

Joint Water Commission

Water Management and Conservation Plan

prepared for

Joint Water Commission

prepared by

CH2MHILL

and

GSI Water Solutions, Inc.

August 2010

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Abbreviations and Acronyms

AF	acre-feet
AMR	automated meter reading
ASR	aquifer storage and recovery
AWWA PNWS	American Water Works Association Pacific Northwest Section
B.I.G.	Business, Industry, Government (commercial water conservation program sponsored By TVWD)
BOR	United States Bureau of Reclamation
CCC	Consortium Conservation Committee of the RWPC
CWS	Clean Water Services (wastewater treatment provider in Washington County)
CWWCC	Columbia-Willamette Water Conservation Committee
DEQ	Oregon Department of Environmental Quality
EEC	Events and Education Committee of the JWC
ESA	Endangered Species Act
ET	evapotranspiration
gpcd	gallons per capita per day
HET	high efficiency toilet (toilet that uses less than 1.6 gallons per flush)
JWC	Joint Water Commission
MG	million gallons
mgd	million gallons per day
NPSD	non-peak season demand
PGE	Portland General Electric
PSD	peak season demand
PWB	Portland Water Bureau
RWPC	Regional Water Providers Consortium
TVWD	Tualatin Valley Water District
USEPA	U.S. Environmental Protection Agency

SECTION 1

Introduction

This section satisfies the requirements of OAR 690-086-0125.

Overview

The Joint Water Commission (JWC) is the primary drinking water supplier in Washington County, Oregon. In 2007, the JWC served a population of approximately 252,000, which represented nearly half of the Washington County population. The JWC is made up of five member agencies: the Cities of Hillsboro, Forest Grove, Beaverton, and Tigard, and the Tualatin Valley Water District (TVWD). The JWC is governed by a Board of Commissioners (three commissioners from each agency), and the City of Hillsboro serves as the managing agency. Each member agency has individually-owned water-related facilities, and varying levels of ownership in the JWC and the JWC's water treatment, storage, and transmission facilities. As the newest JWC member, the City of Tigard leases stored water, transmission capacity, and treatment from the other JWC member agencies. The JWC has been assigned the state and federal Public Water System Identification Number 4100379[1].

The JWC water supply comes from two surface water sources: the Tualatin River including its tributaries Sain Creek and Scoggins Creek, and the Middle Fork of the North Fork of the Trask River. In addition to diverting water directly from these sources ("direct diversion" or "live flow"), in the summer months the JWC uses water from storage supplies in Barney Reservoir, on the Middle Fork of the North Fork of the Trask River, and Scoggins Reservoir (Hagg Lake) on Scoggins Creek, a tributary of the Tualatin River. The JWC obtains water from the Tualatin River through the Spring Hill Intake south of Forest Grove. Water is treated at the JWC Water Treatment Plant (WTP) located at 4475 SW Fern Hill Road.

History of JWC Water Management and Conservation Plans

In 1993, a Conservation Plan was prepared and adopted by members of the JWC as part of the Barney Reservoir Expansion Project. The purpose of the plan was to address the role of conservation in the resource management and planning process.

In August 1998, JWC submitted Phase I of a Water Management Plan to the Oregon Water Resources Department (OWRD) to fulfill OWRD's requirements for JWC's permit S-50879 for diversion of water from Scoggins Creek. In a letter dated, February 8, 1999, OWRD approved several sections of the 1998 *JWC Water Management Plan* and granted interim approval of Section 3, Water Conservation, and Section 5, Long Range Supply Plan. OWRD requested that these sections be updated by January 31, 2003. In 2003, JWC submitted to the OWRD a *Water Management Plan Update* that superseded the measures and actions

[1] In the past, this identification number referred to both the JWC and the City of Hillsboro distribution system. JWC retained the original number, and the City of Hillsboro now has Public Water System Identification Number 4101513.

originally described in 1998 plans. In a letter dated August 17, 2004, JWC received a final order from the OWRD accepting the plan and requiring an update by August 16, 2009.

This *Water Management and Conservation Plan, 2009* replaces all previously submitted plans.

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 JWC's water supply.

The plan also fulfills the requirements of OAR 690-315-0090(3) because access to water under "extended permit" S-50879 is requested.

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	*OAR 690-086-0160*
Section 5 - Water Supply	*OAR 690-086-0170*

Affected Local Governments

The following governmental agencies may be affected by this WMCP:

- Washington County
- City of Hillsboro
- City of Forest Grove
- City of Tigard
- City of Beaverton
- Tualatin Valley Water District
- City of Portland
- City of Lake Oswego
- City of North Plains
- City of Gaston
- City of Cornelius
- LA Water Cooperative

Thirty days prior to submitting this WMCP to the 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.

An example of the letters requesting this input and the input received are contained in **Appendix A**.

Plan Update Schedule

JWC anticipates submitting an update of this plan within 10 years of receiving the final order for this plan. As required by OAR Chapter 690, Division 86, a progress report will be submitted within 5 years of the final order.

Project Consultants

The following consulting firms worked with JWC member agencies in the preparation of this document:

- CH2M HILL, Inc.
- GSI Water Solutions, Inc.
- Gary Fiske and Associates, Inc.

SECTION 2

Water Supplier Description

This section satisfies the requirements of OAR 690-086-0140.

Joint Water Commission

The Joint Water Commission (JWC) is the primary drinking water supplier in Washington County, Oregon. The JWC is made up of five member agencies: the Cities of Hillsboro, Forest Grove, Beaverton, and Tigard, and the Tualatin Valley Water District (TVWD). The JWC is governed by a Board of Commissioners (three commissioners from each agency), and the City of Hillsboro serves as the managing agency. Each member agency has individually-owned water-related facilities, and varying levels of ownership in the JWC and the JWC's water treatment, storage, and transmission facilities. As the newest JWC member, the City of Tigard leases stored water, transmission capacity, and treatment from the other JWC member agencies. The JWC has been assigned the state and federal Public Water System Identification Number 4100379 by the Oregon Department of Human Services Drinking Water Program[2].

Exhibit 2-1 is a map that shows JWC, and member agency water sources, the current JWC service area, and wholesale customers. Each JWC member's water supply, service area and wholesale customers are discussed in more detail below.

Service Area and Service Population Description

OAR 690-086-0140 (2)

As of December 2007, the JWC WTP provided drinking water to approximately 252,000 people through its five member agencies and two wholesale customers. If all sources of water are considered, the total population served by the member agencies and JWC was approximately 421,000 as shown in **Exhibit 2-2**.

Unless otherwise noted, population numbers are based on estimates from Portland State University's Population Research Center. Exhibit 2-2 summarizes each member agency's meter inventory, total population served, and estimate of population served with JWC-supplied water. To determine the population served by JWC versus total population served, each agency determined the percentage of annual water supplied by JWC versus total supply (averaged from 2005 through 2007) and applied that percentage to the total population. Because JWC member agency customers can receive water from multiple and varying sources, per capita demand, unaccounted-for water, and conservation measures are based on total demand from all sources, and total population served, rather than the JWC

[2] Before 2008, this identification number referred to both the JWC and the City of Hillsboro distribution system. After July 2008, JWC retained the original number, and the City of Hillsboro was assigned the Public Water System Identification Number 4101513.

service population estimates presented in Exhibit 2-2. A discussion of service area and service area population estimates by agency follows.

