	Assess metering at Big Butte Springs and Coal Mine to assure accuracy of BBS production and transmission line losses.	Assessment 2009; Initiate corrective actions 2010, if needed
Document unmetered water usage	Better define components of unbilled water; improve quantification of hydrant use, reservoir overflows, etc.	Initiated 2008, Expand 2009
Metering		
Fully meter system	Already fully metered	Ongoing
Meter testing/ maintenance program	Continue current meter testing program	Ongoing
	Test sample meters being removed & enter findings on database; target underperforming meter types for replacement	Testing initiated 2008; Begin targeting 2011
	Meter replacement program to AMR	Ongoing / long term
Rate Structure & Billing Practices		
Quantity-based billing	Currently perform quantity-based monthly billing	Ongoing
Rate structure that encourages conservation	Evaluate adding a tier and increasing the differential between tiers for SFR customers. Evaluate increasing the differential between summer/winter rates for all other customers	Propose for consideration 2010; Possibly implement in phases
	Consider modifications to rate structure for wholesale cities aimed at encouraging conservation, peak use reduction	2012
	Continue surcharges for unrepaired leaks	Ongoing

EXHBIT 3-1
MWC Summary of 5-year Conservation Benchmarks, 2009-2013

Objective/OWDR Requirement	Proposed Action(s)	Start Date/Frequency
Leak Detection & Repair		
System leakage of less than 10%	Current unaccounted for water is less than 10%. Improve documentation of valid unbilled uses to enable more accurate identification of true losses	Improved quantification initiated 2008; Expand 2009; Evaluate annually
Line replacement program	Develop database on pipe condition based on coupon removals, leaks, etc.	2010
	Continue funding major line rehabilitation program	Ongoing
Minimize customer side leakage	Continue / expand customer leak notification activities	Ongoing
Public Education Programs		
Education programs to encourage efficient water use	Continue newsletters, bill messages, booths at public venues, promotion of school conservation kit, etc.	Ongoing
	Increase outreach to targeted sectors, including public officials, developers, landscapers, business groups	Initiate 2009; Evaluate annually
	Continue development of enhanced WEB-site features	Evaluate annually
	Continue irrigation audit program	Ongoing
	Co-sponsor irrigation auditor training for local landscapers	2009
	Continue involvement with Bear Creek Watershed Education Partners; consider additional youth education opportunities	Ongoing
Technical & Financial Assistance Programs		
Provide technical and financial assistance to encourage efficient water use by customers	Continue conservation grant program for public/nonprofit entities. Increase outreach under this program	Ongoing
	Continue irrigation audits; enhance targeting of high users	Ongoing
	Consider pilot program of cost-sharing incentives for largest commercial/industrial/institutional customers	2012
	Consider and evaluate financial incentives for incorporating water-efficiency measures in new construction, especially landscaping	2012

EXHBIT 3-1
MWC Summary of 5-year Conservation Benchmarks, 2009-2013

Objective/OWDR Requirement	Proposed Action(s)	Start Date/Frequency
Fixture Retrofit/Replacement		
Implement fixture replacement programs	Initiate toilet rebate program	2009
	Encourage retrofits of city-owned facilities with funding assistance through conservation grants	2011
	Consider retrofit options for other fixtures that contribute to efficient water use	2011
Water Reuse/Recycling		
Consideration of reuse, recycling and non-potable water opportunities	Continue involvement and funding of the WISE project, which is exploring agricultural reuse of municipal wastewater	Ongoing
	No urban reuse anticipated within benchmark period. Wastewater treatment not under MWC's jurisdiction, urban reuse opportunities not currently cost effective, and availability of wastewater for urban uses dependent on outcome of WISE project	Beyond benchmark period
Other Conservation Measures		
Encourage conservation in new construction	Work with City of Medford staff and policy makers to encourage development of water conserving development guidelines. Consider similar effort with wholesale cities.	Initiate 2009
	Encourage and work cooperatively with targeted large construction projects to facilitate integration of water conservation	Efforts with schools ongoing; Consider other options when opportunities arise.

Current Conservation Measures

MWC has implemented a significant water conservation program focused on the Commission's retail customers, particularly those within the City of Medford. Current activities relevant to water management and conservation include the following:

Annual Water Audit. MWC documents production and consumption of water monthly. Between 2000 and 2005 unaccounted for water rates ranged from 3.3 to 12 percent with an average of 8.3 percent. Subsequent unaccounted for water values have been below 10 percent, and will be documented as part of MWC's five-year progress report.

System-Wide Metering. The MWC water system has been fully metered for decades. Authorized but un-metered uses of water from hydrants include main flushing, fire

fighting, city and county public works access, and construction. Construction use of water from hydrants is billed at a flat rate of $10 per day.

Meter Testing and Maintenance. MWC tests all meters greater than 2-inches and all 2–inch turbine meters every 10 MG or every five years, whichever comes first. MWC tests all 2-inch and larger meters and 1 out of every 6 smaller new meters before installing them to ensure accuracy. All newly installed meters are radio read or are capable of being radio read.

Rates. MWC uses an inclining block rate structure for single family residential customers, which is favorable for encouraging water conservation. There are two rate blocks, both inside and outside city limits. Seasonal rates that increase during the summer apply to all other customers including wholesale accounts. For example, residential customers inside city limits in the Gravity Pressure Zone in 2008 were charged $0.53 per 1,000 gallons for the first 15,000 gallons of water used and $0.71 per 1,000 gallon for water use over 15,000 gallons. Seasonal rates applicable to other customers have a $0.05 increase per 1,000 gallons during June through October.

Billing statements include a comparison of the monthly consumption for the same month from the prior year to enable customers to compare current with previous use.

Leak Detection. MWC has occasionally hired an outside leak detection company in recent years to survey limited portions of the distribution system. Pipe condition is monitored through the use of coupons (small circular pipe sections removed when making main line connections), and coupon data indicate that pipelines are in excellent condition.

MWC also addresses customer–side leaks with notifications enclosed in bills in the event of unusually high water use. Additionally, based on a review of water use each March, residential customers with higher than normal winter water use are notified via letter and phone to make them aware of possible plumbing leaks. Leak detection brochures and toilet dye strips are enclosed in these mailings.

MWC regulations include a water waste provision allowing imposition of a 300 percent surcharge for customers deemed negligent of wasting water. This surcharge is imposed infrequently when other efforts to encourage conservation or leak repair have proved unsuccessful.

Public Information. MWC supports the following programs for public information relating to water conservation:

- conservation articles in newsletters
- conservation messages included on face of billing statements
- a consumption feature on the MWC website (www.medfordwater.org) that allows residential customers to compare their use to others in their neighborhood and city
- distribution of brochures that encourage and provide guidance on water conservation
- conservation messages in the annual Consumer Confidence Report
- periodic interviews with TV and newspaper reporters

- an information booth at the annual Spring Garden Fair
- a water-wise demonstration garden
- occasional teacher and school presentations
- participation in development of a water conservation study kit for schools, and associated teacher training
- interaction with developers, building contractors, and landscape contractors to discuss and encourage more water efficient landscape designs

Irrigation Audits. Free irrigation audits (surveys) to help customers better understand their sprinkler systems have been provided every summer since 2001. In these audits, staff visits sites to educate customers about their sprinkler systems, identify maintenance issues, and provide appropriate watering schedules based on site-specific watering rates. Residential customers have been the primary participants, but several parks, commercial sites, and churches have also been audited. Some participants are targeted based on high water usage, but the majority of audits are conducted at the request of property owners who have learned about the surveys through advertising or word of mouth.

Water-Wise Landscape Guidelines. Although landscaping techniques are not currently regulated, MWC has encouraged the City of Medford to adopt landscape guidelines that integrate efficient water use.

Conservation Incentive Programs. MWC has provided financial support to some conservation programs. Irrigation auditor training has been sponsored, including partial tuition for public employees responsible for grounds maintenance at parks and school properties.

A Conservation Grants program provides incentives for public and non-profit agencies to pursue water conservation activities on their premises. Projects have included water-wise landscaping at City Hall and a fire station, retrofitting of traffic islands from grass to low water using plants, purchase of a weather station for scheduling irrigation in city parks, conversion of an athletic field from grass to artificial turf, and a plumbing retrofits (high efficiency urinals and faucets) at local schools.

MWC's conservation focus and interaction with the City of Medford has led the city to pursue several water efficiency measures independently. The most significant measure is installation of artificial turf on playing fields throughout the U.S. Cellular Park. Sustainable principles also are being employed in the design of the proposed Oregon Hills Park.

Staff Professional Development. MWC staff actively participates in the Pacific Northwest Section of the American Water Works Association Conservation Committee. This involvement has included various training, such as instruction in performing commercial water audits. MWC conservation staff also attends conservation-oriented conferences, such as those sponsored by AWWA.

Use and Reporting Program

The Medford Water Commission has a water use measurement and reporting program that complies with the measurement standards in OAR Chapter 690, division 86.

Required Conservation Programs

The Oregon Administrative Rules for Water Management and Conservation Plans require that all water suppliers establish five-year benchmarks for implementing the following required conservation measures:

- Annual water audit
- System-wide metering
- Meter testing and maintenance
- Unit-based billing program
- Leak detection and repair (if system leakage exceeds 10 percent)
- Public education

As described in the preceding subsection, MWC has implemented the above measures. MWC conducts annual water audits, is fully metered, and uses inclining block and seasonal rate structures. MWC conducts public outreach through printed and electronic media, presentations, irrigation audits, and a water-wise demonstration garden. MWC has performed leak detection surveys and followed up with repairs or pipe replacements as leaks have been identified.

The conservation measures listed in this chapter and summarized in **Exhibit 3-1** will be implemented to promote sustainable use of MWC's water supply and to help defer capital improvements costs. However, conservation measures will not preclude the need for securing additional long-term water supply.

Five-Year Benchmarks for Required Conservation Measures

Over the next 5 years MWC will continue the programs described above and expand measures related to annual water audits, meter testing and maintenance, rate structure review, leak detection and repair, and public education. Descriptions of MWC's plans to implement measures specifically required of all municipalities under Division 86 conservation rules are summarized in **Exhibit 3-1**, and are as follows:

Annual Water Audit. MWC will improve its audit system to increase report accuracy. MWC has actions underway to better assure meter accuracy at its Big Butte Springs (BBS) and Coal Mine stations, with one objective being to use and compare the following two methods to monitor production from Big Butte Springs: 1) metering total flow at the springs and 2) summing the total flow at Coal Mine Station (CMS) and the metered use along the transmission line leading from BBS to CMS. This has involved installation of new magnetic meters at both BBS and CMS.

MWC is developing procedures to account for valid unbilled water uses, to further reduce unaccounted for water rates, and better identify actual water losses due to leakage, as

outlined in the American Water Works Association (AWWA) manual titled *Water Audits and Leak Detection* (M-36, AWWA 1990).

Beginning in 2008, reservoir water levels are monitored and overflow values are recorded. Procedures also are being developed and implemented to quantify and document hydrant use. Beginning in January 2009, MWC started to record its own hydrant use for flushing, maintenance and construction. Efforts to obtain similar quantification of use by other public entities, including local fire and public works entities, will also be pursued. Other non-revenue uses of water have been identified for quantification. These include irrigation of MWC facilities and flows associated with water sampling stations. Metering of construction-related hydrant use will be considered.

To improve clarity, MWC will alter the format of its annual Statistical Report (annual water audit). Likely improvements will include:

- Labeling all units
- Improving linkages between pages and better defining methods for summarizing totals and calculating values
- Reviewing calculation methods for accuracy and appropriateness

Meter Testing and Maintenance. MWC will improve metering accuracy by performing additional meter testing and repair and replacing underperforming units. Meter repair and replacement will reduce unaccounted for water by improving meter accuracy, but may not result in actual water savings. However, meter repair and replacement may result in water savings if under-reporting meters are corrected, and higher bills motivate customers to reduce water use. MWC will continue to enforce existing design standards requiring all larger meters to be installed with test ports and bypass lines to aid testing and repair. Development of replacement frequency standards based on age and brand or type of meter will be implemented. Testing of sample meters by age and type has recently been initiated to determine appropriate replacement strategies. MWC is installing automatic meter reading (AMR), with current replacement priority being given to neighborhoods where meters are difficult or dangerous to read. MWC's focus thereafter will include replacement of meter types found to be under performing.

Water Rate Structure. MWC will analyze its current billing rates and formats to determine possible modifications for improving price incentives for conservation. Revisions to consider include modifying the differential between summer and winter rates and blocks, and adding an additional block to the residential tiered rate structure. The rate structure for wholesale city customers will also be reviewed for possible modification aimed at encouraging conservation and reductions in peak use. MWC also expects to modify the format of future bills, with inclusion of 12 months of consumption comparison information to be considered.

Leak Detection and Repair. MWC's unaccounted for water levels have been generally favorable, averaging 8.3 percent from 2002 to 2005.[1] As noted above, MWC is developing

[1] The unaccounted for water value of 12.3 percent reported for 2005 was subsequently adjusted downward when an accounting mistake was recognized.

procedures to account for valid unbilled water uses, to further reduce unaccounted for water rates, and better identify actual water losses due to leakage.

To improve conveyance and minimize water loss, MWC will maintain its current water line rehabilitation program and its system monitoring and repair programs. MWC will continue to build its pipe replacement fund to provide available capital for future large scale replacement needs.

Specific measures intended to improve future leak detection and repair include the following:

- Review and confirm that construction standards are current relative to industry best practices
- Improve water use accounting to better document known unbilled water uses, such as hydrant use and reservoir overflows, enabling the amount of unaccounted for water from leakage to be more closely monitored
- Document system leaks as well as MWC's response and findings
- Consider creating a database that relates identified leaks to pipe material, age, static pressure, soil type, and geographic location within the system
- Create a database documenting pipe coupon removals to relate pipe condition to location, age, and other properties for future replacement planning.

Public Education. To encourage efficient water use, MWC will expand its current public outreach efforts and develop additional programs. This will include updating its website, with possible components to include more interactive irrigation features. Future outreach efforts will target 1) developers and builders, 2) nurseries and landscapers, 3) Chamber of Commerce and business groups and 4) Public officials responsible for establishing development standards. Public education that motivates customers to reduce water use can result in actual water savings. Specific programs proposed to improve public education and encourage conservation include the following:

- Continue the irrigation audit program and attempt to better track results of audits
- Continue supplying conservation information at a booth at the annual Spring Garden Fair
- Increased outreach to developers and builders to encourage water efficient development practices, particularly with landscape designs
- Expanded communication with staff and public officials of the communities served by MWC, to educate and encourage implementation of water-efficient guidelines within development standards
- As a partner with the EPA WaterSense program, MWC will promote WaterSense products, including improving awareness of these products through MWC newsletters, Web site and other venues.

- Consider development of more formalized youth programs to change perceptions of water use
- Continue educational outreach partnerships with watershed councils and Bear Creek Watershed Education Partners

Expanded Use Under Extended Permits

Because MWC plans to eventually develop water rights associated with extended permit S-23210, which is in OWRD's permit extension queue, and because this involves diverting water from the Rogue River, an area with resource issues, MWC is required to develop a leak repair and line replacement program within 5 years that will reduce system-wide leakage to less than 15 percent. Current annual unaccounted for water has averaged 8.3 percent. Therefore, this rule will not apply to MWC.

Expanded Use Under Extended Permit S-23210

Under this rule requirement, a water provider that serves a population greater than 1,000 and intends to expand use under extended permits for which resource issues have been identified shall establish 5-year benchmarks for implementing a number of listed conservation measures or document that the measures are neither feasible nor appropriate.

A summary of the 5-year benchmarks for additional conservation measures developed by MWC are contained in Matrix 2 of **Appendix B**. Further descriptions of the benchmarks evaluated are presented below.