EXHIBIT 2-2
Summary of Meters, Total Population, and JWC Service Population for Member Agencies and Wholesale Customers, 2007

	Total Number of Meters	Total Population Served[1]	Population Served By JWC[1]
JWC Member Agency			
Hillsboro	23,559	81,600	75,900
Forest Grove	5,511	20,900	10,500
Beaverton	16,950	66,000	66,000
TVWD	54,910	193,400	87,000
Tigard	17,720	57,000	10,000
Wholesale Customers			
Westside Lutheran School & City of North Plains[2]	--	2,000	2,000
Total	**118,650**	**420,900**	**251,800**

[1] Populations rounded to the nearest 100 people.

[2] Westside Lutheran School had 62 students and teachers, and the City of North Plains population was approximately 1,890.

Hillsboro

The City of Hillsboro is located in central Washington County. Hillsboro's economy is based on high-tech industry, small business, and the surrounding agriculture community. Hillsboro Water's service area includes two geographically separated areas. The Hillsboro In-Town (retail) service area includes approximately 75 percent of the City of Hillsboro, and the Hillsboro Upper System is located to the south and west of Forest Grove. The remaining City of Hillsboro population, east of Cornelius Pass Road, is served by TVWD. Current infrastructure does not allow transfer of water between the In-Town and Upper System service areas.

The 2007 JWC service population in the City of Hillsboro was approximately 66,200. Hillsboro Water also serves the Cities of Cornelius and Gaston with 2007 populations of 10,900, and 650, respectively. In addition, Hillsboro Water's staff estimates that approximately 1,860 people are served within Hillsboro Water's Upper System, and 2,000 people are served within LA Water Cooperative. Summing the City of Hillsboro service population, wholesale customer populations, and rural unincorporated populations yields a total service area population of 81,600. For the period 2005 through 2007, the JWC WTP supplied approximately 93 percent of Hillsboro Water's demand. Therefore, the JWC service population is estimated at 75,900. **Exhibit 2-3** shows the number of accounts by customer category inside and outside of Hillsboro's city limits.

EXHIBIT 2-1
JWC Service Area, 2008

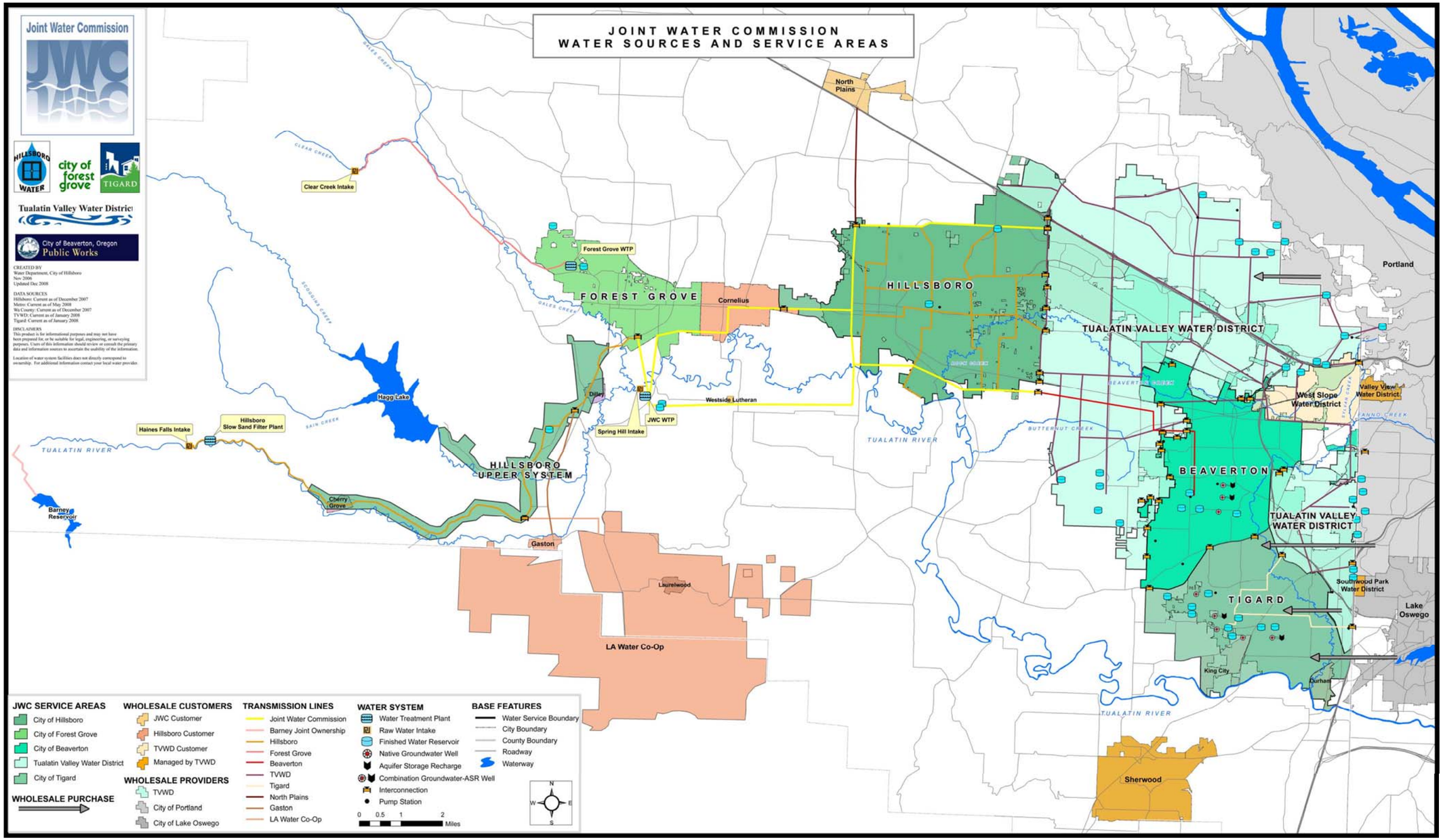


EXHIBIT 2-3

Hillsboro Water: Meters By Customer Category, Inside and Outside the City of Hillsboro City Limits, 2007

Customer Class	Inside City Number of Meters	Outside City Number of Meters	Total Number of Meters
Single-Family Residential	21,066	632	21,698
Commercial	906	22	928
Irrigation	394	0	394
Multi-Family Residential	254	3	257
Public Users	130	5	135
Industrial	61	9	70
Non-Profit	61	7	68
Wholesale	0	9	9
Total	**22,872**	**687**	**23,559**

Forest Grove

The City of Forest Grove is the smallest of the member agencies. Forest Grove's economy is supported by surrounding agriculture and Pacific University. Forest Grove's service area is bounded by the city limits, but approximately 160 people residing outside of city limits also receive water from the city system. The City of Forest Grove's 2007 population was estimated at 20,775. Including the customers outside city limits yields a total service population of 20,935. Because JWC supplies approximately 50 percent of Forest Grove's demand, the JWC service population presented in Exhibit 2-2 was estimated at approximately 10,500. **Exhibit 2-4** shows the number of accounts by customer category for Forest Grove.