Analyses of Potential New Conservation Measures

In addition to other activities described herein, MWC identified three conservation programs to consider and evaluate with cost/benefit analyses: a rebate program for the replacement of water-inefficient toilets with low-use toilets, a rebate program for customers who replace grass with low-water use plantings ("Cash for Grass"), and a cost-sharing program to help commercial and industrial customers implement conservation measures (sometimes referred to as a Capacity Buyback program).

Exhibit 3-2 summarizes the three conservation measures that were given detailed consideration. Water savings and program costs were estimated for a 5-year period based on the assumptions described in Exhibit 3-2 and in **Appendix C**. Estimated participation rates and water savings used in these calculations were based on similar programs in other communities. Actual costs and water savings would vary depending on factors such as the level of participation by customers, the condition of existing plumbing fixtures and the level of staff effort required to initiate and maintain each conservation program. The water savings shown are those that could be expected after the fifth year of each program. If all three programs were implemented at the estimated participation levels, the overall impact

EXHIBIT 3-2
Conservation Program Analysis

Program	Cost Over 5 Years	Total Savings, 5th Year (gpd)	Annual Volume Saved, 5th Year (MG)	Percent of Savings During Peak Season	Water Savings During Peak Season[1] (MG)	Water Savings During Non-Peak Season (MG)	Reduction in ADD	Reduction in MDD	Unit Cost of Water Savings ($ per 1,000 gal)
Toilet rebate	$120,000	14,300	5.2	33%	1.7	3.5	0.05%	0.03%	$0.92
Cash for grass	$595,000	137,000	16	73%	12	4.5	0.17%	0.25%	$3.63
Commercial/industrial cost share	$832,000	181,000	66	9%	6.2	60	0.62%	0.32%	$0.63

1. Peak season for this analysis is June through September

2. Assumes that irrigation water use by industrial/commercial customers average 13 percent of their total use.

3. Finished water production cost from Duff WTP = $0.52 per 1000 gallons.

would be approximately 0.8 percent reduction in ADD and 0.6 percent reduction in MDD at the end of five years.

Since the most significant water savings from conservation are those that would reduce the need for Rogue River water treated at the Duff WTP, the cost of producing water at Duff WTP is a reasonable benchmark for comparison to conservation measures. Production costs from the Big Butte Springs are considerably lower. The cost of producing water from the Rogue River in 2006 was estimated by MWC staff at $0.52 per thousand gallons. This value is for finished water pumped into the distribution system, and includes labor, materials, energy, and depreciation for the Rogue River intake, Duff WTP, and energy for the three pump/control stations. MWC may update this unit cost based on the Duff WTP facility plan that is being prepared in 2008.

The unit cost for the toilet rebate program was estimated as $0.92 per 1,000 gallons or about twice the Duff WTP production costs. At $120,000, its total cost was the least of the three options evaluated. These values were based on a rebate offering of $75 per toilet and assume that 2 percent of those owning pre-1990 homes (2 percent of approximately 19,800 in the City of Medford, or approximately 400 residences) would participate. At the market penetration level assumed, the toilet rebate program had the lowest total potential water savings (14,300 gpd). Several variables could impact both the cost and benefits of this program. For example, if a 5 percent participation rate could be achieved, the unit cost would be reduced to $0.87 per 1,000 gallons, and the total potential water savings in the fifth year would be approximately 36,000 gpd. The benefit relative to cost would also be more favorable if the program targeted older toilets and/or replacements were limited to high efficiency toilets (HETs) now being certified under the EPA's WaterSense program. MWC has determined that it will implement a toilet rebate program.

The analysis of the Cash for Grass program suggested that it could achieve considerable water savings (137,000 gpd), but its unit cost estimate was very high at $3.63 per 1,000 gallons. This assumed that MWC offered an incentive of $1.00 per square foot of replaced lawn, and that approximately 2 percent of eligible customers would participate, each replacing an average of 1,000 square feet of lawn. Because of the unfavorable cost/benefit findings, MWC will not implement this program.

The commercial/industrial cost share program offered both the highest potential for water savings (181,000 gpd) and the lowest unit cost ($0.63 per 1,000 gallons). This unit cost is just slightly greater than the cost for production from the Duff WTP. However, its total overall cost is quite high at $832,000 over five years. The calculations assumed that 150 commercial/industrial customers would participate, the average incentive provided by MWC was $5,000 and that each participant reduced their water use by 15 percent. The cost/benefit differentials could be impacted considerably if incentives required to inspire participation were found to be greater, or water use reductions were less than projected. MWC's low overall rates could significantly impact participation. MWC will consider implementing this program, but at a lower participation level than analyzed because of the high overall costs.

Five-Year Benchmarks for Additional Conservation Measures

MWC plans to consider or implement the following additional conservation measures over the next five years. These will promote sustainable use of MWC's water supply and will help to defer capital improvements related to expansion. However, conservation measures will not preclude the need for securing additional long-term water supply.

Technical and Financial Assistance. MWC will continue its irrigation water audit program, likely expanding the targeting of high volume users, and will consider other technical and financial assistance programs as follows:

- Targeting some of the largest commercial, industrial, and institutional water users to invite participation in a cost share program for water efficiency programs. Because of the very high cost and technical complexity associated with some of these uses, it is likely that this would involve a smaller pilot program than assumed in the program analyzed above.
- Adding an irrigation feature to its website providing current weather-based irrigation schedules for various types of sprinklers, and promoting publications on water-efficient plants (for example those produced by Oregon State University's Extension Service).
- Rebates to encourage installation of water-wise landscapes in conjunction with new construction.
- Encouraging retrofits of existing facilities through various means, including the existing conservation grant program
- Creating financial assistance programs for customer installations of pressure regulating devices and leak repairs

Retrofit Incentive Programs. The following programs will be implemented or considered:

- MWC will establish a targeted rebate program for retrofitting older, inefficient toilets as described in the preceding analysis. Rebates for other fixtures and appliances will also be considered, possibly directed to toilet rebate participants or with a focus on low income customers. Where significant per-site water use reductions can be realized, MWC will pursue opportunities such as the urinal retrofit program being implemented in association with renovations at Medford schools. MWC's priority is to devote staff time and resources to support conservation activities to reduce peak summer use. In the near term, a large fixture retrofit program associated with indoor water use at individual households is not anticipated
- MWC's current programs have targeted reduction of landscape water demands. Given the very high cost to benefit ratio determined in the analysis of the Cash for Grass program, different landscape-related options likely will be pursued. These may focus on financial incentives for new water-efficient landscapes instead of retrofit incentives.

Rates and Regulations. MWC currently uses monthly billing, with a quantity-based billing structure. In addition, single family residential customers are subject to tiered rates and all other customers pay seasonal rates. Monthly billing, inclining block rates, and seasonal rates are all considered to be conservation-oriented rate strategies. However, their effectiveness at encouraging water conservation is hindered because MWC's rates are low in comparison to

some water utilities. While rates cannot be raised arbitrarily without relation to costs, MWC will evaluate and consider the following revisions to promote internal and external conservation:

- Modifications to current rate structures, including the possible addition of another tier to the single family residential tiered structure. The price differentials between summer and winter rates also will be reviewed and possibly modified.
- Consideration of more individualized rates for wholesale (other city and water district) customers to better reflect the water usage impacts of specific entities, particularly relative to peak usage.
- Facilitating the adoption of comparable WMCP components and actions by other city wholesale customers.
- Implementing internal regulations related to water recycling for car washes, water features, water parks, and other similar activities

Water Reuse and Non-Potable Water Opportunities. MWC has been an active participant in the Water for Irrigation, Streams, and Economy (WISE) project, a collaborative water management program for the Bear Creek and Little Butte Creek watersheds in Jackson County. Among other components, this project is exploring opportunities for agricultural reuse of wastewater generated by the regional treatment plant. The wastewater treatment plant is owned and operated by the City of Medford under a regional governance agreement, so implementation of reuse is not under the MWC's guidance or control. The WISE project is an activity that may not directly benefit water supplies available for use by MWC, but furthers other regional water efficiency efforts.

At this time, the WISE project appears to be the most realistic reuse opportunity. The regional wastewater treatment facility is not located in close proximity to the majority of the MWC service area. Use of reclaimed water for large irrigated areas in the City of Medford would require extensive piping and pumping. The most realistic urban reuse option might involve the White City industrial area. This area is relatively close to the wastewater plant and has high water needs. Further exploration of this reuse opportunity is not likely to occur within the next several years, because the quantity of water available for urban reuse will not be known until the WISE program is implemented and evaluated.

Some large tracts of land subject to new development have irrigation water rights associated with them. Direct use of this water is seldom preferred because little of it is delivered under pressure, and additional piping to enable service to individual subdivision parcels is expensive. The water tends to contain debris that chokes sprinkler systems and introduces weed seeds if not well filtered. Water management changes, proposed with the WISE project, would improve the feasibility for use or transfer of irrigation water rights, but those changes are long term and uncertain.

There are occasional opportunities for use of irrigation water within the MWC service area. Most golf courses within the region primarily use non-potable irrigation water, and plans are underway to irrigate playing fields at the new South Medford High School with irrigation water.

Cooperative Efforts. Cooperative efforts will be maintained and new working relationships will be developed to encourage conservation. Continued work with targeted customers, such as school districts, will be attempted to better ensure that new facilities incorporate efficient indoor and outdoor water use measures. MWC is currently working with the Medford school district and design teams to encourage integration of water conservation in the designs of several local schools under construction or renovation. MWC has begun and will continue to encourage new commercial developments expected to use large quantities of water to implement efficient water use designs. MWC will collaborate with Medford and perhaps other city wholesale customers in an effort to integrate water conservation landscaping provisions into design guidelines.

Constraints. Conservation programs must operate within the parameters of a utility's overall operations. Some desired activities may be constrained by seemingly unrelated limitations. For example, MWC's current billing and accounting system may limit the extent to which new rate structures can be considered and implemented, as well as the ability to easily process and credit rebates and other payback programs. While MWC is beginning the analyses of alternative billing and accounting systems, given the significant impact to all phases of MWC operations, this is likely to be a long-term project that may not be implemented within five years.

SECTION 4

Curtailment Plan

SECTION 4

Curtailment Plan

Introduction

Curtailment planning is the development of proactive measures to reduce water demand if the water supply is reduced temporarily. Supply shortages could result from a number of situations, including those identified below.

The goal of this plan is to define objective criteria and actions to prepare MWC for management of water supplies in the event of diminished supply or reduced delivery capacity. This plan recognizes the need to maintain essential public health and safety while applying measures in an equitable manner that minimizes impacts on economic activity and lifestyle. This may include more restriction on uses deemed less essential.

This plan builds on curtailment procedures adopted by MWC in 1992. These procedures have been revised, both to comply with Oregon Administrative Rules, Chapter 690, Division 86 and to reflect desired modifications. While this plan includes specific triggering conditions and defined procedures, it should be recognized that the circumstances to which this plan may apply could vary in terms of severity as well as whether they are anticipated or occur suddenly. The time of year during which curtailment is needed would also impact what types of actions might be appropriate. Some events might impact only a portion of the water system, with actions tailored accordingly.

This plan is intentionally thorough to enable a variety of options to be quickly identified for consideration in potentially stressed circumstances, with the understanding that some proposed actions might not be implemented or may be deferred to later curtailment stages. The objective of this plan is therefore to provide guidance while allowing flexibility to respond according to specific circumstances.

Authority

Section 21 of the City of Medford Charter (1976) grants MWC the authority to "distribute, furnish, sell and dispose of water, and provide water service…on such terms and conditions as the Board of Water Commissioners determines to be in the best interests of the city." This provision allows for the imposition of curtailment measures necessary to preserve supply. In addition, MWC has asserted authority to implement non-voluntary curtailment or suspensions of water service through Section 15 of its *Regulations Governing Water Service* handbook. Relevant provisions of that handbook are paraphrased in Attachment **A** at the end of this section. Review and revision of portions of that guidance document will be done as needed to assure consistency with this WMCP. Amendments will include addition of provisions for curtailment-related rate surcharges.

Plan Implementation

Whenever possible, activation of this Curtailment Plan and stages thereof will be by a majority vote of the Board of Water Commissioners. However, actions under the plan may be initiated upon a determination of urgency by the Commission's Manager. The Board of Commissioners, by a majority vote, may rescind the determination upon finding that the emergency no longer exists, or that the original declaration was made in error.

The plan may be enacted for the entire system, or only in those geographic areas that are directly impacted by the water supply shortage. The Manager may broaden or restrict the scope of enactment at any time for the duration of the plan implementation.

As previously noted, several nearby cities and water districts also rely on the Medford Water Commission to provide treated water to their jurisdictions. The Commission's 1992 Curtailment Plan was applicable to and adopted by these other entities. Some of these cities have subsequently prepared updated Water Management and Conservation Plans associated with their own water rights. This, coupled with revisions contained within this plan, will result in Curtailment Plans that are not fully consistent between jurisdictions. To the extent that is practical, Medford Water Commission will encourage actions that are regionally consistent and which can therefore be deemed equitable and able to be communicated to the public with a unified message. If a wholesale entity is unwilling or unable to implement consistent actions, their individual actions should yield comparable reductions in water usage.

Water System Capacity Constraints and Historical Supply Deficiencies

MWC's two water sources, Big Butte Springs (BBS) and the Rogue River, have continuously met the system's needs with no service disruptions.

BBS water is transported through two transmission pipelines, each of which has a capacity of 13.2 mgd. These pipelines follow slightly different routes to town, lessening the potential for a single event impacting both pipelines simultaneously. During droughts, the available supply of the BBS has fallen below 26.4 mgd. Between 1991 and 2003, the Willow Creek Reservoir failed to completely fill on three occasions. Because of coordination of water rights with the Eagle Point Irrigation District, limitations on MWC's water use from BBS were as low as approximately 20 mgd at some points in time.

The current summer capacity of the Rogue River supply is 45 mgd, as limited by the treatment capacity of the Duff WTP.

Current peak summer demands for the overall system have occasionally exceeded 60 mgd. Therefore, should either the BBS or the Rogue River supply be interrupted during peak summer periods, curtailment would be necessary. The water system currently relies entirely on the BBS supply during winter months, and failure of one or both BBS pipelines could also result in at least a short term need for curtailment, either until the BBS supply could be fully restored or the Rogue River supply could be brought online.

Alternate sources of supply available to MWC are limited. Local groundwater tends to be

marginal in quantity, so drilling of wells to supplement supplies is not a viable option. MWC is the supplier of potable water to most neighboring cities, none of whom operate treatment facilities of their own. While an interconnection with the City of Ashland might occur within the foreseeable future, it would be for the purpose of Ashland's water supplies being supplemented by MWC, with limited potential for the reverse. Ashland typically does not have surplus water available, and is generally more impacted by drought than MWC. However, if an intertie is constructed, there might be potential to receive some water from the City of Ashland, depending upon future agreements, the time of year and whether the precipitating event was regional in nature.

In extreme circumstances, limited amounts of potable water may be delivered via water truck from the Cities of Ashland, Grants Pass, Gold Hill, Rogue River or Butte Falls. If only a portion of MWC's system was compromised, limited amounts of water could also be trucked from other portions of the water system.

Level 2 treated wastewater from the regional reclamation plant might be a potential source for uses (such as dust control) that could utilize trucked non-potable water. Local irrigation water may provide another potential option for non-potable water, provided that irrigation supplies were not similarly subject to shortage.

Potential causes of water supply shortages include, but are not limited to the following:

- long-term drought
- fire in the BBS or Rogue River watersheds that affects water quality
- contamination such as from a chemical spill, that necessitates shutting down either water source
- flooding that forces shutdown of one or more facilities
- landslides or other natural disaster that damage water pipelines or facilities
- power outages, particularly those impacting the Duff WTP
- facility or equipment failure, either from natural or human causes

Curtailment Stages

MWC's plan recognizes five stages of increasingly stringent curtailment response. The initiating conditions for each stage are presented in **Exhibit 4-1**, along with the type of actions that would be taken. The list of initiating conditions provides guidelines, may not be all-inclusive, and might not impact customers within all portions of the MWC service area. It would be desired, but not mandatory that curtailment activities be implemented in lower stages first, with each stage building on the prior stage. Compliance measures would also likely be more acceptable to customers if voluntary and less restrictive measures have been attempted first. However, MWC could implement measures proportionate to a sudden disruption of service without prior notification or action. Upon implementation of a curtailment stage, there will be ongoing re-evaluation to determine the appropriate curtailment status.

EXHIBIT 4-1
Curtailment Stages

Stage	Initiating Conditions	Actions
1. Awareness of Potential Water Shortage	A series of indicators suggest that a future shortage is possible; these may include drought-related conditions or other supply factors	Raise public awareness about potential for water shortage through such means as general articles in newsletters, newspapers and Web site
2. Potential Water Shortage Alert	Continued and / or further indicators raise concerns about the ability to meet supply needs unless demand levels are reduced, or Sustained demand reaches 90 percent of supply	Enhanced public awareness and outreach efforts to convey potential water shortage message Request voluntary water use reductions
3. Water Shortage	Indicators show that supply and/or delivery capacities are strained to meet current demand levels; these may include: Sustained demand reaches 95 percent of supply or delivery capacities, or Water storage facility(ies) is/are not routinely refilling, and Manager determines that continuation could result in inability to meet fire protection or other essential needs.	Strengthened notification messages and further outreach methods regarding water shortage conditions Mandatory restrictions on water use Potential enforcement of restrictions Consideration of rate surcharges
4. Severe Water Supply Shortage	Series of indicators show that water consumption levels must be immediately reduced; indicators may include: Sustained demand is exceeding normal supply or delivery capacities, or Water storage facility(ies) is/are only 2/3 full, and Manager determines that ability to meet fire protection or other essential needs is jeopardized. Supply or delivery capacities have been reduced by up to 35%	Urgent notification messages; significant outreach / customer notification Further mandatory restrictions on water use Significant enforcement of restrictions Rate surcharges
5. Emergency Water Supply Disruption	Major water use reductions are deemed necessary to avoid system failure, inadequate fire protection capability and/or to assure protection of water quality; indicators may include: Sustained demand continues to exceed supply or delivery capacities, or Water storage facility(ies) is/are only 1/3 full Supply source or major facility is lost, reducing supply or delivery capabilities to less than 65% of normal capacities	Extreme alert; urgent notification of customers, both by broadcast means and direct notification Only essential water use allowed Significant enforcement Heightened rate surcharges

Curtailment Actions

Stage 1: Awareness of Potential Water Shortage

Stage 1 would be implemented to provide general awareness of the potential for water shortage based on preliminary indicators of reduced supplies. Voluntary, but non-specific conservation activities will be encouraged. Under Stage 1, MWC will take the following actions:

1. Assemble a Water Shortage Action Team as identified in **Attachment B** at the end of this section to determine the likelihood of a shortage and define outreach activities.
2. Notify Members of the Board of Water Commissioners.
3. Define appropriate internal actions to minimize waste or perception of waste by MWC operations. Determine whether activities such as main flushing and reservoir cleaning should be immediately reduced or accelerated to complete in advance of a potential higher level of curtailment. Contact landscape maintenance contractor responsible for MWC sites to request that sprinkler maintenance needs be addressed, and appropriate sprinkling schedules followed.
4. Notify officials of the City of Medford and wholesale city customers of the potential for a water supply shortage.
5. Raise public awareness through general notification measures. This might consist of press releases or notices with monthly bills.

Stage 2: Potential Water Shortage Alert

This status will activate more extensive outreach to inform customers of the potential for water shortages, and encourage voluntary conservation of water through specific recommended measures.

Stage 2 – MWC Actions

Under Stage 2, MWC actions will include the following:

1. Convene the Water Shortage Action Team to assess the likelihood of a shortage, define demand reduction goals, define outreach activities, and evaluate the possible need for additional personnel to assist with outreach and customer assistance activities.
2. Notify members of the Board of Water Commissioners.
3. Re-evaluate appropriate internal actions to minimize waste or perception of waste by MWC operations. Remind landscape maintenance contractors responsible for MWC sites that sprinkler maintenance needs must addressed and appropriate sprinkling schedules followed.
4. Notify City of Medford officials. Include information on actions relevant to the city.
5. Notify staff and/or officials of wholesale city and water district customers of the curtailment determination, along with their need to enact equivalent provisions to assure that their efforts are no less intense than those imposed by MWC. Inform them

of water reduction goals.

6. Consider providing direct notification to others on the Contact List included as **Attachment C**, such as:

    a. Representatives from sectors that might be most influential in causing water usage reductions. At this stage, the focus would be on water uses that are considered less essential, such as landscape irrigation, rather than those that would result in economic impacts.

    b. Businesses that could be impacted if Stage 3 status becomes necessary, such as car washes, pool contractors and landscape contractors.

7. Provide general notification to customers. Such notification will include a description of the current water situation, the reason for the requested actions, and a warning that mandatory restrictions may be implemented if voluntary measures are not sufficient to achieve water use reduction objectives or if conditions worsen. Include drinking water quality information in notices, so that the public understands the role of flushing in maintaining water quality.

    MWC may request that notices be posted on bulletin boards, websites, public restrooms and similar venues. Guidelines and conservation information will also be placed on the MWC Website, including detailed information to facilitate customer's use of weather-based irrigation scheduling. Utilizing press releases to maximize notification would also be anticipated.

8. Consider initiating or expanding customer educational programs to assist customers in implementing curtailment actions. Examples might include presentations for homeowners and /or landscape managers, and site visits to provide assistance in adjusting sprinkler schedules.

9. Consider distribution of low cost items such as toilet dye tablets, efficient shower heads, low flow aerators, early closing toilet flappers and hose nozzles, which would yield water savings and raise awareness of the water shortage situation.

10. Monitor and report results of curtailment efforts and progress in meeting demand reduction goals. Keep MWC employees informed.

Stage 2 – Customer Actions

The following voluntary actions may be requested of customers when Stage 2 is triggered:

1. Request reduction in water use by the percentage determined to be the goal based on the comparable month in the prior year.

2. Manage landscape watering. The following guidelines are encouraged :

    a. Water landscapes only between the hours of 9:00 pm to 6:00 am, if on automatic timers, and between the hours of 7:00 pm to 9:00 am, if performed manually.

    b. Encourage use of timing devices when watering with hoses.

    c. Suggest adherence to weather-based irrigation schedules, provided on the MWC

Web site, the Lawn Watering Infoline, and other potential venues.

d. Encourage sprinkler maintenance and adjustment to repair leaks, and minimize conditions such as over spray and high pressure that result in obvious water waste.

3. When in use, hoses should be equipped with nozzles that maximize effectiveness of the spray pattern and shut off when not activated.

4. Encourage repair of all known customer leaks.

5. Reduce vehicle washing and use facilities that recycle water. Manual car washing should include use of a bucket and hose equipped with a shutoff nozzle for brief wetting and rinsing.

6. Request that exterior paved surfaces be swept, rather than washed. If washing is necessary for such reasons as public health or safety, use of water brooms that provide maximum cleaning with minimum water usage is encouraged.

7. Maintain swimming pools, hot tubs, ponds and other water features in a manner that minimizes the need to fill or refill.

8. Integrate recirculation/reuse of water where appropriate. Examples include water features and heating/cooling equipment

9. Request that the City of Medford and other city customers set good examples with their internal operations by implementation of the applicable items above, as well as the following:

   a. Reduce water used in street sweeping

   b. Ask Fire Department to limit or avoid training exercises that use water

   c. Consider reducing use of and pursue actions needed to retrofit any fountain or water spray recreational facility that does not re-circulate water

   d. Identify important recreational facilities and fields in order to concentrate on preserving these, while decreasing water use at less critical facilities.

Stage 3: Water Shortage

Stage 3 is similar to Stage 2 except that the voluntary measures will be made compulsory. This may be because of a worsening water supply situation or of insufficient water savings from the voluntary measures. Additional non-essential water use will be prohibited.

Stage 3 – MWC Actions

MWC will take the following actions:

1. Re-convene the Water Shortage Action Team to assess the effectiveness of actions taken in Stage 2 and re-define demand reduction goals. Sector-specific targets for water use reductions may be developed. Define additional outreach and enforcement measures, and re-assess the possible need for temporary staffing increases to assist with outreach, monitoring and enforcement.

2. Contact Members of the Board of Water Commissioners

3. Review actions to minimize waste or perception of waste by MWC operations. Make appropriate reductions in hydrant and water line flushing without compromising water quality. Determine what internal actions can be taken for MWC to meet the percentage reduction goal being requested of other customers. Confirm that irrigation of MWC-owned sites is in conformance with requirements below.

4. Notify City of Medford officials/staff and of the changed curtailment status. Include direct notification to departments of any actions that may be relevant to their operations.

5. Notify staff and/or officials of the wholesale city and water district customers of the changed curtailment status. Inform them of water reduction goals. If possible, provide assessments of their performance in Stage 2, based on meter readings and/or observations. Remind other cities of the need to enact equivalent provisions to assure that curtailment efforts are no less intense than those imposed by MWC.

6. Consider implementation of temporary rate surcharges. These can be beneficial in promoting customer action, financing additional costs associated with curtailment (such as increased staffing, development and distribution of information materials and conservation devices), and in offsetting potential revenue losses from decreased sales.

7. Contact high use customers to encourage water use efficiency and the possible imposition of water reduction goals. Inform them of the potential future need for greater reductions, and solicit their input on how such reductions might be most equitably applied, while minimizing economic impact.

8. Contact others on the Contact List included as Attachment C, with a focus on those who will be most impacted by current and possible future curtailment actions. As deemed appropriate, meetings may be convened to enable input to be received relative to potential actions that may be taken.

9. Expand notification and outreach activities to customers as defined by the Action Team. This may include targeting specific customer groups. For example, restaurants might be encouraged to avoid serving water except upon request, and motels might be encouraged to promote reduced linen laundering. Translation and dissemination of information through Spanish-speaking media will also be pursued.

10. Monitor and report results of curtailment efforts and progress in meeting demand reduction goals. Keep MWC employees informed.

Stage 3 – Customer Actions

Except as modified below, all voluntary customer actions recommended in Stage 2 become mandatory. The following modifications and additional restrictions also may be imposed:

1. Landscape watering will be subject to some or all of the following conditions. Landscapes installed within the previous 40 days would be allowed some flexibility to enable plant establishment.

    a) Time-of-day guidelines included in Stage 2 become mandatory, except for areas

irrigated completely with drip, soaker or other watering method that applies water directly to the root zone without spray.

b) Use of hose bib mounted timing devices required when sprinkling from hoses.

c) Landscape irrigation should follow a weather-based schedule, which will be provided on the WMC Web site, the Lawn Watering Infoline and by other means. This schedule may afford preference to ornamental trees and shrubs, which if lost would take years to re-establish. Lawn sprinkling schedules might encourage dormancy, watering at a lower percentage of ET to keep roots alive, but without the goal of maintaining a uniformly green appearance.

d) Sprinkling may be limited to certain days of the week. As an example, in July, properties with even addresses might irrigate on Sunday, Tuesday and Friday, while properties with odd addresses would water on Monday, Thursday and Saturday, with no irrigation occurring on Wednesdays to facilitate refilling of reservoirs. Schedules would vary according to season and specific circumstances.

e) Sprinklers and other irrigation components shall be repaired, adjusted and operated without waste. Prohibited waste may include, but would not be limited to leaks, overspray of more than one foot onto paved surfaces, misdirected spray patterns, obvious runoff and operation at clearly excessive pressures.

2. Planting of new lawns and annual plants may be prohibited. Planting of shrubs and trees would be allowed, possibly subject to verified soil amendment and mulching (aimed at water retention) and/or irrigating with drip, soaker hose or similar root zone water application method.

3. When in use, hoses must be equipped with nozzles that direct water and shut off when not activated.

4. Require repair of all known customer leaks.

5. No washing of personal motorbikes, motor vehicles or recreational vehicles except at commercial washing facilities that practice wash water recycling, or by using a bucket and hose equipped with a shut-off nozzle for brief wetting and rinsing.

6. Except for vehicles that must be cleaned to maintain public health and welfare such as food carriers and solid waste transfer vehicles, washing of commercial vehicles shall only be done in a facility that recycles water. Washing of vehicles for sale on commercial lots may be afforded less stringent washing regulations to enable limited washing on location, but at reduced schedules that result in significantly reduced water usage levels as compared to the prior year.

7. No washing sidewalks, walkways, driveways, parking lots, tennis court, and other hard-surfaced areas, except when necessary for public health and safety or to the minimal extent necessary to loosen caked-on mud or similar circumstances.

8. Except as needed for painting or construction, no washing of buildings and structures.

9. No water for a fountain or pond for aesthetic or scenic purposes unless it recycles water and is leak free (with refill demands being equivalent to the current ET rate).

Noncompliant ponds that support fish will be afforded reasonable time to move fish or repair leaks.

10. Pools and hot tubs shall not be drained, and shall be managed to minimize the need to re-fill. This may include requirements for covering when not in use and other actions.
11. Water for initial filling of new swimming pools may be restricted. Pools already under construction prior to imposition of such regulations will be allowed to fill, but may be subject to rate and time of day restrictions.
12. Where potable water is used on golf courses, it shall be restricted to watering only tees and greens.
13. Use of potable water for dust control or street cleaning may be disallowed or made subject to regulations setting maximum frequency or rate of application.
14. Restrictions may be placed on use of water from hydrants for any purpose other than fire fighting and flushing deemed necessary to maintain water quality.
15. In addition to applicable items above, the City of Medford and wholesale city customers should adhere to the following:
    a. Amend street sweeping activities to minimize or eliminate use of potable water. If non-potable water is used, this shall be advertised on the sweeper.
    b. Fire Department should discontinue training exercises that use water
    c. Cease use of decorative fountains
    d. Reduce hours of operation or make relevant operational changes to manage water use at pools or other water recreational facilities. Cease use of any water spray recreational facility that does not re-circulate water.
    e. Continue to decrease water use at fields and facilities determined to be less critical.
    f. Retrofit restrooms in city-owned facilities with water efficient fixtures.

Stage 4: Severe Water Supply Shortage

At Stage 4, nonessential water use must be severely curtailed, and economic impacts cannot be avoided. The goals of MWC's response will be to maintain water supplies necessary for health and safety needs of the community while minimizing economic hardship.

Stage 4 – MWC Actions

MWC will respond with the following actions:

1. The Water Shortage Action Team will meet to define updated demand reduction goals, review and assess actions taken to date, and evaluate new actions to be taken. Rationing protocols should be defined and uses prioritized. For example, fire suppression and critical sanitation needs for hospitals will be among uses given the highest priority.

   If not already implemented, rate surcharges will be imposed. The need for additional

temporary staffing for expanded outreach and enforcement of mandatory water restrictions also will be re-assessed.

2. Contact members of the Board of Water Commissioners. A special Water Commission meeting may be called.

3. Re-evaluate actions to minimize waste or perception of waste by MWC operations. Make appropriate reductions in hydrant and water line flushing without compromising water quality. Consider prohibition on activation/flushing of newly installed water lines or allow only during off-peak nighttime hours. Verify that irrigation of MWC-owned sites is in conformance with requirements below.

4. Notify staff and officials of the City of Medford of the changed curtailment status and updated water reduction goals. Direct notification will be made to individual departments that may be impacted by new regulations.

5. Notify staff and officials of the cities and districts that are MWC customers of the changed curtailment status, updated water reduction goals and the continued need to maintain actions equivalent to those being taken by MWC. If possible, provide assessments of their performance in Stage 3, based on meter readings and/or observations.

6. Expand notification and outreach efforts to convey the severity of the conditions, and possibly include outreach options listed for prior stages, but not yet taken. Translation and dissemination of information through Spanish-speaking media will be continued.