EXHIBIT 2-4

City of Forest Grove: Meters By Customer Category, 2007

Customer Class	Number of Meters
Single-Family Residential	4,752
Commercial	356
Multi-Family Residential	257
Industrial	61
School	44
City	41
Total	**5,511**

Beaverton

Beaverton is located in eastern Washington County and has an economy based largely on electronics and light industry. The city provides water to a majority of city residents with the remainder served by TVWD, West Slope Water District, and Raleigh Water District. The 2007 population within city limits was estimated at 85,560. Beaverton calculates the population served with city-supplied water by multiplying the overall city population times the ratio of city water accounts to total city sewer accounts because the total number of sewer accounts includes accounts in areas served by other water providers. Using this approach, the population served with city water was estimated at approximately 66,000. Because the city receives all of its water from the JWC, the JWC service population is equal to the city-served population. (Note: Beaverton has an active aquifer storage and recovery (ASR) system, but JWC-supplied water is used for recharging this system. Native ground water provides less than one percent of supply.) **Exhibit 2-5** shows the number of accounts by customer category for Beaverton.

EXHIBIT 2-5
City of Beaverton: Meters By Customer Category, 2007

Customer Class	Number of Meters
Single-Family Residential	14,473
Commercial/Industrial	850
Apartments*	681
Multi-Family Residential*	524
Irrigation	353
Public Facilities	69
Total	**16,950**

*The apartment category is defined as greater than four units; multi-family accounts have four units or fewer.

TVWD

TVWD covers an area of more than 45 square miles and serves the unincorporated communities of Cedar Hills, Oak Hills, Terra Linda, Cedar Mill, Reedville, Rock Creek, Cooper Mountain, The Bluffs, Progress, Metzger, Bonny Slope, Aloha, and portions of the Cities of Beaverton, Hillsboro, Portland, and Tigard. TVWD has two geographically distinct service areas. The larger, Wolf Creek Service Area is located to the northwest of Beaverton, and the Metzger Service Area is located to the southeast of Beaverton.

TVWD's staff estimates the June 2007 TVWD population at 193,400. The JWC portion of this service population was estimated at approximately 54 percent, or 87,030 people. TVWD tracks service population monthly by using account information and an average number of people per service.

Exhibit 2-6 provides TVWD's accounts by customer category for 2007.

EXHIBIT 2-6
TVWD: Meters By Customer Category, 2007

Customer Class	Number of Meters
Single-Family. Residential	51,947
Commercial	1,405
Multi-Family Residential	675
Industrial	37
Irrigation	833
Wholesale	13
Total	**54,910**

Tigard

The Tigard water service area includes the Cities of Durham and King City, two thirds of the City of Tigard, and a portion of the unincorporated area of Washington County outside the Tigard city limits commonly known as Bull Mountain. The city's Public Works Water Division estimates the entire service area population at approximately 57,000, and the JWC service population at approximately 10,000. **Exhibit 2-7** shows the number of accounts by customer category for Tigard.

EXHIBIT 2-7
City of Tigard: Meters By Customer Category, 2007

Customer Class	Number of Meters
Single-Family Residential	16,243
Commercial	650
Industrial	14
Multi-Family Residential	599
Irrigation only	214
Total	**17,720**

JWC Wholesale

The JWC WTP directly serves two wholesale customers: Westside Lutheran School and the City of North Plains. Westside Lutheran School has approximately 60 students and teachers. The City of North Plains has approximately 1,900 people, and began receiving JWC-supplied water in June 2005.

Interconnections with Other Systems

OAR 690-086-0140(7)

As shown on Exhibit 2-1, there are multiple interconnections between JWC member agencies, and between neighboring communities. All JWC partners, except Tigard, have a direct connection to a JWC transmission line. **Exhibit 2-8** provides a summary of the interconnections between systems.

EXHIBIT 2-8
Summary of Interconnections for JWC Members

Agency	Metered or Un-metered	Hillsboro	Forest Grove	Beaverton	TVWD	Tigard	JWC	PWB	Cornelius	Other	Total	Overall Total
Hillsboro[1]	M		0	0	0	0	12	0	1	3	16	24
	U		0	0	8	0	0	0	0	0	8	
Forest Grove	M	0		0	0	0	1	0	0	0	1	2
	U	0		0	0	0	0	0	1	0	1	
Beaverton	M	0	0		6	3	1	1	0	0	11	23
	U	0	0		12	0	0	0	0	0	12	
TVWD[2]	M	0	0	6		2	2	7	0	2	19	39
	U	8	0	12		0	0	0	0	0	20	
Tigard[3]	M	0	0	3	2		0	2	0	4	11	11
	U	0	0	0	0		0	0	0	0	0	
JWC[4]	M	12	1	1	2	0		0	4	2	22	22
	U	0	0	0	0	0		0	0	0	0	

[1] Total includes Hillsboro In-Town and Hillsboro Upper System Service Areas; Other includes one connection to the City of Gaston and two to LA Water Cooperative.

[2] Total includes Wolf Creek and Metzger Service Areas; Other includes one connection with West Slope Water District and one with the Raleigh Water District.

[3] Other includes one connection with the City of Lake Oswego, two with the City of Tualatin, and one with Lake Grove Water District.

[4] Other includes one connection with Westside Lutheran and one with the City of North Plains.

Of all the interconnections with neighboring water systems, only two systems are able to provide a JWC partner with substantial, stable supplies. The Portland Water Bureau (PWB) provides reliable supplies to TVWD and Tigard. PWB obtains its water from the Bull Run Watershed, with a seasonal and emergency water supply from the Columbia South Shore Wellfield. Tigard also has a supply connection with Lake Oswego. Lake Oswego obtains its water from the Clackamas River. The Cities of Tigard and Lake Oswego are partnering to improve their interconnection to make this supply more reliable. None of the wholesale

customers are able to supply water to a JWC partner because they do not have large reliable supply sources of their own.

JWC Interconnections

JWC transmission lines connect to the following JWC member systems through 16 connections: the Cities of Forest Grove, Hillsboro, and Beaverton; TVWD's Wolf Creek Service Area, and the Hillsboro Upper System. The City of Cornelius has four interconnections along the JWC transmission line, and the City of North Plains and Westside Lutheran School each have one intertie. All of these connections are metered and used regularly.

Hillsboro Interconnections

Hillsboro Upper System

Hillsboro's Upper System transmission line has one metered interconnection with the City of Gaston, two with the LA Water Cooperative, and one with the JWC. Gaston, LA Water Cooperative, and Hillsboro's Upper Retail System are primarily served by the Hillsboro slow sand filter plant. A portion of the Upper System can be fed with adequate pressure by the JWC WTP. Cornelius was supplied by the Hillsboro slow sand filter plant until August 2004 when service was switched to the JWC WTP.

Hillsboro In-Town System

Hillsboro's main distribution system has interconnections with JWC, TVWD Wolf Creek, and the City of Cornelius. Eight unmetered emergency interties with TVWD are located on the boundary between the two systems. Hillsboro has 11 master meter locations connecting to JWC transmission lines. Hillsboro has one interconnection with the City of Cornelius on the boundary between the cities.

Forest Grove Interconnections

Forest Grove maintains one metered connection from the transmission line from the JWC WTP, and has an emergency intertie with the City of Cornelius. Forest Grove's Clear Creek source and WTP do not supply or connect to other systems.

TVWD Interconnections

TVWD receives water supplies from the JWC via two connections, and from PWB via four connections. TVWD also has three additional backup interconnections with PWB, and emergency interconnections with the Cities of Hillsboro, Beaverton, and Tigard, West Slope Water District, and Raleigh Water District.