7. Notify high use customers of water volume limits and rationing protocols.

8. Contact and/or meet with others on the Contact List included as Attachment C, particularly those who will be most impacted by current and possible future curtailment actions.

9. Identify possible sources of water that may be used to supplement supply for specific functions. This may include provision of non-potable water for uses such as dust control or watering of high priority landscapes or gardens.

10. Re-consider or continue distribution of low cost items identified in Stage 3 that would yield water savings and raise awareness of the water shortage situation

11. Monitor and report results of curtailment efforts and progress in meeting demand reduction goals. Keep all MWC employees informed.

Stage 4 – Customer Actions

Except as modified below, provisions imposed on customers in Stage 3 will remain in effect, and options listed in that stage but not implemented, will be re-assessed. The following additional or modified measures may also be adopted:

1. Water volume limits may be imposed on all customers.

2. Further restriction of landscape irrigation, with regulations to be provided on the WMC Web site, the Lawn Watering Infoline and other potential venues, are as follows:

a. Watering of turf may be prohibited or allowed only one day per week to keep roots alive while grass goes dormant.

b. Shrub watering will follow a restrictive schedule, reflective of current ET or a fraction thereof, along with plant survival needs.

c. Tree watering shall be accomplished with use of soaker hoses or similar methods that apply water directly to the root zone, rather than broadcast spraying. Frequency and volume allowed will be established through consultation with the City of Medford's Arborist and/or other tree experts. Use of non-potable water for this purpose may be encouraged.

d. Time-of-day watering provisions imposed in Stage 3 remain in effect for all spray irrigation.

e. Use of hose bib mounted timing devices will be required when irrigating from hoses.

f. Sprinkling will be limited to certain days of the week. Allowances will vary according to season and plant type.

g. Sprinklers and other irrigation components must be repaired, adjusted and operated without waste as defined in Stage 3.

h. Exceptions to these regulations may be granted at the discretion of the Manager upon documentation that the landscape was installed within the previous 40 days or is deemed a high priority public use area.

3. No planting new landscapes during Stage 4.

4. No construction or installation of new pools or hot tubs shall be initiated during Stage 4, and existing pools and hot tubs may not be drained to less than 90% of capacity and refilled. Further restrictions on filling of pools and hot tubs might also be imposed. Exceptions may be granted by the Manager if the pool or hot tub's use is required by a medical doctor's prescription or is deemed a high priority community recreational or health facility.

5. No water for a fountain or pond for aesthetic or scenic purposes unless necessary to support fish, and is leak free as defined in Stage 3. Measures shall be taken to move fish to aquariums or other smallest reasonable tub or ponds.

6. Except for vehicles that must be cleaned to maintain public health and welfare such as food carriers and solid waste transfer vehicles, washing of vehicles shall only be done in a facility that recycles water. This shall apply to all vehicles, including motorbikes and recreational vehicles, whether or not personal, commercial or displayed on sales lots.

7. No potable water use for dust control or street cleaning.

8. Stop serving water in restaurants unless requested by the customer. This action generates awareness for curtailment, and reduces use of water for washing glasses.

9. Hotels and motels shall discourage daily linen replacement by providing procedures

for guests to opt for less frequent laundering.

10. No new water line extension work shall be initiated except as approved by MWC.
11. No use of water from hydrants except for fire fighting and flushing deemed necessary to maintain water quality.
12. No water running to waste onto paved surfaces or into gutters.

Stage 5: Emergency Water Supply Disruption

Stage 5 reflects an extreme circumstance in which water available is considerably less than normal demands, and it is imperative that all customer sectors participate in immediate demand reductions. This situation is most likely to result from a sudden event that severely impacts a major system component or affects multiple system components simultaneously. Examples might include failure of a transmission main or intake structure, a chemical spill impacting a water source, a malevolent attack on the system or multiple failures resulting from an earthquake or flood. However, a less dramatic event such as an extended power outage affecting the Duff Treatment Plant, but not the majority of customers, could also lead to sudden and significant curtailment needs.

Stage 5 – MWC Actions

The goals of MWC's response are to avert system shut-down, and prevent adverse health and safety impacts to the community. MWC will respond with the following actions:

1. The Water Shortage Action Team will convene to define demand reduction needs, and critical actions to be taken. Rationing protocols will be defined and water uses prioritized. Fire suppression and critical sanitation needs for hospitals will be among the uses given the highest priority.
2. Members of the Board of Water Commissioners will be contacted. An emergency Water Commission meeting may be called.
3. Notify the local news media to request their assistance in notifying the public of the severity of the situation. This will include dissemination of information through Spanish-speaking media.
4. Contact staff and officials of the City of Medford and of the cities and districts that are MWC customers. Inform them of water rationing determinations.
5. Contact the largest customers to inform them of applicable water rationing.
6. Mobilize MWC resources to perform rigorous public outreach and enforcement.
7. If deemed necessary, contact local law enforcement and fire departments to enlist help in notifying customers.
8. If water in the system is unsafe to drink, the Oregon Drinking Water Program will be contacted, and their assistance requested for responding to the problem.
9. If applicable, consider options for renting a water hauling truck and purchasing water from nearby communities, sending customers to a pre-designated water distribution

location, and supplying bottled water.

Stage 5 – Customer Actions

Customer water use restrictions in Stage 5 will include those listed in Stage 4, except as modified below:

1. Water volume limits will be imposed on all customers.
2. No irrigation of landscapes with potable water. If Stage 4 remains in effect for an extended duration, and ongoing actions are proving successful in adequately maintaining reservoir levels, limited watering directly to the root zones of significant large trees and shrubs may be exempted from this ban. Frequency and volume allowed will be established through consultation with the City of Medford's Arborist and/or other tree experts. Use of non-potable water for this purpose may be encouraged.
3. No construction or installation of new pools or hot tubs shall be initiated, and existing pools and hot tubs shall not be drained and refilled. No water to refill swimming pools or hot tubs. Exceptions may be granted by the Manager if the pool or hot tub is deemed to serve an important community health function.
4. Strengthened rate surcharges will be imposed, particularly if Stage 5 curtailment is anticipated to be in place for an extended period.

Variances

MWC may, in writing, grant temporary variances for prospective uses of water otherwise prohibited after determining that because of unusual circumstances, failure to grant such variance would cause undue hardship or would adversely affect the health or safety of the applicant or the public. Variance requests shall be made directly to a management level employee designated by the MWC Manager.

Penalties

Violations of regulations identified in the Stages 3 through 5 may be enforced by MWC as follows:

1. First violation: Notice of Violation issued advising of the violation and informing of sanctions to be imposed if violations continue.
2. Second violation: a fine which is the greater of $75 or 20% of the customer's water charges for the prior month.
3. Third violation: a fine which is the greater of $150 or 40% of the customer's water charges for the prior month.
4. Fourth and subsequent violations: a fine which is the greater of $300 or 80% of the customer's water charges for the prior month.

5. Depending upon the magnitude of curtailment in effect, reasonable time will be provided for offenses to be corrected. However, each day during which a violation occurs may be deemed a separate offense.

6. All fines will be added to monthly water charges. Failure to pay fines with associated monthly water bills may be regarded as an overdue water bill, with reminder notices and shut-off provisions applied as if payment of regular charges had not been made.

7. MWC may dispense with fines and terminate water service after the second violation if water waste is blatant and the offending party expresses a disregard for correction. A Notice of Intent to Terminate Water Service shall be delivered as set forth in #8 below at least 24 hours prior to termination of service. Disconnected service will be restored if the customer does the following:

    a. Pays 50% of the amount owing on fines, as well as fees normally charged for restoration of service following termination for nonpayment of water bills. The remainder of the fine(s) may be paid with subsequent water bills.

    b. Gives suitable assurances to the MWC that the action causing the disconnection will not be repeated.

    c. In addition to the foregoing, the MWC may, prior to restoration of services, install a flow-restrictor device on the customer's service.

8. MWC will deliver notices of violation, fines and intent to terminate service to the occupant(s) of the premises or offending parties. If no occupant is present, MWC will leave the notice at the premises by a door hanger or similar means. MWC will also attempt to leave a phone message and/or mail notices by regular mail to the occupant at the address of the subject premises where the violation has occurred. If possible, efforts will also be made to notify the property owner or manager, if different from the occupant.

9. Provisions relative to termination of water service as set forth in #7 above do not apply to water service temporarily shut off in order to immediately eliminate significant waste when the occupant of the premises has not received full notification as set forth herein and is not at the premises to notify at the time of shutoff. Such shutoffs will not require notice, and will not be subject to reconnection terms set forth in #7, but may qualify as a violation subject to fines.

Appeals

Every party is entitled to go through the appeal process defined in Section 10 of the "Regulations Governing Water Service" handbook. This shall apply to appeals of variances denied as well as fines imposed. When fines are appealed, 50% of the fine shall still be paid when due, with the remainder being deferred until a final decision is rendered on the appeal. Any amount paid that is overturned on appeal will be credited to the water account to which it was charged.

Modifications

MWC may modify or revise this plan, or any portion if deemed appropriate. Modifications of the plan can be approved by majority consent of the Board of Water Commissioners.

This policy is intended to conform to all applicable Federal and Oregon State statutes. If any part is now, or becomes, in conflict with said statutes, only that portion which is determined to be in violation shall become invalid.

ATTACHMENT A

Relevant Provisions from Regulations Governing Water Service

The Medford Water Commission has the authority to terminate service and implement non-voluntary curtailment or suspensions of water service under the *"Regulations Governing Water Service"* handbook. Following are brief descriptions of sections of these regulations relevant to curtailment actions. Portions of this document may be revised to better conform with this plan.

Section 6.12 Waste of Resource

This section provides procedures for addressing leak and waste abatement. While in later curtailment stages, the imposition of penalties would likely take priority over the provisions of this section, this section includes procedures that might be employed during lower stages of curtailment.

Section 9 Discontinuance of Service

Procedures and fees are set forth for termination and resumption of service, which are referenced within the Curtailment Plan.

Section 10 Appeals

While generally reflective of appeals of bills, procedures set forth in this section can be applied to appeals associated with the Curtailment Plan.

Section 15 Interruptions, Curtailments, Fluctuations and Shortages

This section addresses the Commission's commitment to supply satisfactory and continuous water service, but recognizes that there will at times be some degree of failure, interruption, or curtailment. It is further stipulated that MWC cannot and will not guarantee constant or uninterrupted delivery of water service and shall have no liability to its customers or any other persons for such interruptions.

ATTACHMENT B

Water Shortage Action Team

The following shall comprise the Water Shortage Action Team, with responsibilities as identified. This team will convene and meet regularly to assess water supply, distribution and demand whenever it appears that a curtailment order may be necessary, as defined within this Curtailment Plan:

- Manager will contact
  - Commissioners
  - City Manager
  - Water Shortage Action Team members
- Water Quality Superintendent will
  - Monitor water quality
  - Maintain production at Duff WTP
- Operations Superintendent will
  - Monitor the distribution system, including reservoirs and pump stations
  - Maintain production at Big Butte Springs
- Public Information Coordinator will
  - Prepare and distribute press releases, and meet with media as spokesperson
  - Notify other cities and water districts
  - Prepare other public information materials
- Information Services/Customer Service (IS/CS) Administrator will
  - Obtain information from Public Information Coordinator and Manager
  - Staff office to handle customer inquiries
  - Monitor payment status of penalties, surcharges
  - Switch phones from call forward if necessary
- Principal Engineer will
  - Be available to assist in all areas as directed by the Manager

All team members will keep the Manager informed on a regular basis.

The following additional MWC staff will also participate as part of the Water Shortage Action Team when it appears that additional staffing, expenses, and surcharges will become applicable:

- Finance Administrator will
  - Keep team informed about financial impact of curtailment actions
- Human Resources/Payroll Specialist will
  - Assist with hiring of additional staff if determined to be necessary
  - Advise on status of employee overtime resulting from curtailment

- Technical Services Coordinator
  - Inform team on relevant computer tasks that may be appropriate
  - Modify billing programs as necessary to accommodate surcharges and penalties.

Additional parties may also be added to this team as deemed appropriate.

ATTACHMENT C

Contact List

The following is a working list of contacts for easy reference in the event of imposition of curtailment actions. It will be updated and modified by the Public Information Coordinator as deemed necessary. In addition to communication actions aimed at the general public, the following will be contacted directly as appropriate:

City of Medford Contacts:

- City Manager
- Department Directors

Customers:

- Wholesale customers
- Commercial, industrial and institutional customers
  - Highest water users
  - Schools
  - Domiciliary

Health Professionals:

- Jackson County Health Department
- Oregon Dept of Human Services, Drinking Water Program
- Hospitals

Landscape Interests:

- Landscape contractors
- Landscape architects
- Nurseries
- Landscape maintenance firms

Miscellaneous business interests:

- Chamber of Commerce
- Car Washes
- Swimming pool contractors
- Construction industry: commercial and utility contractors, Homebuilder's Assoc.
- Rental management firms

SECTION 5

Water Supply Element

SECTION 5

Water Supply Element

Delineation of Service Areas

The MWC service area includes the City of Medford, three water districts located near Medford, and the unincorporated community of White City to the north of Medford. There are also a limited number of small enclaves of outside customers, most of whom were once within now-dissolved water districts. **Exhibit 5-1** identifies Medford's Urban Growth Boundary (UGB) and its proposed Urban Reserve Area (URA). These are the areas into which the city is projected to grow within the next several years, with the UGB representing MWC's likely service area in the short term.

The areas delineated as the proposed Urban Reserve Area (URA) for the City of Medford are future growth areas identified through an ongoing, regional, long-term planning project known as Regional Problem Solving (RPS). These growth areas, shaded purple on Exhibit 5-1, represent lands into which Medford will grow over a time horizon of approximately fifty years, although some of these lands may be added to the UGB upon culmination of the RPS project. While the RPS planning project is not yet final, the boundaries shown are the result of several years of hearings and have been consistent for some time. The map is therefore believed to represent a reasonable future service area for the purposes of this report.

MWC also provides water to five other cities on a wholesale basis. These cities are not included in Exhibit 5-1 These cities are responsible for their own water management and conservation activities. Further, as stated in Section 2, by 2015 the other cities served by MWC are required to secure water stored in Lost Creek Reservoir or provide other comparable water rights sufficient to meet their summertime demands. These cities likely will continue to rely on water rights held by MWC to meet winter demands, and on MWC's water treatment and distribution infrastructure year round.

Because the City of Ashland has paid to oversize the pipeline currently serving Talent and Phoenix, and is in the process of securing water from Lost Creek Reservoir, Ashland is expected to extend a connection to the MWC water system in the future. If that occurs, Ashland would rely on MWC water to supplement existing supplies.

Population Projections

Methodology

Per capita demands for 2005 were estimated from historical water demand and service area population estimates for MWC's retail and wholesale customers, and were presented in Section 2, Exhibits 2-20 and 2-21. These values were assumed to remain constant throughout the planning period, and future demands were projected by multiplying per capita values by projected service populations.

Per capita values represent the system demand divided by service population. Therefore, they include residential, commercial, industrial, and municipal demands as well as unaccounted for water. As noted above, and in Section 2, MWC serves a variety of customers: retail customers include individual customers inside and outside the City of Medford's city limits, including residents of unincorporated White City, and wholesale customers include four water districts surrounding Medford and five nearby cities.

In general, assuming that per capita demands remain constant provides a reasonable estimate of future demand. However, this approach assumes that the proportion of residential to other types of demand remains relatively constant with time. Over the past 22 years, the overall per capita demand decreased, largely because of reductions in industrial water use. If future changes occur, for example the loss or addition of a high-water demand industry, per capita values will need to be adjusted. Conservation activities also are expected to impact per capita use levels somewhat during the planning period. However, since the magnitude of such reductions is currently unknown, impacts of conservation have not been incorporated into projections.