Of TVWD's 39 total interconnections, 30 are to Wolf Creek and 9 are to Metzger.

Wolf Creek Service Area

TVWD's Wolf Creek Service Area has two metered interconnections with JWC: one on the north and one on the south transmission line, and two metered connections with PWB.

In addition, this service area has one emergency intertie with West Slope Water District, and eight interties to Hillsboro's in town distribution system along the boundary between the two service areas. There are also emergency interconnections, with various delivery capacities, at 16 different locations along the Beaverton and Wolf Creek boundary.

Metzger Service Area

TVWD's Metzger area receives water from PWB on a regular basis via three interconnections. There are two unmetered emergency interconnections with Beaverton, one metered interconnection with Tigard, and one metered connection with Raleigh Water District.

TVWD has an additional interconnection with PWB that has recently been converted to a metered emergency connection. PWB can supply both Tigard and TVWD Metzger from two co-located meters at a common interconnection point. In recent years, during peak season Tigard required additional supplies and TVWD became a wholesale provider to Tigard through this interconnection. As of January 2009, a contract renegotiation terminated TVWD as a wholesale supplier to Tigard. This interconnection now provides an emergency backup supply for TVWD.

Beaverton Interconnections

Beaverton has a total of 23 interconnections, 11 metered and 12 unmetered, with four neighboring agencies: the JWC, TVWD, the City of Tigard, and PWB. Beaverton's main water supply is from the JWC's south transmission line.

Interconnections with TVWD exist at 18 locations along the system boundaries. Two unmetered interconnections are the only interties with TVWD's Metzger service area; the remaining 16 metered and unmetered connections are with the Wolf Creek service area.

Beaverton also maintains three metered interconnections with the City of Tigard. Only one of these connections is used regularly on a seasonal basis. The other two are emergency connections, feeding either direction if necessary.

One emergency interconnection with PWB can supply Beaverton during peak demand periods, but would require planning and preparation before the connection could be activated.

Tigard Interconnections

Tigard has nine interconnections with six other water utilities: three interconnections are maintained by the city of Beaverton, two by PWB, and one each by TVWD, the City of Lake Oswego, the City of Tualatin, and Lake Grove Water District.

PWB can supply both Tigard and TVWD Metzger from two co-located meters at a common interconnection point. In recent years, during peak season Tigard required additional supplies and TVWD became a wholesale provider to Tigard through this interconnection. As of January 2009, a contract renegotiation terminated TVWD as a wholesale supplier to Tigard. Tigard now receives water directly from PWB at this location.

Tigard can obtain water from Lake Oswego on a surplus basis. This interconnection is bidirectional and each agency maintains a meter. Because of operational difficulties the

actual flow available is far below the full capacity. This interconnection and supporting infrastructure will be redesigned as Tigard pursues securing a permanent source with Lake Oswego.

Only one of the three interconnections with Beaverton is used on a regular seasonal basis. Typically, Tigard only draws about one-third of its full capacity from this interconnection. Two metered emergency connections between Tigard and Beaverton are designed to provide water to either system, but have not been used in recent years.

Tigard has one emergency interconnection with both the City of Tualatin and Lake Grove Water District.

Intergovernmental Agreements

OAR 690-086-0140(1)

A summary of all current intergovernmental agreements for JWC member agencies is contained in **Appendix B**. These include agreements for wholesale water purchase, storage and diversion of water from the Barney and Scoggins Reservoirs, and the interagency agreements related to ownership, usage, maintenance, and financing of the JWC.

Water Sources

OAR 690-086-0140(1 & 2)

JWC Sources

The JWC water supply comes from two surface water sources: the Tualatin River including its tributaries Sain Creek and Scoggins Creek, and the Middle Fork of the North Fork of the Trask River. JWC diverts water directly from the "live" or natural flow of the Tualatin River during the off-peak season. JWC defines peak season as the six month period from May 1 through October 31, and non-peak season as the remaining six months of the year. During the peak season, the JWC is regulated off most of its "live flow" water right permits. When this happens, JWC releases water from storage supplies in Barney Reservoir, on the Middle Fork of the North Fork of the Trask River, and Scoggins Reservoir (Hagg Lake) on Scoggins Creek, a tributary of the Tualatin River.

Tualatin River

JWC's main live flow source is the Tualatin River and its tributaries. The Tualatin River Basin encompasses approximately 712 square miles. The valley is surrounded to the north and east by the Tualatin Mountains, to the south by Chehelem and Parrott Mountains, and to the west by the Coast Range where the Tualatin River headwaters are located.

The JWC obtains water from the Tualatin River through the Spring Hill Intake at River Mile (RM) 56.3, south of Forest Grove. Water is treated at the JWC Water Treatment Plant (WTP) located at 4475 SW Fern Hill Road southwest of the intake. JWC also owns 40 million gallons of finished water storage near the JWC WTP at Fern Hill. The location of the Spring Hill Intake, JWC WTP, and two finished water reservoirs are shown on Exhibit 2-1.

The Spring Hill Intake and pump station are shared with the Tualatin Valley Irrigation District and are owned by the U.S. Bureau of Reclamation. Raw water is delivered to the JWC WTP through 36- and 42-inch-diameter transmission lines. The intake has traveling screens and strainers to prevent debris and wildlife from entering the pump well.

Barney Reservoir

The Trask River watershed is approximately 175 square miles. However the sub-watershed from which JWC diverts and stores water is approximately 13.2 square miles. The Barney Reservoir is owned jointly by TVWD (35 percent), City of Hillsboro (31 percent), City of Beaverton (21.5 percent), Clean Water Services (10 percent) and the City of Forest Grove (2.5 percent). These entities make up the Barney Reservoir Joint Ownership Commission with the City of Hillsboro serving as the managing agency. The Barney Reservoir is formed by the 120-ft, rock-fill, Eldon S. Mills Dam. Its storage capacity is 20,000 acre-feet. Of the annual storage or fill capacity, 15 percent is reserved by the Oregon Department of Fish and Wildlife for releases to the Trask River during the peak demand, low flow season, 460 acre-feet remain in the dead pool, and the remainder of the storage is divided between owners by the ownership percentages presented above. During the storage release season, a 36-inch pipeline, 6,500 feet in length, diverts water across a narrow Coast Range divide from the Trask River Watershed into the headwaters of the Tualatin River at RM 78. Because of the travel time from Barney Reservoir to the Spring Hill Intake, water released from the reservoir is available for diversion at the intake in approximately 24 hours during the low flow (peak) season. The location of Barney Reservoir is shown on Exhibit 2-1.

Scoggins Reservoir

The Scoggins Reservoir (Henry Hagg Lake) was constructed between 1972 and 1975 primarily for flood control, irrigation for agriculture, municipal and industrial uses, water quality control, and for the conservation and development of fish and wildlife. The 150-foot, earthen, dam is owned by the Bureau of Reclamation and operated by the Tualatin Valley Irrigation District. The majority of this reservoir's 56,000 acre-feet of water is owned by the Tualatin Valley Irrigation District, but the JWC has water rights to use up to 13,500 acre-feet of impounded water when the reservoir fills to capacity. Hillsboro, Forest Grove, and Beaverton have contracts with the Bureau of Reclamation for water volumes of 5,000, 4,500, and 4,000 acre-feet, respectively. Water is released from Scoggins Reservoir into Scoggins Creek (a tributary of the Tualatin River) located at RM 60. Water released at Scoggins Dam takes approximately 12 hours to reach the Spring Hill Intake during the low flow season.

The JWC is participating in the Tualatin Basin Water Supply Project (TBWSP) to identify future water supply options for residents within this watershed. The TBWSP is discussed in further detail in Section 5 of this plan.

Non-JWC Sources

Each JWC member agency has at least one, non-JWC supply source as described below.

Hillsboro

The City of Hillsboro serves its Upper System, Gaston, and LA Water Cooperative with water from its slow sand filtration plant on the Tualatin River. Hillsboro's Haines Falls Intake, located at RM 73.2, is a screened intake.

Forest Grove

The City of Forest Grove supplements its JWC-supplied water with water from the city-owned Clear Creek Watershed. The city has intake facilities within the Clear Creek Watershed on Clear Creek, Roaring Creek, Thomas Creek, Deep Creek and Smith Creek. The city's water rights within this basin total 8.06 cfs (5.20 mgd). The city also has a water right on Gales Creek totaling 4.46 cfs (2.88 mgd). Water receives conventional, media-filtration treatment at the Forest Grove WTP located at Watercrest Road on Buxton Hill. During the summer, the supply is limited by the low flows in the creeks and can drop to as low as approximately 1.5 mgd, as measured by the raw water flow meter at the WTP.

Beaverton

The City of Beaverton has two native ground water wells, and three active ASR wells. (Ground water rights are on the three ASR wells.) A fourth ASR well is planned. The two ground water wells have a total capacity of 1.9 mgd. Beaverton uses JWC supply in the winter months to recharge the ASR system. This water is withdrawn in the summer months to help meet peak demand.

TVWD

TVWD is a wholesale customer of PWB, and has two native ground water wells primarily used for emergency back-up supply. In addition to these ground water rights, TVWD is a member of the Willamette River Water Coalition, which holds Permit S-49240 for use of up to 202 cfs from the Willamette River for municipal and industrial uses. TVWD is currently working on an ASR project.

Tigard

The City of Tigard is a wholesale customer of PWB, and the City of Lake Oswego. ASR and native ground water are used to augment these sources of supply. The City of Tigard is also a member of the Willamette River Water Coalition, which holds Permit S-49240 for up to 202 cfs from the Willamette River for municipal and industrial uses.

System Description

OAR 690-086-0140(8)

JWC facilities

Along with the intake and raw water reservoirs described in the Water Sources section above, the JWC also owns a WTP, two finished water reservoirs, and a transmission system including transmission lines, meters and pressure reducing valves. These facilities are shown on Exhibit 2-1.

The JWC WTP has a rated peak capacity of 75 mgd. Treatment at the WTP consists of conventional media filtration with coagulation, flocculation, and sedimentation processes prior to filtration.

Finished water from the JWC WTP is pumped via high pressure transmission lines directly to Forest Grove's or Hillsboro's distribution systems, or to Fern Hill Reservoirs, two 20-million-gallon (MG) concrete reservoirs located on a hill approximately one-third mile east of the WTP. The first reservoir has been in operation since 1983, and the second came online in 2006.

Finished water is distributed to member agencies through the transmission lines shown on Exhibit 2-1, and described below:

- 36 and 42-inch lines from Spring Hill intake to the JWC WTP (raw water)
- 24-inch line from the JWC WTP to Forest Grove
- 45- and 72-inch lines from the JWC WTP to Fern Hill Reservoirs
- 45-inch line from the Fern Hill Reservoirs to Hillsboro (South Transmission Line)
- 42-inch line from Hillsboro to Beaverton (South Transmission Line)
- 72-inch line from the JWC WTP to Hillsboro (North Transmission Line)
- 66-inch line from Hillsboro to TVWD (North Transmission Line)
- 42-inch line located near Hillsboro's western border (North-South Intertie)

Exhibit 2-9 presents an inventory of JWC-owned transmission lines by diameter. The transmission system is primarily constructed with concrete cylinder pipe (95.9 percent), of diameters 42-inches and greater. The remainder of the system is ductile iron (3.8 percent) and cast iron (0.3 percent). **Exhibit 2-10** summarizes the relative age of the transmission lines. The age of the system varies from approximately 30 years (46 percent) to less than 10 years (23 percent). **Exhibit 2-11** is an inventory of JWC master meters and pressure reducing valves.

EXHIBIT 2-9
JWC Transmission Line Inventory By Pipe Diameter

Diameter	Length (ft)	Length (mi)	Percentage
24-inch	10,843	2.1	7%
42-inch	34,488	6.5	22%
45-inch	37,543	7.1	24%
54-inch	1,103	0.2	1%
66-inch	25,239	4.8	16%
72-inch	47,709	9.0	30%
Total	**156,926**	**29.7**	**100%**

EXHIBIT 2-10
JWC Transmission System By Decade of Installation

Date Installed	Percentage of System
Post 2000	23.5%
1990-1999	30.1%
1980-1989	0.0%
1970-1979	46.4%
Total	**100.0%**

EXHIBIT 2-11
JWC Master Meter and PRV Inventory

Meter Vault Locations	Customer	PRV Size (inch)	Meter Size (inch)	Meter Type
45"/42" South Transmission Line				
Fern Hill Reservoir	JWC	N/A	42"	Magnetic
First Avenue	Hillsboro	8"	8"	Sonic
		12"	12"	Sonic
Minter Bridge	Hillsboro	8"	8"	Sonic
		12"	12"	Sonic
Roseway	Hillsboro	10"	10"	Sonic
239th & TV Hwy	Hillsboro	10"	10"	Sonic
75th & TV Hwy	TVWD	4"	12"	Magnetic
Cornelius Pass & TV Hwy	Beaverton	N/A	36"	Magnetic
72"/66" North Transmission Line				
10th & Heather	Cornelius	8"	8"	Magnetic
12th & Baseline	Cornelius	6"	6"	Magnetic
Basco's on Baseline	Cornelius	6"	6"	Magnetic
Valley View on TV Hwy	Cornelius	4"	6"	Magnetic
	Hillsboro	3"	3"	Magnetic
Toby's on TV Hwy	Hillsboro	6"		
		3"	3"	Magnetic
Connell & Jackson	Hillsboro	10"	18"	Sonic
Glencoe & Evergreen	Hillsboro	6"	12"	Sonic
Glencoe & Evergreen	North Plains	N/A	10"	Magnetic

EXHIBIT 2-11
JWC Master Meter and PRV Inventory

Meter Vault Locations	Customer	PRV Size (inch)	Meter Size (inch)	Meter Type
25th & Evergreen	Hillsboro	6"	18"	Sonic
Shute & Evergreen (aka Dawson Creek)	Hillsboro	10"	24"	Sonic
229th & Bennet	Hillsboro	10"	18"	Sonic
Cornelius Pass & Hwy 26	TVWD	N/A	20"	Magnetic
24" Dilley/Forest Grove Line				
Elm St. & Hwy 47 Bypass (aka Dilley)	Hillsboro	8"	8"	Sonic
	Forest Grove	24"	24"	Sonic

Non-JWC Distribution System Facilities

Exhibit 2-12 summarizes non-JWC finished water storage facilities. Of the member agencies, Beaverton, Tigard, and TVWD all have ASR storage capacity. To date, Beaverton and Tigard have actively used their ASR systems.