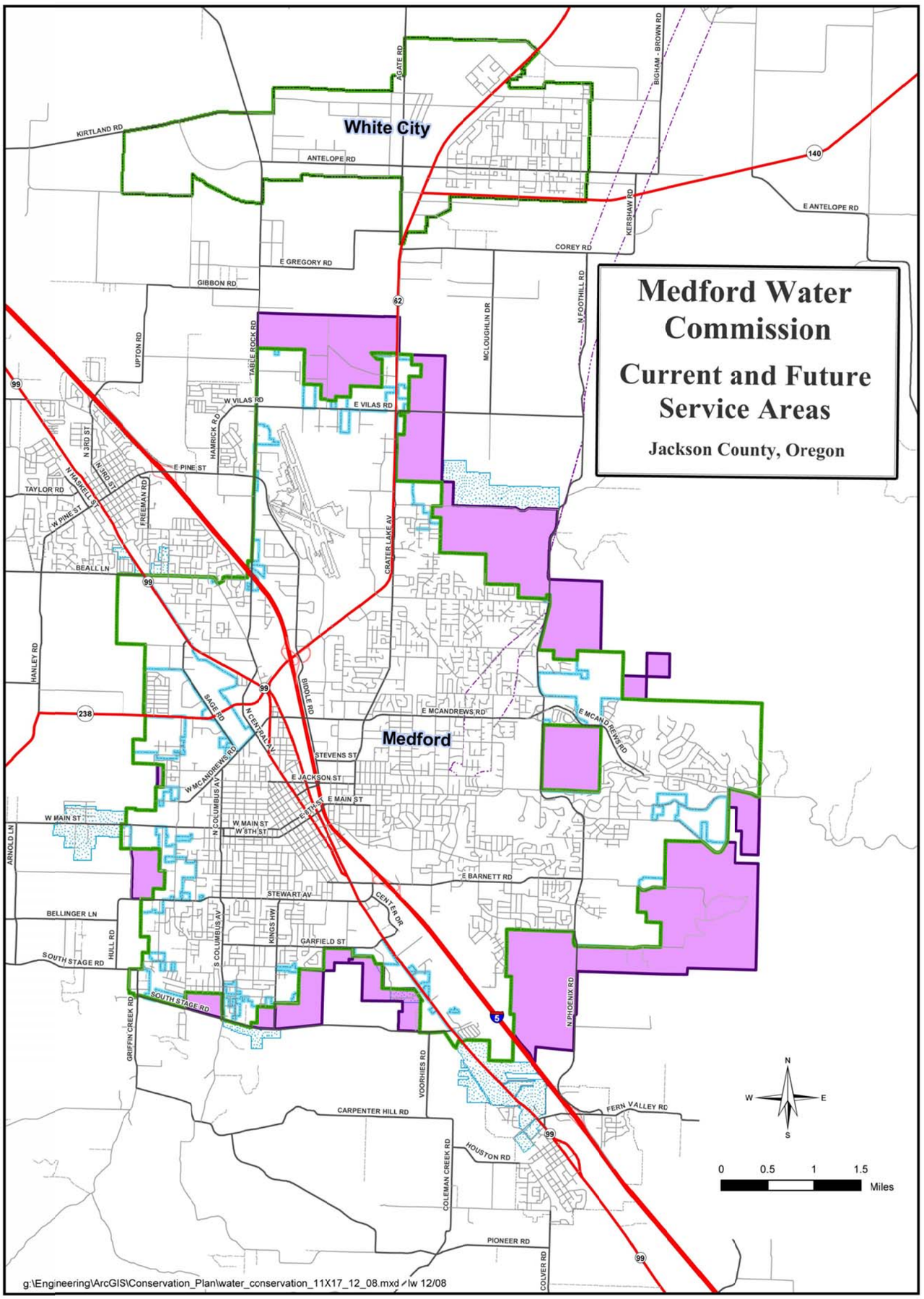
Population Forecast

On February 22, 2007 Jackson County approved updated population forecasts for their Comprehensive Plan in accordance with ORS 195.036. ECONorthwest developed various scenarios in which population was allocated to each community. The county's Planning Commission endorsed an allocation that increased the baseline population for Jackson County by 3 percent over the Oregon Office of Economic Analysis's population forecast for Jackson County for the period 2005 to 2040. This population was then allocated between jurisdictions.

The resulting population projections were used to estimate average annual growth rates for the periods 2005 to 2026 and 2026 to 2040 to apply to communities receiving water service from MWC. To determine growth rates beyond 2040, MWC staff provided 2056 population estimates based on allocations to cities pursuant to the ongoing, long term RPS regional planning project using population estimates dated January 27, 2006. Eagle Point's 2056 population estimate was increased slightly over the RPS forecast, however, because the 2040 allocation by Jackson County exceeded the RPS 2056 forecast. The 2056 population for the City of Phoenix was also increased from the RPS allocation to include annexation of some of the population now served by the Charlotte Ann Water District.

Exhibit 5-2 presents the criteria used to project service area populations for the retail and wholesale customers of MWC. As discussed in Section 2, service area populations were based on United States Census and Portland State University (PSU) population estimates for the various jurisdictions. These estimates were then adjusted to subtract households that were located within jurisdiction boundaries but not receiving water service from that entity, or adding households located outside of boundaries that were receiving water service. Since areas served outside of corporate boundaries (water districts and outside customers) are not evaluated by PSU, and Census boundaries do not align with their service areas, MWC staff determined the baseline populations for these customer groups. The service population for Ashland includes only a portion of this city's population in recognition that if a connection is made to Ashland, it would only supplement this city's existing water supplies.

EXHIBIT 5-1
City of Medford Existing Service Area (Medford Urban Growth Boundary and White City Unincorporated Community Boundary) and Proposed Future Service Area (Urban Reserve Area)



Legend

- City Limits
- Medford Urban Growth Boundary/ White City Unincorporated Community Boundary
- Proposed Urban Reserve for Medford
- Remnants of Water Districts (some dissolved) outside Medford Growth Boundaries
- Big Butte Springs Transmission Lines

MEDFORD WATER COMMISSION

Medford Water Commission
Data produced by City of Medford, Jackson County
December 2008

EXHIBIT 5-2
Growth Rates and Demand Factors for MWC

Criteria	Ashland[1]	Central Point	Eagle Point[2]	Jacksonville[3]	Medford	Phoenix[4]	Talent[8]	White City	Outside customers[6]	Water Districts[6]
2005 Service Area Population[1] =	-	15,632	7,619	2,636	70,534	4,432	6,339	7,070	760	3,860
AA Growth Rate 2005-2026[2] =	-	2.0%	3.9%	1.5%	2.2%	2.0%	1.5%	2.2%	-1.3%	-0.8%
AA Growth Rate 2012-2026[2] =	3.2%	-	-	-	-	-	-	-	-	-
AA Growth Rate 2026-2040[2] =	4.6%	1.9%	1.7%	1.8%	1.3%	1.3%	1.1%	1.0%	-1.8%	-0.4%
AA Growth Rate 2040-2056[2] =	2.3%	1.1%	1.0%	0.2%	1.3%	2.3%	0.7%	0.9%	-0.7%	-4.9%
Per Capita ADD (gpcd)[3] =	200	174	158	241	246	170	114	568	568	370
Per Capita MMD (gpcd)[3] =	-	361	321	547	463	337	201	934	934	614
Per Capita MDD (gpcd)[3] =	400	415	369	629	532	387	232	1,074	1,074	707

1 "Service Area Population" reflects an adjustment to the cities' population to add households outside of city limits who receive water service and/or subtract city residents who do not receive water service from the city. See Exhibit 2-20 for detailed analysis.

2 AA Growth Rate = Average Annual Growth Rate. Preliminary population estimates for developed by ECONorthwest during 2006 were used to estimate average annual growth rates to apply to these communities for the periods 2005 to 2026 and 2026 to 2040. Growth rates beyond 2040 were estimated from population estimates dated January 27, 2006 from the RPS process.

3 See Exhibit 2-21 for calculations of per capita demands.

4 The City of Ashland is not currently served by MWC, but future service to supplement Ashland's water supply is possible and should be planned for. Growth rates reflect growth in water service population, not Ashland's overall population.

5 Eagle Point's 12 residences (estimated 34 people) outside city limits in 2005 were assumed to be annexed to the city by 2026.

6 Jacksonville's 2005 population was adjusted by 146 additional people, based on 74 residences served outside city limits and 6 houses inside water service. It was assumed that by 2026, the 6 residences not currently served will be, but that 6 outside customers will be within city limits, resulting in no net change. The remaining 68 customer accounts outside city limits are located along a pipeline beyond proposed growth boundaries. This population was assumed to remain outside and constant through 2056.

7 Most of Charlotte Ann Water District is within the proposed Urban Reserve Boundary for City of Phoenix. However, recent Jackson County official population projections to 2040 do not accommodate annexation of much, if any of this area. Due to this omission, assumed annexations from Charlotte Ann to Phoenix herein fall between 2040 and 2056, resulting in an anomalous population increase for Phoenix and corresponding large population decline for Districts during this time frame.

8 The 35 houses (estimated 84 people) receiving outside water service from Talent are well beyond the city's growth boundaries and were assumed to remain outside city limits through 2056.

Estimated average annual growth rates for each period were applied to baseline 2005 service area populations to project future service area populations:

(1) $P_t = P_{t_0}(1+R)^{(t-t_0)}$

Where

P_t = service area population at time, t
P_{t0} = service area population at time, t_0
R = average annual growth rate.

Although MWC and some of its city wholesale customers continue to honor service arrangements with existing customers located beyond corporate limits, MWC policies generally limit further extension of water service beyond current and future urban boundaries. Service area population growth is therefore expected to occur within these urban entities, rather than as individual outside customers or within water districts. As city boundaries grow, many individual and water district customers are likely to be annexed. Therefore the number of individual outside customers and water district populations should decline. MWC staff provided estimates for expected changes in service population for the water districts and individual outside customer category.

Exhibit 5-3 presents projected service area populations.

EXHIBIT 5-3
Projected MWC Service Area Populations[1]

Community	2005	2026[3]	2040[3]	2056[4]
Ashland[2]	0	1,500	2,800	4,000
Central Point	15,632	23,863	31,221	36,981
Eagle Point[5]	7,619	16,955	21,449	24,999
Jacksonville[6]	2,636	3,543	4,529	4,646
Medford	70,534	110,522	132,792	163,257
Phoenix[7]	4,432	6,675	8,032	11,500
Talent[8]	6,339	8,556	9,900	11,083
White City	7,070	11,200	12,960	15,000
Outside customers[9]	760	583	450	400
Water Districts[9]	3,860	3,260	3,080	1,380
Total	**118,882**	**186,656**	**227,214**	**273,247**

1 "Service Area Population" reflects an adjustment to the cities' population to add households outside of city limits who receive water service and/or subtract city residents who do not receive water service from the city. See Exhibit 2-20 for detailed analysis.

2 MWC staff suggested assuming that beginning in 2012, Ashland would receive Commission water service sufficient for 1000 residents, increasing to 1,500 residents in 2026, 2800 in 2040 and 4000 in 2056.

3 2026 and 2040 base population projections for cities (and unincorporated White City) are pursuant to a recent Jackson County Update to Population Element. These were adjusted only to arrive at Service Area Population as described in Notes 1, 6, 7, 8 & 9.

EXHIBIT 5-3
Projected MWC Service Area Populations[1]

Community	2005	2026[3]	2040[3]	2056[4]

[4] 2056 population projections for cities and unincorporated White City are pursuant to RPS allocations except for 1) adjustments for Service Area populations, 2) Eagle Point population was increased to better correlate with Jackson County 2040 projection and 3) Phoenix, for which the allocation herein assumes annexation and absorption of some population for Charlotte Ann Water District, which has not been recognized in RPS projections.

[5] Eagle Point's 12 residences (estimated 34 people) outside city limits in 2005 were assumed to be annexed to the city by 2026.

[6] Jacksonville's 2005 population was adjusted by 146 additional people, based on 74 residences served outside city limits and 6 houses inside water service. It was assumed that by 2026, the 6 residences not currently served will be, but that 6 outside customers will be within city limits, resulting in no net change. The remaining 68 customer accounts outside city limits are located along a pipeline beyond proposed growth boundaries. This population was assumed to remain outside and constant through 2056.

[7] Approximately 228 residents of the City of Phoenix currently receive water service from the Charlotte Ann Water District, not from the city. It was assumed that this population would be connected to the City of Phoenix water system by 2026. The proposed Urban Reserve Boundary (per RPS) also includes most of the remainder of the Charlotte Ann Water District. It was assumed that approximately 1600 people from this district would annex to and become customers of Phoenix by 2056.

[8] The 35 houses (estimated 84 people) receiving outside water service from Talent are well beyond the city's growth boundaries and were assumed to remain outside city limits through 2056.

[9] All projections relative to water districts and outside customers are per MWC staff estimates.

Water Demand Forecast

Exhibit 5-4 summarizes future ADD, MMD, and MDD values for 2005, 2026, 2040 and 2056. The overall system ADD is projected to be 45 mgd (70 cfs) by 2026 and 65 mgd (101 cfs) by 2056. The overall system MDD is projected to approach 97 mgd (150 cfs) by 2026 and 141 mgd (218 cfs) by 2056. Other cities' MDDs represent an increasing percentage of overall system MDD from approximately 23 percent in 2005 to 26 percent by 2056. **Exhibit 5-5** graphically displays the projected individual and system-wide MDDs for the initial 20-year planning period. **Exhibit 5-6** shows the projected MDD for the entire MWC system, and for the entire system excluding the MDDs of other cities.

As noted, these projections are based on current use patterns, and do not consider water savings from conservation measures, or changes in the types of water customers. The effects of conservation measures implemented as a result of this plan will be incorporated in future projections.

EXHIBIT 5-4
Summary of Projected Demands (mgd)

	2005			2026			2040			2056		
Community	**ADD**	**MMD**	**MDD**	**ADD**	**MMD**	**MDD**	**ADD**	**MMD**	**MDD**	**ADD**	**MMD**	**MDD**
Ashland	0.0	-	0.0	0.3	-	0.6	0.6	-	1.1	0.8	-	1.6
Central Point	2.7	5.6	6.5	4.1	8.6	9.9	5.4	11.3	13.0	6.4	13.4	15.4
Eagle Point	1.2	2.4	2.8	2.7	5.4	6.3	3.4	6.9	7.9	4.0	8.0	9.2
Jacksonville	0.6	1.4	1.7	0.9	1.9	2.2	1.1	2.5	2.8	1.1	2.5	2.9
Medford	17.3	32.7	37.6	27.2	51.2	58.8	32.6	61.5	70.7	40.1	75.6	86.9
Phoenix	0.8	1.5	1.7	1.1	2.2	2.6	1.4	2.7	3.1	2.0	3.9	4.5
Talent	0.7	1.3	1.5	1.0	1.7	2.0	1.1	2.0	2.3	1.3	2.2	2.6
White City	4.0	6.6	7.6	6.4	10.5	12.0	7.4	12.1	13.9	8.5	14.0	16.1
Outside Customers	0.4	0.7	0.8	0.3	0.5	0.6	0.3	0.4	0.5	0.2	0.4	0.4
Water Districts	1.4	2.4	2.7	1.2	2.0	2.3	1.1	1.9	2.2	0.5	0.8	1.0
Total	**29.2**	**54.6**	**62.8**	**45.2**	**84.1**	**97.4**	**54.4**	**101.2**	**117.5**	**64.9**	**120.8**	**140.6**

MDD = MMD multiplied by the system-wide MDD/MMD peaking factor (1.15).