EXHIBIT 2-12
Non-JWC Finished Water Storage Capacity

Agency	Number of Reservoirs	Total Reservoir Storage Capacity (MG)	Aquifer Storage Capacity (MG)
Hillsboro	3	21.9	0
Forest Grove	2	6.00	0
Beaverton	5	28.25	450
Tigard	14	27.48	250
TVWD	24	53.43	200-300
Total	**48**	**137.06**	**900-1,000**

From 2008 *Joint Water Commission Emergency Response Guide.*

Exhibits 2-13 and 2-14 summarize member agency distribution system inventories by length and material type, respectively. The total length of the distribution systems served by JWC is approximately 1,500 miles. TVWD accounts for approximately 42 percent of this length with 620 miles of pipeline. Forest Grove has the smallest distribution system of the member agencies with 75 miles of pipeline. As shown in Exhibit 2-14, the majority of member agencies' systems are constructed with ductile iron pipe. Forest Grove is the exception, with roughly equal percentages of cast iron and ductile iron construction.

EXHIBIT 2-13
Non-JWC Distribution System Inventory: Length By Diameter

JWC Member Agency	Distribution System Pipe Length By Diameter (lineal feet)						
	<= 6-inch	8- to 14-inch	16- to 42-inch	> 42-inch	Unknown	Total (ft)	Total (mi)
Hillsboro	478,234	867,886	225,768	81	44	1,572,014	298
Beaverton	545,829	785,970	100,306	0	0	1,432,105	271
Forest Grove	173,785	210,613	13,528	0	99	398,024	75
Tigard	454,945	729,776	56,079	0	0	1,240,800	235
TVWD	1,535,749	1,365,599	330,079	40,142	0	3,271,569	620
					Total	**7,734,028**	**1,499**

EXHIBIT 2-14
Non-JWC Distribution System Inventory: Approximate Percentage by Material Type

JWC Member Agency	Steel/Concrete Cylinder	Cast Iron	Ductile Iron	Other[1]	Unknown	Total
Hillsboro	8%	20%	68%	3%	0.4%	100%
Beaverton	0%	33%	61%	6%	0%	100%
Forest Grove	1%	46%	46%	6%	2%	100%
Tigard	0%	22%	78%	0%	0%	100%
TVWD	5%	20%	75%	0%	0%	100%

[1] "Other" includes plastic, PVC, and copper.

Records of Water Use

OAR 690-086-0140(4) and (9)

Terminology

Production refers to the quantity of water delivered to a distribution system from a water treatment plant, wholesale supplier, native ground water well, or an ASR well. Water supplied *to* an ASR system is not included in production. Because water *from* an ASR system is counted as production, if the amount of water delivered *to* an ASR system also is counted as production, the same water would be counted twice. By definition, production equals system demand. Production (system demand) includes metered consumption (for example, residential, commercial, industrial, public, and irrigation customers[3]), un-metered public

[3] Each JWC member agency defines its own customer categories.

uses (fire fighting, hydrant flushing, other), and water lost to leakage, reservoir overflow, and evaporation.

Consumption is equal to the metered water use. System demand minus consumption equals unaccounted-for water. Unaccounted-for water is equal to the sum of un-metered uses (hydrant flushing, for example), leakage, overflows, evaporation, and inaccuracies of measurement at the production or customer meters.

JWC defines its peak season as the six-month period from May through October. To evaluate seasonal use, summer season is defined as the four consecutive months of highest monthly demand or consumption. In general, this corresponds to the months of June through September for demand data, and July through October for billed consumption data. The offset in summer season for the two data sets results from differences in the timing of production meter and customer meter reading.

Generally, demands and consumption in municipal systems are expressed in units of million gallons per day (mgd). They may also be expressed in cubic feet per second (cfs) or gallons per minute (gpm). One mgd is equivalent to 1.55 cfs or 694 gpm. For annual or monthly values, it is typical to refer to the total quantity of water in million gallons (MG). Water use per person (per capita use) is expressed in gallons per capita per day (gpcd).

The following terms are used to describe specific values of system demands:

- Average day demand (ADD) equals the total annual production divided by 365 days. Production refers to the total amount of water that enters the system from a surface water treatment plant, wholesale supplier, native ground water well, or an ASR well.
- Maximum day demand (MDD) equals the highest system demand that occurs on any single day during a calendar year. It is also called the one-day MDD or peak day demand. In a complex system such as JWC, with multiple water sources, the system-wide MDD must be estimated based on metered customer use, production from all sources, and relevant peaking factors. Meters for well production and wholesale use often are not read daily, or at regular intervals.
- WTP Maximum day demand equals the highest WTP production that occurs on any single day during a calendar year.
- Monthly demand refers to demand during a calendar month. This demand can be expressed as the total volume of water produced in a month, or as a daily demand value by dividing the total monthly volume by the number of days in the month.
- Maximum monthly demand (MMD) equals the highest monthly demand during a calendar year.
- Peaking factors are the ratios of one demand value to another. The most common and important peaking factor is the ratio of the MDD to the ADD.

Historical Water Demands

JWC Monthly Demands

Exhibit 2-15 shows the monthly demand from all sources for all member agencies and JWC wholesale customers for the period 2002 to 2007. **Exhibit 2-16** shows the monthly JWC-supplied demand for the same period. As expected, demand peaks in the summer months, when weather is hot and dry and water is used for irrigation, swimming pools, and seasonal commercial uses such as food processing, etc., and is lower during the rest of the year. As shown in Exhibit 2-15, because of its large service population TVWD has the largest overall peak monthly demand of all of the JWC partners. However, TVWD obtains much of its peak month supply from other sources. Therefore, as shown in Exhibit 2-16, since 2005 TVWD's peak month supply from the JWC has been less than Hillsboro and comparable to Beaverton. Forest Grove has the lowest overall monthly demand of the member agencies, and primarily has relied on the JWC supply during the summer months. Until 2005, Tigard received water from the JWC throughout the year. Beginning in 2006, Tigard only received JWC supply during the summer months.

EXHIBIT 2-15
Total Monthly Demand from all Sources for JWC Members and Wholesale Customers, 2002-2007