EXHIBIT 5-5
Projected MDD contributed by customers served by MWC

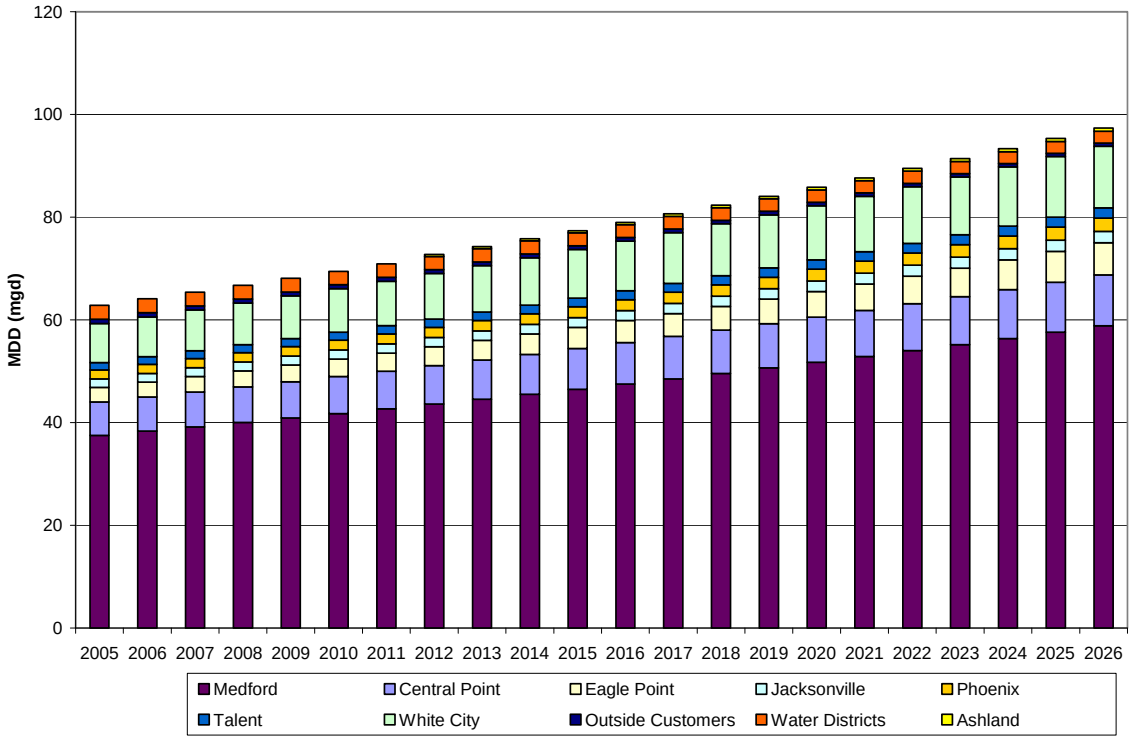
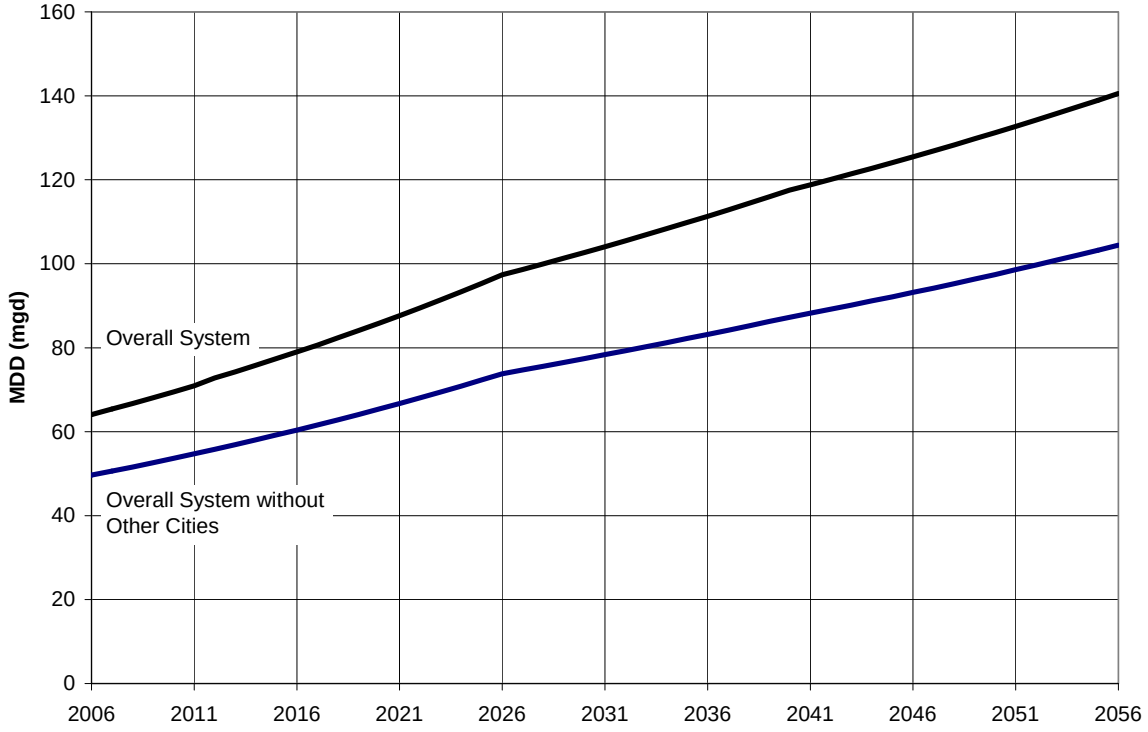


EXHIBIT 5-6
Projected Overall System MDD and Overall System minus Other Cities MDD



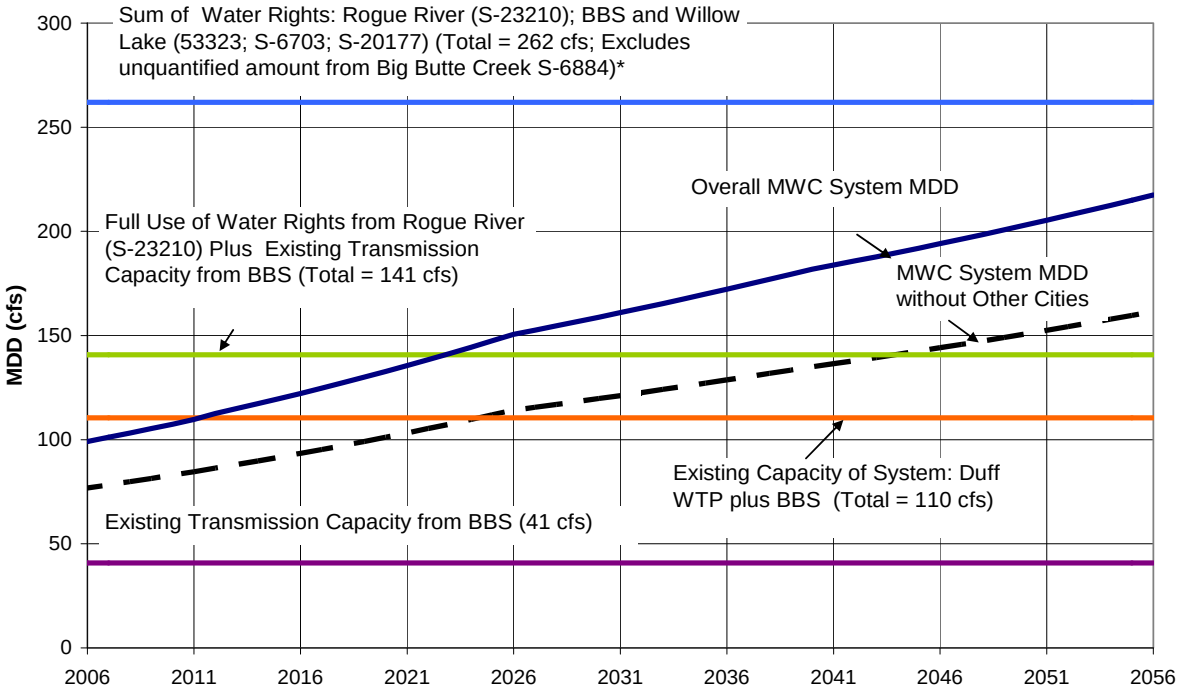
Schedule to Exercise Permits and Comparison of Projected Need to Available Sources

Exhibit 5-7 displays the peak demand curves from Exhibit 5-6 with demand in units of cfs instead of mgd. Also shown in Exhibit 5-7 are current system production constraints and water rights. The existing transmission pipeline capacity shown on Exhibit 5-7 assumes a supply from the Big Butte Watershed equal to or greater than the 41 cfs (26.4 mgd) pipeline capacity. As indicated in Section 2, this supply was limited to 31 cfs (20 mgd) in June of 1992. **Exhibit 5-8** shows the same demand projections along with supply constraints at BBS from possible drought conditions.

As shown in Exhibits 5-7 and 5-8, the projected overall system MDD approaches the limit of the existing system capacity by 2012, or earlier if the BBS supply is reduced from its typical value, as it was in 1992. MWC plans to expand its WTP capacity from 70 cfs (45.2 mgd) to 100 cfs (64.6 mgd) to make full use of the Rogue River water right (Permit S-23210) by approximately 2012.

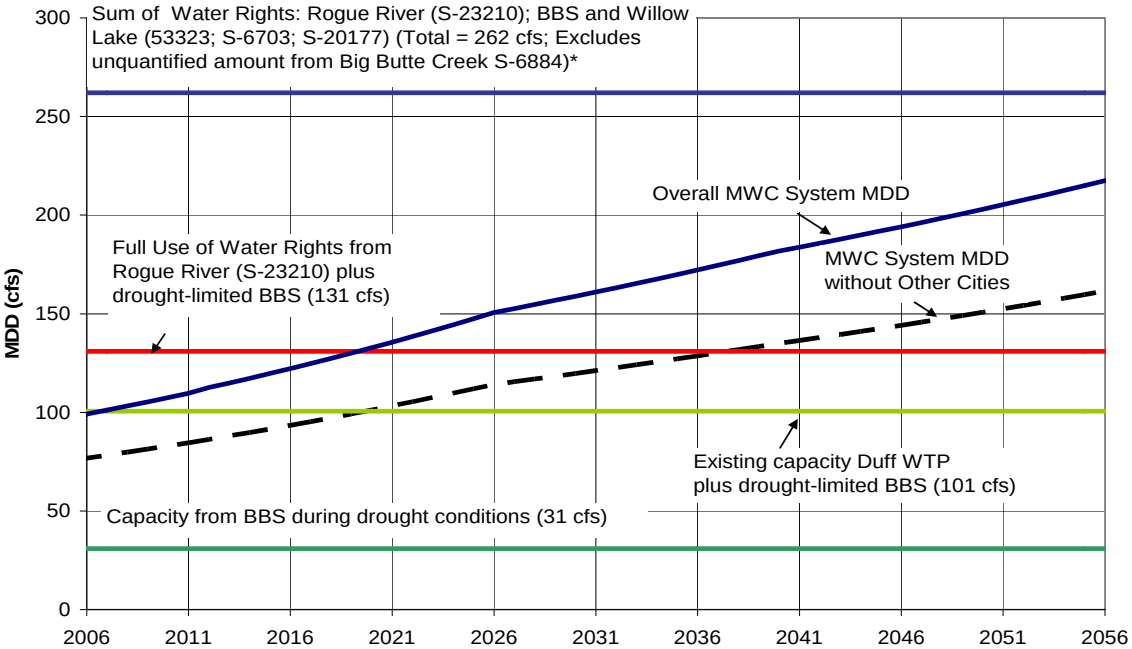
With this WTP capacity expansion, the MWC system will fully use from 131 to 141 cfs that represents all 100 cfs from the Rogue River and the 31 to 41 cfs currently available from BBS by between 2020 and 2023. The MWC has required other cities which it serves to obtain water rights sufficient for their 2020 projected MDDs by 2015. Excluding the water needs of the other cities, MWC's projected peak demands would reach the 131 to 141 cfs capacity by between approximately 2037 and 2044.

EXHIBIT 5-7
Demand Projections Compared to Capacity Limits and Water Rights



* Because of MWC's aggreement with Eagle Point Irrigation District, and potential weather-related limitations on the BBS supply during summer months, the actual quantity of water available to meet peak demand may be lower than the sum of the water rights shown here.

EXHIBIT 5-8
Demand Projections Compared to Capacity Limits and Water Rights if BBS is Drought Limited



* Because of MWC's aggreement with Eagle Point Irrigation District, and potential weather-related limitations on the BBS supply during summer months, the actual quantity of water available to meet peak demand may be lower than the sum of the water rights shown here.

Prior to 2020, MWC will need to evaluate future expansion of treatment capacity on the Rogue River, using water rights supplied by other cities, or expansion of use of the BBS supply. Because of the large expense associated with adding to or replacing the transmission pipelines to BBS, expansion of this source is likely to be postponed until the existing pipelines need to be replaced. Future expansion of the BBS supply could provide additional water during the winter months, but because of weather-related limitations, the BBS may not provide additional supply during the peak use periods illustrated in Exhibits 5-7 and 5-8. As a result, increasing the pipeline capacity may not be justified.

The reliability of the city's permitted water sources, the Rogue River and Big Butte Springs were evaluated in Section 2 of this WMCP. MWC's Rogue River water right is not subject to regulation for senior users and does not appear to be constrained by low streamflows. The reliable supply from BBS is 25 to 35 mgd or 39 to 54 cfs. During a drought condition in 1992, this right only provided approximately 20 mgd (30.1 cfs).

Alternative Sources

As noted above, the MWC has access to two reliable water sources. MWC is planning an initial expansion of its Rogue River water source, and is contemplating future expansions to meet the overall system 20-year demand projections.

The MWC is committed to minimizing impacts resulting from its use of the Rogue River and will engage in all necessary state and federal permitting to move forward. The MWC is also committed to the wise management and conservation of its Rogue River water source as outlined in the conservation measures in Section 3 of this WMCP. These measures, most of which provide water at a cost greater than use of the Rogue River, will delay but not replace the need to exercise permit S-23210 and other Rogue River water rights supplied by other cities.

MWC will continue to maximize its use of the high quality BBS source to the extent possible. The economic impact of expansion of diversion of MWC's BBS water rights (Permits S-6703, S-6884, and S-20177) will be reevaluated periodically.

The use of either local groundwater or aquifer storage and recovery (ASR) to store water available in the winter for use during peak summer demands are not seen as feasible alternatives. The hard rock geology of the Medford area does not provide reliable well yields and is not suitable for ASR.

As discussed in the Water Conservation element (Section 3), reuse of treated wastewater for agricultural purposes is being considered as part of a regional project known as WISE (Water for Irrigation, Streams, and Economy). Therefore this water source currently is not being considered for municipal use.

A number of conservation actions identified in Exhibit 3-1 will be undertaken to reduce the need for additional water resources. While conservation activities will be pursued with cost-benefit considerations, the findings of the cost-benefit analyses described in Exhibit 3-2 and Appendix C suggest that the identified conservation activities will not provide water at a cost that is lower than other supplies.

MWC also may consider the following alternate sources of water in the future:

1. Acquisition and conversion of agricultural natural flow and/or stored water rights
2. Conversion of agricultural water rights appurtenant to MWC-owned land on the BBS watershed to municipal use
3. Purchase of stored water in Lost Creek Reservoir
4. Implementation of additional conservation measures, including those discussed in Appendix B

Quantification of Maximum Rate and Monthly Volume

OAR 690-086-0170(6) requires a quantification of the maximum rate of withdrawal and maximum monthly use if expansion of water allocated under an existing permit is necessary to meet demands in the 20-year planning horizon. As described above and illustrated in Exhibits 5-8 and 5-9, the MWC's overall system water demand could reach an MDD of 151 cfs (97.4 mgd) within 20 years. **Exhibit 5-9** shows projected overall monthly production requirements and the portion supplied from BBS in 2026. The portion of the monthly supply above the 26.4 mgd capacity of BBS, indicated as a line on Exhibit 5-9, must be supplied by the Duff WTP on the Rogue River. The projected monthly demands shown in Exhibit 5-9 were estimated by applying the current monthly percentages of annual use, presented in Section 2 Exhibit 2-12, to the projected 2026 ADD of 45.2 mgd. **Exhibit 5-10** summarizes projected 2026 maximum withdrawal rates and maximum monthly volumes associated with MWC water rights.