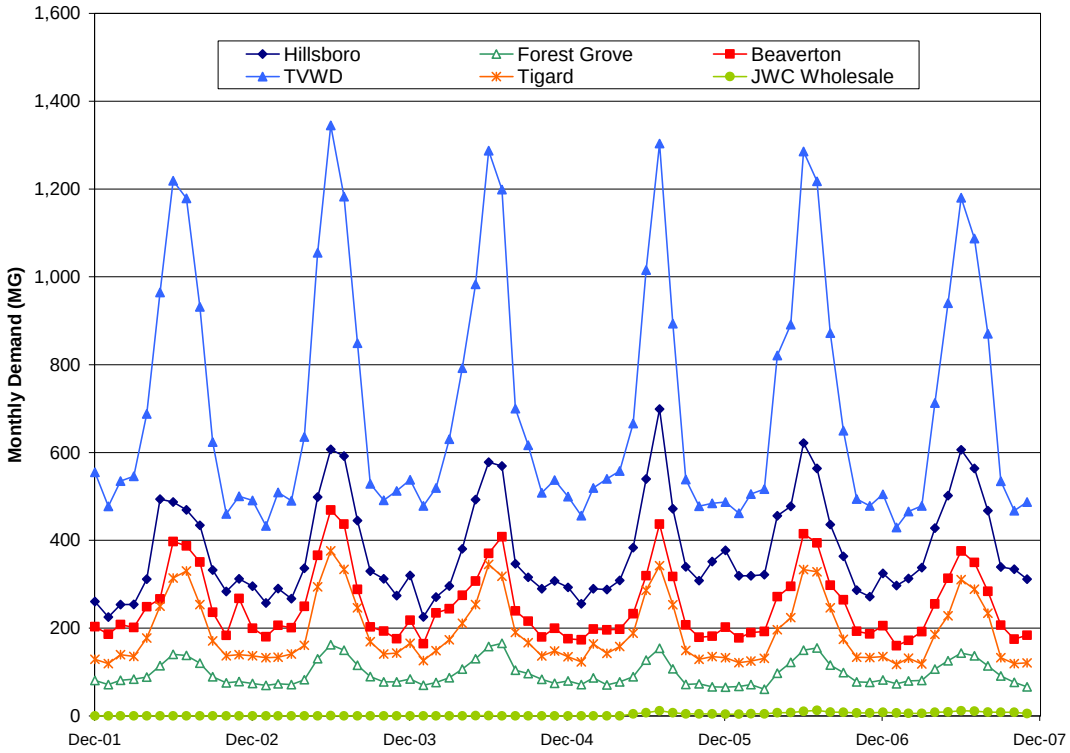
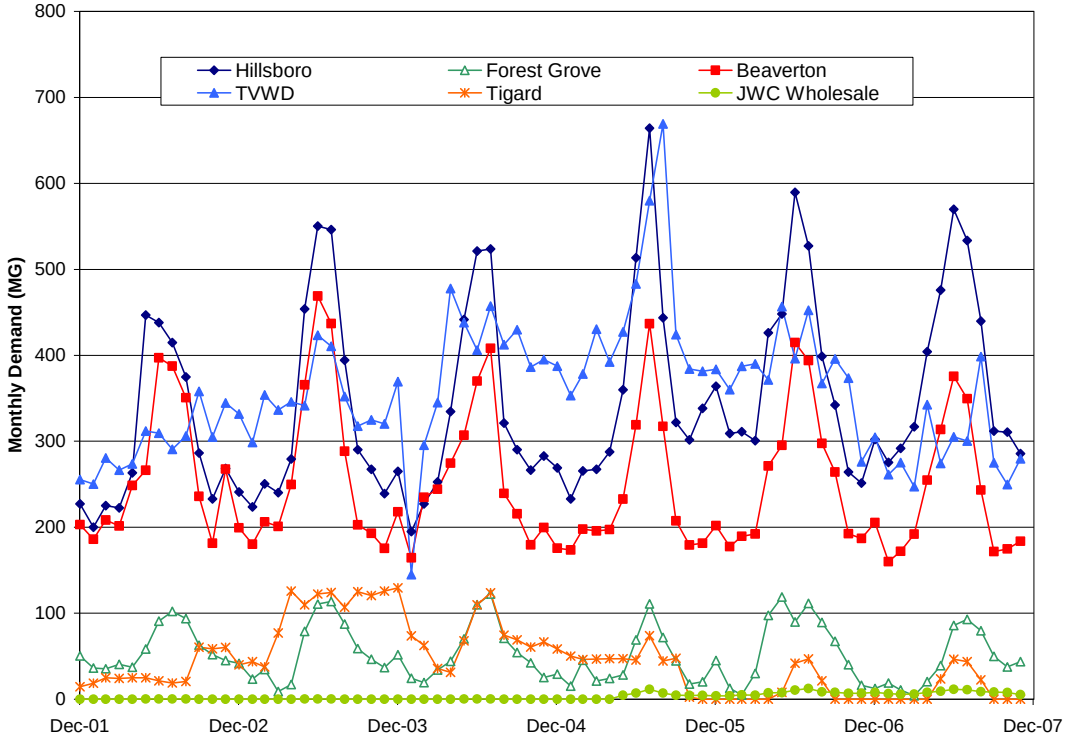


EXHIBIT 2-16
Total JWC-Supplied Monthly Demand for JWC Members and Wholesale Customers, 2002-2007

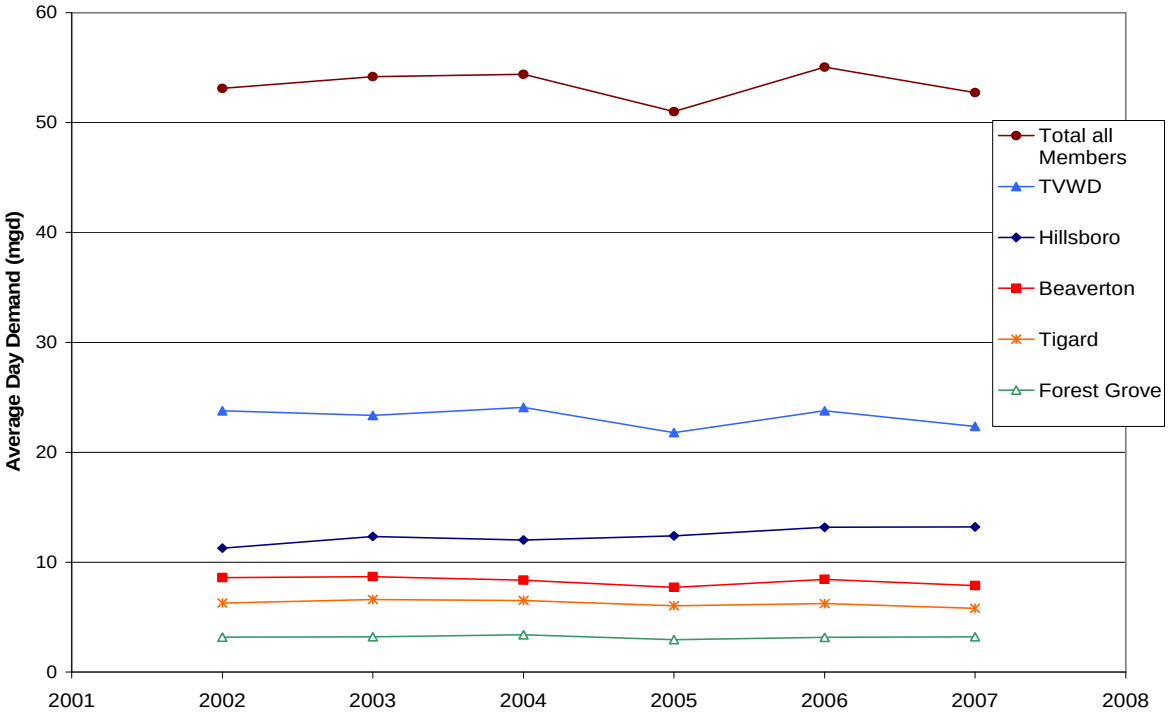


JWC Annual Demand

Exhibit 2-17 graphically depicts historic ADD from all sources for each JWC member agency and the total ADD for all agencies and wholesale customers[4]. Overall ADD from all sources averaged 53 mgd for the six year period, 2002 to 2007. TVWD was the largest supplier, with nearly twice the ADD of the next largest supplier, Hillsboro. Forest Grove was the smallest provider of the JWC members.