EXHIBIT 5-9
MWC Monthly Demand Projections for 2026. Rogue River Supply needed year-round/

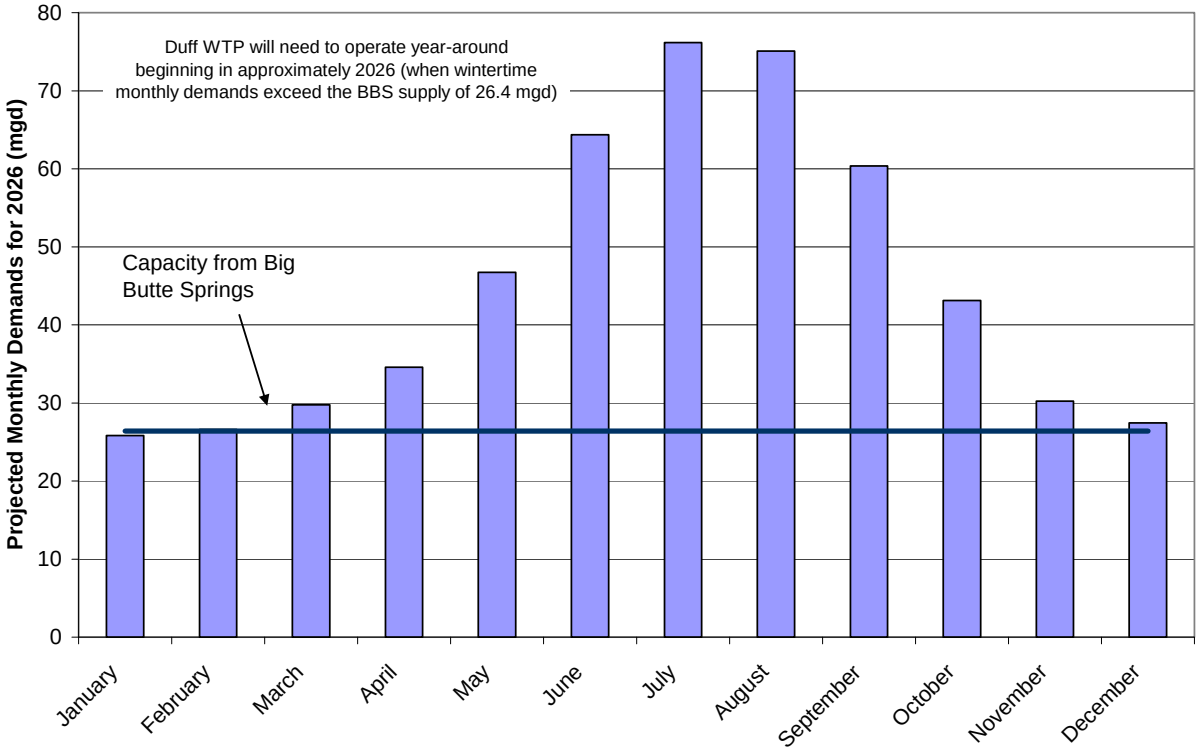


EXHIBIT 5-10
Summary of MWC's Use of Municipal Water Rights by 2026

Source	Water Right Information	Permitted Quantity (cfs)	Estimated Maximum Rate of Withdrawal in 2026 (cfs)	Estimated Maximum Month Withdrawal Volume in 2026 (MG)
Big Butte Creek Watershed 1				
Big Butte Springs.	App: S-10119 Permit: S-6704 Cert: 53323	30	30	601
Big Butte Springs	App: S-8092 Permit: S-6703	30	10.8	216
Big Butte Springs	App: S-10120 Permit: S-6884	"All remaining unappropriated water."	0	0
Subtotal BBS			**40.8**	**818**
Rogue River 2				
Rogue River	App: S-29527 Permit: S-23210 and rights supplied by other cities	S-23210 is for 100 cfs	110	1,543
Total			**151**	**2,360**

[1] Production from BBS maximized year-round while Rogue River supplements supply when needed.

[2] Based on July representing 14 percent of projected annual demand as shown in Exhibits 2-7 and 5-9.

Mitigation Actions under State and Federal Law

Under OAR 690-086-0170(7), for expanded or initial diversion of water under an existing permit, the water supplier is to describe mitigation actions it is taking to comply with legal requirements of the Endangered Species Act (ESA), Clean Water Act and other applicable state or federal environmental regulations.

In anticipation of expanding water supply capacity at the existing Duff WTP site, MWC has engaged in preliminary environmental analyses to identify issues related to wetlands and animal and plant species listed as threatened or endangered by either Federal or State agencies. Details of these analyses may be found in MWC's 2008 *Robert A. Duff Water Treatment Plant Facility Plan.*

The MWC is not aware of any additional legal requirements involving mitigation actions, but will comply with all necessary state and federal permitting requirements prior to expansion of diversion of water under Rogue River permit S-23210 or expansion of use of the BBS water rights.

APPENDIX A
Letters to Affected Local Governments

APPENDIX A

Letters to Affected Local Governments

Example Letter

June 16, 2008

Planning Director
City of Medford
200 South Ivy Street
Medford, OR 97501

Subject: Water Management and Conservation Plan for Medford Water Commission

Dear XXX:

We have attached a copy of Medford Water Commission's Draft Water Management and Conservation Plan for your review and comment relating to consistency with your comprehensive land use plan.

MWC has prepared this plan to fulfill the requirements of OAR Chapter 690, Division 86 of the Oregon Water Resources Department. Please provide comments to me within 30 days of the date of this letter. If the plan appears acceptable to you as written, a comment to that effect would be appreciated. You may either send your comments to me at the address on this letterhead, or email them either to me at laura.hodnett@cityofmedford.org or to: Sheryl.Stuart@CH2M.com.

You are also welcome to call me at 774-2436 or our consultant CH2M Hill's representative, Sheryl Stuart at 541-768-3572 if you have questions about this plan. Thank you for your interest.

Sincerely,

Laura Hodnett
Public Information Coordinator

APPENDIX B

Conservation Matrixes

APPENDIX B

Conservation Matrixes

TABLE 1
Evaluation of Required Items per OAR 690-086-0150(4)

OWRD Requirement	Current MWC Measures or Experience	Comments and Questions	Possible 5-Year Benchmarks for MWC
(a) An annual water audit that includes a systematic and documented methodology for estimating any un-metered authorized and unauthorized uses	MWC has prepared annual statistical reports for decades. These document a number of parameters, including production, retail consumption, and wholesale consumption on a monthly basis. Authorized but unmetered uses of water from hydrants include main flushing, fire fighting, city/county public works access and construction. Construction use of water from hydrants is billed at a flat rate of $10/day. MWC is not aware of any unmetered, unauthorized uses.	The Big Butte Springs production is currently calculated based on the meter reading at Coal Mine station plus upstream customer meter records for the purpose of developing MWC's statistical report. MWC could consider using the springs' meters to monitor production flows instead of Coal Mine to capture any losses that might occur upstream of Coal Mine. The springs meters are currently used for other monitoring purposes, including validating Water Resources Dept. reporting, but their use for production monitoring would also be beneficial for standardizing the statistical evaluation. It is not known how significant hydrant use for fire fighting and main flushing is. MWC has begun to better track hydrant use for these purposes as well as reservoir overflows (overflows being a minor source of unaccounted for water). Without metering, it also is not known how significant hydrant use for construction and public works are. It may be worthwhile to require the installation of meters to track this use for record-keeping, whether or not billing is on a volume-based method.	1. Consider utilizing BBS meters as the basis for BBS production in statistical reports. Initially, this method and the current method for monitoring production from BBS could be used and compared to identify meter errors, etc. 2. Continue development of procedures to document hydrant use for fire fighting, and main flushing in order to eliminate these uses from unaccounted for water. 3. Monitor and record estimated reservoir overflows to enable identification of this separately from unaccounted for water. 4. Consider metering water used from hydrants for construction and public works to enable it to be quantified and eliminated from unaccounted for water. 5. Consider changes to the Statistical Report to make it easier to understand, clearly labeling units, making sure that approaches to summarizing totals or calculating values are well-defined, linked and accurate. Evaluate and modify as necessary so that valuable summary data such as average annual demand, maximum day demand (single and three-day), and unaccounted for water are clearly shown.

TABLE 1
Evaluation of Required Items per OAR 690-086-0150(4)

OWRD Requirement	Current MWC Measures or Experience	Comments and Questions	Possible 5-Year Benchmarks for MWC
(b) If the system is not fully metered, a program to install meters on all un-metered water service connections. The program shall start immediately after the plan is approved and shall identify the number of meters to be installed each year with full metering completed within five years of approval of the water management and conservation plan	MWC's water utility is fully metered.	(No changes are needed)	
(c) A meter testing and maintenance program	In 2005, MWC replaced approximately (based on 6 months of pro-rated data): 310 (6 percent) of its 5/8" meters 29 (6 percent) of its 1" meters 8 (5 percent) of its 1.5" meters 9 (7 percent) of its 2" meters MWC tests all meters > 2" and all 2" turbine meters every 10 MG or every 5 years, whichever occurs first. MWC tests all large meters (>=2") and 1 out of every 6 smaller new meters before installing them to ensure accuracy. All new installs are radio read or are capable of being radio read.	MWC does not test small meters following installation. Replacement is determined by office staff, typically based on suspicious readings or by field staff if deemed warranted when encountered doing other work. In the past, meters were not routinely tested as part of removing them from service. Doing so might facilitate evaluation of what meters (by age and brand) tend to be failing in order to target similar meters for replacement. EWEB, which has had a very active meter test and replacement program, found that residential meters provide reliable service in its system for approximately 50 years. MWC field staff indicates that they find many newer meters seem to fail faster than older meters, so older meters may not be most logical target for replacement. MWC could consider testing the 1.5 and 2" meters in its system.	1. Continue existing design standard that insures all meters 2-inches and larger are installed with test ports and by-pass lines to facilitate testing and repair. 2. Testing of sample groups of meters being removed and documenting results by age and brand/type has been initiated. Based on findings, consider targeting replacement of meters found to be most inaccurate. 3. MWC is installing automatic meter reading (AMR) and the priority has been to target neighborhoods where meters are difficult and/or dangerous to read. After these priority meters have been replaced, MWC could consider replacement of some of the oldest remaining meters and/or those identified in the sample testing from action # 2 above.

TABLE 1
Evaluation of Required Items per OAR 690-086-0150(4)

OWRD Requirement	Current MWC Measures or Experience	Comments and Questions	Possible 5-Year Benchmarks for MWC
(d) A rate structure under which customers' bills are based, at least in part, on the quantity of water metered at the service connections	MWC uses an inclining block rate structure (2 blocks) for single family residential customers. All other customers pay seasonal rates, with higher rates in the summer months. MWC occasionally imposes leak or high use surcharges to encourage corrective action. Pursuant to its regulations, MWC may impose a 300 percent surcharge if it deems that a customer has been negligent of wasting water. If a customer does not correct the cause of the waste after a specified notification process, MWC may impose the surcharge. This happens infrequently, at most a few times a year.	Rates overall are quite low, which typically is an impediment to encouraging conservation. Modification of rates to send a stronger price message and support conservation programs may be worthwhile. Summer peaking has long been considerably higher for the single family residential customers than other customer groups. While a tiered rate structure has been implemented in part to discourage wasteful use, the current structure includes only two tiers. Adding more blocks (tiers) to this rate structure may be beneficial. MWC has utilized a $0.05/1000 gallon differential between summer and winter rates since at least 1987. At that time, this was about a 23 percent price difference. Today, this is less than a 10 percent difference, so is sending a weaker price message than 20 years ago. The rate differential with the SFR inclining blocks has also remained static since implantation, and is relatively small. Re-evaluation of these differentials may be warranted. The rate analysis evaluates wholesale customers in two groups, cities and districts. This does not recognize the differences between entities in terms of usage rates, peaking and internal storage. As such, the rate structure may not be as effective as it could be in rewarding or discouraging conservation activities by these entities.	1. Consider revising rate structure with conservation and equity in mind. Review cost of service rate analysis software capabilities since it has been in use for many years. 2. Evaluate increasing the differentials between summer/winter rates and inclining blocks. 3. Consider adding at least one additional block to the tiered rate structure. 4. Determine whether the rate structure for wholesale customers might be modified to better reward those with less peaking (including internal storage to accommodate hourly peaking) and inspire action by those with more extreme usage and peaking. 5. Consider including at least one year of running use data on future bill formats. New bill format should allow continuation of the current practice of placing conservation measures on bills.

TABLE 1
Evaluation of Required Items per OAR 690-086-0150(4)

OWRD Requirement	Current MWC Measures or Experience	Comments and Questions	Possible 5-Year Benchmarks for MWC
(e) If the annual water audit indicates that system leakage exceeds 10 percent, a regularly scheduled and systematic program to detect leaks in the transmission and distribution system using methods and technology appropriate to the size and capabilities of the municipal water supplier	Recent unaccounted for water rates have ranged from 3.3 to 12 percent and averaged 8.3 percent (2000-2005). Only a part of the unaccounted for water is from leakage. When leaks are found, MWC repairs them right away. Coupon samples of pipe from MWC's system show that pipe lifetimes are very long compared to many systems. MWC has hired an outside leak detection firm a few times in recent years, but only for surveys of minor parts of the system.	At current average day demand values, an unaccounted for rate of 8.3 percent means that MWC is not accounting for an average of 2.4 million gallons per day. Although below WRD's target of 10 percent, this is still a significant amount of non-revenue water. MWC's experience is that pipes provide a long useful life in the system, so leakage is not believed to be a significant portion of the unaccounted for water. Magnitude of leakage would become more clear upon implementation of actions suggested under sections (a) and (c) above. MWC could perform more leak surveys, although this probably is not a high priority. Costs for purchasing leak detection equipment, along with associated operation & maintenance costs may not be warranted, but MWC might consider utilizing outside contractors to conduct leak evaluations of selected pipes each year. Neither of these may be deemed worthwhile unless leakage is a larger problem than presently believed to be.	1. Continue MWC's waterline rehabilitation program. In addition to ongoing work, continue building MWC's pipe replacement fund so that capital is available to replace pipes in the future when many may wear out at the same time. 2. Review MWC's construction standards to ensure they remain current relative to industry best practices. 3. Consider logging calls related to system leaks and document MWC's findings. Maintain data base that links identified leaks to pipe material, pipe age, static pressure, soil type, and geographical location within the system. 4. Improve water use accounting (as noted in earlier items) so that the amount of unaccounted for water that is from leakage can be more closely estimated. 5. Build a database as pipe coupons are removed that would identify condition of pipe as related to location, age, and other factors, to use in the future when pipe replacement becomes a greater need.

TABLE 1
Evaluation of Required Items per OAR 690-086-0150(4)

OWRD Requirement	Current MWC Measures or Experience	Comments and Questions	Possible 5-Year Benchmarks for MWC
(f) A public education program to encourage efficient water use and the use of low water use landscaping that includes regular communication of the supplier's water conservation activities and schedule to customers	MWC currently implements many public information programs: *conservation articles in newsletters *conservation message (poems) on face of bill *consumption feature on WEB site (residential customers can compare their use to others in their neighborhood and city) *distribution of brochures *conservation messages in CCR *interviews with TV and newspaper reporters *annual booth at Spring Garden Fair *a water-wise demonstration garden *limited number of teacher / school presentations *development of water conservation study kit for schools *interaction with developers/ contractors/landscape contractors *irrigation audits - primarily residential	Programs targeting outdoor use are important, with summer use being approx. 2.8 times winter use. Consider: *working more with target groups (developers, landscape installers, plant nurseries, landscape architects) to educate them on water-efficient landscape principles *work with local planners and officials to integrate water efficiency into local site development standards *continuing with Garden Fair booth, as this seems to provide good publicity. *continue with irrigation audit program, both for its customer education value and the opportunity for MWC staff to be informed of local landscape issues. *continuing with notices on customers bills and newsletters MWC may also wish to consider developing a more structured elementary school program.	1. Continue irrigation audit program and Spring Garden Fair booth. Attempt to better track results of audits. 2. Develop a few additional programs that focus on landscaping & irrigation. Work with the city planning staffs and commissions to integrate water wise site development standards. Consider further targeting of developers and builders to encourage water efficient landscape practices. 3. Consider adding a feature to MWCs WEB site that has more detailed irrigation information. 4. Target outreach efforts to the following groups: *developers and builders * the Green Industry (nurseries, landscapers, etc.) * Chamber of Commerce / business / industry groups 5. Consider development and implementation of a more formalized school program or youth education opportunities to change customer thinking about water. Continue partnering with Bear Creek Watershed Council and Bear Creek Watershed Education Partners in educational outreach measures.

TABLE 2
Evaluation of Items to Implement if Feasible per OAR 690-086-0150 (6)

OWRD Requirement	Current MWC Measures or Experience	Considerations and Questions	Possible 5-Year Benchmarks for MWC
(a) A system-wide leak repair program or line replacement to reduce system leakage to 15 percent, and if the reduction of system leakage to 15 percent is found to be feasible and appropriate, to reduce system leakage to 10 percent	(See discussion under Required Measures)		
(b) Technical and financial assistance programs to encourage and aid residential, commercial and industrial customers in implementation of conservation measures	MWC has provided the following technical and financial assistance: 1. Sprinkler audit (survey) program (staff make site visits and provide guidance to consumers on efficient irrigation). Primarily focused on residential customers, but MWC has also audited some parks, commercial properties, and churches 2. Based on a review of water use each March, residential customers with higher than normal winter water use levels are contacted to make them aware of possible plumbing leaks (mailings and then phone calls). 3. MWC has provided partial funding for projects with public/nonprofit entities under a water conservation grant program. Projects have included water-wise landscaping at City Hall and fire station, retrofitting of traffic islands from grass to low water using plants, purchase of a weather station for scheduling irrigation in city parks, conversion of an athletic field from grass to artificial turf, and plumbing retrofits (high efficiency urinals and faucets) at local schools.	MWC could consider incentives for high use commercial industrial / institutional customers. The cost/benefit analysis suggests this may be feasible, but that program costs would be high. The low price of MWC water may hinder generating customer interest. Incentives associated with new CII construction might also be considered. The cost/benefit analysis for a "cash for grass" program suggested a low benefit relative to cost. Landscaping incentives for new construction might prove more cost effective. MWC has no mechanism in place for helping customers with repairing leaks in private plumbing systems. MWC has areas with quite high pressure. As a general rule, it has been found that high pressure correlates with high overall water usage (i.e. a 10 psi decrease in pressure is estimated to reduce sprinkler flows by about 15 percent). It may be beneficial to consider a program to help customers install pressure regulating devices.	1. Consider cost-sharing incentives for largest commercial / industrial / institutional water users to motivate implementation of efficiency changes. 2. Consider financial incentives to mitigate higher initial costs for incorporating water efficient measures into new construction, including landscaping. 3. Continue to offer irrigation audits. Consider more targeted audits of high-use accounts. 4. Work toward creating an irrigation Web feature that provides current weather-based irrigation schedules for various types of sprinklers. 5. Develop rebate programs that provide incentives for retrofitting facilities with high efficiency toilets. Consider similar rebates for appliances. 6. Explore financial assistance programs to help customers install pressure regulating devices and/or repair leaking private plumbing. 7. Encourage retrofits of city-owned facilities, including expanded use of existing conservation grant program.

TABLE 2
Evaluation of Items to Implement if Feasible per OAR 690-086-0150 (6)

OWRD Requirement	Current MWC Measures or Experience	Considerations and Questions	Possible 5-Year Benchmarks for MWC
(c) Supplier financed retrofitting or replacement of existing inefficient water using fixtures, including distribution of residential conservation kits and rebates for customer investments in water conservation	No rebate or incentive programs exist at the present time.	MWC could consider a rebate program for replacement of less-efficient toilets or clothes washing machines with more efficient models. Toilets account for approx. 26 percent of indoor use (*Residential End Uses of Water*, AwwaRF 2000). Indoor use is estimated as 60 percent of total residential use (for MWC in 2000-2005). Residential use represents approx. 62 percent of total use. Therefore, toilet use is approx. 16 percent of residential use and 10 percent of total water use. This equates to approx. 2.8 million gallons per day at 2006 demand levels.EPA has recently established the WaterSense program—a toilet labeled WaterSense is certified as being efficient in using water.No evaluation has been done to determine what percent of customers currently have water-efficient toilets and clothes washing machines.	1. Establish a rebate program (possibly targeted based on housing stock age) for replacing older, non-efficient toilets (and perhaps appliances) with more efficient models. The focus could be on models now being certified as "high-efficiency" (20 percent more efficient than the current standard) under the EPA WaterSense program. This activity was not shown to be clearly cost-effective in the cost/benefit analysis performed, but appears to be reasonably favorable given MWC's low water costs. Consider limited give-away of aerators, shower heads. 2. Evaluate the opportunities associated with a landscaping/sprinkler system rebates. The cost/benefit analysis for a "cash for grass" program (rebates for removal of turf) showed high costs relative to benefit. Explore other options, such as rebates for "smart controllers" or for installation of water-efficient landscapes at the time of new construction. Some such programs might be most effectively targeted for large associations and institutional customers.
(d) Adoption of rate structures, billing schedules and other associated programs that support and encourage water conservation	(See discussion under Required Measures)		

TABLE 2
Evaluation of Items to Implement if Feasible per OAR 690-086-0150 (6)

OWRD Requirement	Current MWC Measures or Experience	Considerations and Questions	Possible 5-Year Benchmarks for MWC
(e) Water reuse, recycling and non-potable water opportunities	No reuse projects are currently operating in the Medford service area. A significant obstacle is the location of the wastewater treatment plant, which is a considerable distance from much of the service area. Current regional project known as "WISE" is exploring reuse opportunities for local agriculture.	Cost-effective opportunities for reuse appear to be limited at the current time. The wastewater treatment plant is also operated by a regional entity that is independent from the Medford Water Commission.	The Medford Water Commission is not involved in the operation of the regional wastewater treatment plant. It is also probable that costs to implement urban reuse programs would not provide a sufficiently high benefit relative to cost to consider as a feasible conservation program for Medford Water Commission at this time. MWC will continue its involvement in the WISE project, which is exploring agricultural reuse.
(f) Any other conservation measures identified by the water supplier that would improve water use efficiency			1. City wholesale customers have or are in the process of obtaining summer water rights in their own names and in turn have/will be required to submit WMCPs. Review and monitor these plans to assure consistency with objectives of this plan and implementation of activities. 2. Continue work with targeted customers such as school districts to ensure that new facilities incorporate water-efficiency measures, both for indoor and outdoor water use. MWC staff are currently trying to coordinate with the school district and design teams to ensure water-efficiency is considered in the designs of new and retrofitted schools being constructed through a recent bond measure.

TABLE 2
Evaluation of Items to Implement if Feasible per OAR 690-086-0150 (6)

OWRD Requirement	Current MWC Measures or Experience	Considerations and Questions	Possible 5-Year Benchmarks for MWC
		The Duff WTP is operating at about a 95 percent efficiency (comparing production to river withdrawals). This is a typical level and represents good quality control at the plant. At 95 percent efficiency, the annual water use at the plant (for backwashing and other in-plant uses) is currently about 120 million gallons. A 1 percent reduction in water use (increasing efficiency to 96 percent) would save approx. 25 million gallons per year. The efficiency may decrease as the plant operating period extends into the winter months as system demands grow. This may make water-saving measures at the plant even more important.	3. Work with staff and policy makers for Medford and other cities to raise awareness and encourage implementation of water conserving site development guidelines. 4. Consider internal regulations that require recycling of water by certain uses such as car washes, water features, water parks, etc. 5. MWC may wish to consider including features in the planned expansion of the Duff WTP that would contribute to water use efficiency.

APPENDIX C

MWC Conservation Measures Analyses

APPENDIX C

MWC Conservation Measures Analyses

Toilet Rebate Program Evaluation
Medford Water Commission

Background data

2	#	toilets per house
19,808	#	Estimated number of pre-1990 single family homes, based on U.S. Bureau of the Census, Census 2000
39,616	#	Estimated number of pre-1990 toilets in single family homes
27	mgd	Average day demand (ADD) for 2012 (5th year of program)
56	mgd	Maximum day demand (MDD) for 2012 (5th year of program)

Unit Savings per Low Flow Toilet

6.8	#/day	flushes per day for average toilet (from EPA WaterSense toilet specification)
4.25	gpf	Average use for pre-1990 toilet, gallons per flush (range is 3.5-5.0 gpf)
1.6	gpf	Use per low flow toilet (1.6 gpf) (conservative, as it does not consider high-efficiency toilets)
18	gpd/toilet	Typical Water Savings from measure: gpd per residential toilet

Program Variables

2%	Estimated market penetration (% participating out of total potential)
792	Number of Planned Installations
25	Anticipated life span for replaced toilets in years
5	Number of year that program will run
158	Number of units to be installed per year

Item		Unit Cost	Totals	
Cost over the life of the program				
Marketing and advertising (posters, etc)		$ -	$ 1,000	Allowance
Labor (FTE)	0.45	$ 80,000	$ 36,300	See summary, below
Rebate amount per toilet		$ 75	$ 59,400	MWC can adjust rebate amount if desired
Administration			$ 7,500	Allowance, see below
Consulting or Contracting			$ -	
Processing cost per toilet rebate		$ 20	$ 15,840	Allowance
Total Program Costs for 5 years			**$ 120,000**	
Estimated Water Savings				
Estimated annual water savings after 5th year			5,220,000	gallons per year
Estimated water savings after 5th year			14,300	gpd
Total water savings over life of program			130,230,000	gallons, over 25 typical toilet life
Program Benefits				
Unit cost of savings (after 5th year)			$0.92	$/1000 gallons saved
Reduction in ADD after 5th year			0.05%	% of ADD
Reduction in MDD after 5th year			0.03%	% of MDD

Administrative costs			
Evaluating Results	$ 1,000	Track savings (annual cost)	
Train Employees	$ 500	Employee training/meetings (annual cost)	
Total annual admin cost	$ 1,500		
Total admin cost over life of program	$ 7,500		

Labor Estimation Background	
40	Hours staff time to set up program (funding, rules, procedures)
40	Hours staff time to advertise program
1	Hours staff time per toilet rebate
792	Hours staff time for total number of planned replacements
872	Total hours of staff time
109.0	Total days of staff time

Grass for Cash Program Evaluation
Medford Water Commission

Background data

27,362	#	Number of single family residential + commercial customers in 2012
27	mgd	Average day demand (ADD) for 2012 (5th year of program)
56	mgd	Maximum day demand (MDD) for 2012 (5th year of program)

Unit Savings per Lawn Conversion

30	gal/sf	Gallons per year per square foot of lawn that is replaced

Program Variables

2%	%	Estimated market penetration (% participating out of total potential)
547	#	Total number of participants
1000	sf of lawn	Average area of lawn replacement per participant
10	#	Anticipated life span for converted lawns
5	#	Number of year that program will run
109	#	Number of units to be installed per year

Item		Unit Cost	Totals	
Cost over the life of the program				
Marketing and advertising (posters, etc)		$ -	$ 1,000	Allowance
Labor (FTE)	0.33	$ 80,000	$ 26,200	See summary, below
Rebate amount per square foot of lawn		$1.00	$ 547,000	A rebate of $1/sf of replaced lawn is typical--MWC can adjust
Administration			$ 10,000	Allowance, see below
Consulting or Contracting			$ -	
Processing cost per lawn conversion rebate		$ 20	$ 10,940	Allowance
Total Program Costs for 5 years			**$ 595,000**	
Estimated Water Savings				
Estimated annual water savings after 5th year			16,410,000	gallons per year
Estimated daily water savings during irrigation period			136,750	gpd during 4-month irrigation season of June-September (some irrigation also in April-May and October, but main savings during central 4 months)
Total water savings over life of program			164,100,000	gallons over 10-year life of program
Program Benefits				
Unit cost of savings			$3.63	$/1000 gallons saved
Reduction in ADD after 5th year			0.17%	% of ADD (based on annual savings compared to total annual water use)
Reduction in MDD after 5th year			0.25%	% of MDD

Administrative costs		
Track results (allowance)	$	1,000
Report to management (allowance)	$	1,000
Total annual admin cost	**$**	**2,000**
Total admin cost over life of program	**$**	**10,000**

Labor Estimation Background	
40	Hours staff time to set up program (funding, rules, procedures)
40	Hours staff time to advertise program
1	Hours staff time per lawn conversion for initial visit, follow up visit
547	Hours staff time for total number of planned replacements
628	Total hours of staff time
78.5	Total days of staff time

MWC Cost Share Program for Commercial/Industrial (C/I) Water Conservation (also called Capacity Buy Back)
(For all MWC customers except those in other cities)

Background data

962	MG	Annual water use by 14 largest C/I customers in 2005 (assumed to remain constant over next 5 years--to 2012)
69	MG	Annual average use per customer for 14 largest C/I (assumed to remain constant through 2012)
2,691	MG	2000-2005 average C/I use (total, includes 14 largest)
1,728	MG	2000-2005 average C/I use excluding 14 largest
2,793	#	Number of commercial accounts estimated for 2012 (5th year of program)
123	#	Number of industrial accounts estimated for 2012 (5th year of program)
2,885	MG	Estimated total C/I water use in 2012 (assuming 1% growth rate, includes largest 14)
7.9	mgd	Estimated total C/I average daily water use in 2012 (assuming 1% growth rate, includes largest 14)
1,923	MG	Estimated 2012 annual C/I water use excluding 14 largest
0.66	MG	Estimated annual C/I water use per account in 2012 not counting the top 14
29	mgd	Average day demand (ADD) for 2012 (5th year of program)
56	mgd	Maximum day demand (MDD) for 2012 (5th year of program)

Program Variables

5	#	Number of 14 largest C/I users that participate
15%	%	Percent reduction in water use for participating customers out of 14 largest category
5%	%	Percent participation by other C/I customers
145	#	Number of other C/I customers that participate
15%	%	Percent reduction in water use for participating customers (among those not in 14 largest category)
20	years	Estimated duration of water savings (life of program)
150	#	Total number of participating C/I customers (after 5th year)

Item		Unit Cost	Totals	
Cost over the life of the program				
Marketing and advertising (posters, etc) materials		$ -	$ 2,000	Allowance
Labor (FTE)	0.38	$ 80,000	$ 30,000	See labor estimation, below
Submetering installation and recording		$ 1,000	$ 50,000	Assumes submetering is installed at one-third of participating C/I customers
Administration				Included in labor
Consulting or Contracting			$ -	
Cost-share by MWC		$ 5,000	$ 750,000	$5,000 average cost share by MWC; this could vary considerably
Total Program Costs for 5 years			**$ 832,000**	depending on how MWC set up program
Estimated Water Savings After 5th Year				
For largest 14			52,000,000	gallons per year
For largest 14			142,000	gpd
For other C/I participants (excluding largest 14)			14,000,000	gallons per year
For other C/I participants (excluding largest 14)			38,000	gpd
For largest 14 plus other C/I participants			66,000,000	gallons per year
For largest 14 plus other C/I participants			181,000	gpd
Total water savings over life of program			1,320,000,000	gallons
Program Benefits				
Unit cost of savings			$0.63	$ per 1000 gallons saved
Reduction in ADD after 5th year			0.62%	% of ADD
Reduction in MDD after 5th year			0.32%	% of MDD

	Labor Estimation Background
40	Hours staff time to set up program (funding, rules, procedures)
80	Hours staff time to advertise program
4	Hours staff time per particpating C/I customer
600	Hours staff time for total number of planned replacements
720	Total hours of staff time
90	Total days of staff time