[4] For simplicity, JWC wholesale customer demands are not shown individually, but are included in the total demand curve shown on Exhibits 2-17, 2-19, and 2-20. MDD values were not determined for these customers.

EXHIBIT 2-17
Historical Total Average Daily Demand From All Sources for JWC Members, 2002-2007



Exhibits 2-18 and 2-19 show historic MDD and MMD values, respectively, as estimated by each member agency. [5] The average of the sum of each member's MDD was 106 mgd, or approximately two times the ADD from all sources. Municipal MDDs are generally more variable from year to year than are ADDs because MDDs are sensitive to weather patterns. Unusually hot weather or the combination of hot and dry weather increases outdoor irrigation, which in turn increases the MDD.

[5] Because individual systems experience maximum day and maximum month demand events at different times during the summer season, the sum of member agency MDDs and MMDs, shown in Exhibits 2-18 and 2-18, provide only an estimate of system-wide values. Wholesale customer MDD were not determined, but MMD values were included in the total shown in Exhibit 2-19.

EXHIBIT 2-18
Historical Total Maximum Daily Demand From All Sources for JWC Members, 2002-2007

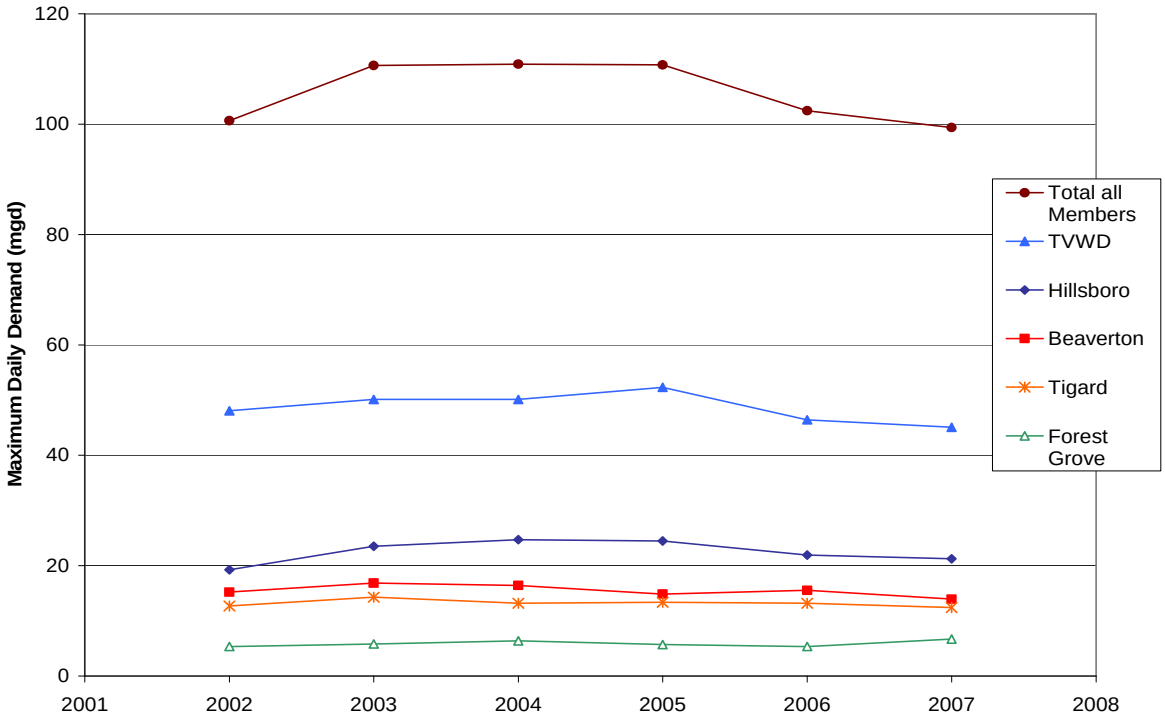


EXHIBIT 2-19
Historical Total Maximum Monthly Demand From All Sources for JWC Members, 2002-2007

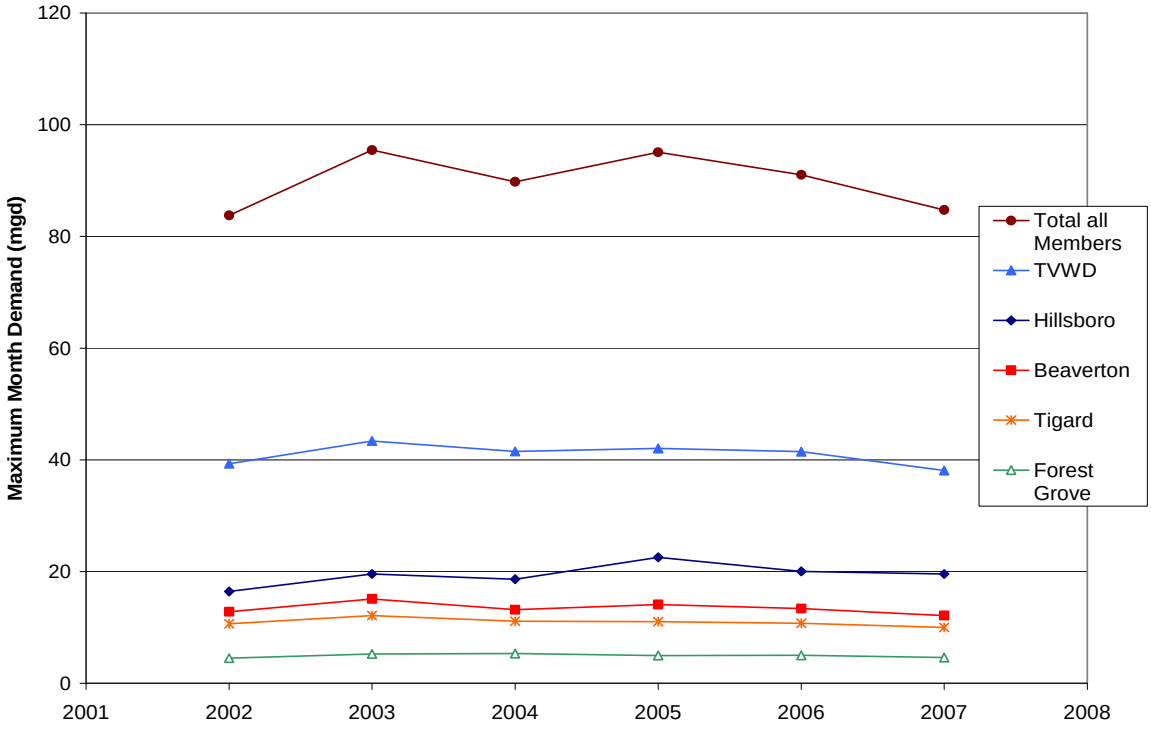


Exhibit 2-20 shows the historic annual ADD supplied to each member agency from the JWC WTP. Total JWC-supplied ADD averaged 34 mgd for the six year period, or approximately 64 percent of the sum of member agencies' demand from all sources. As noted above, because TVWD receives a portion of supply from PWB, its ADD supply from JWC is comparable to Hillsboro.

EXHIBIT 2-20
Historical Total Average Day Demand From JWC WTP for JWC Members, 2002-2007

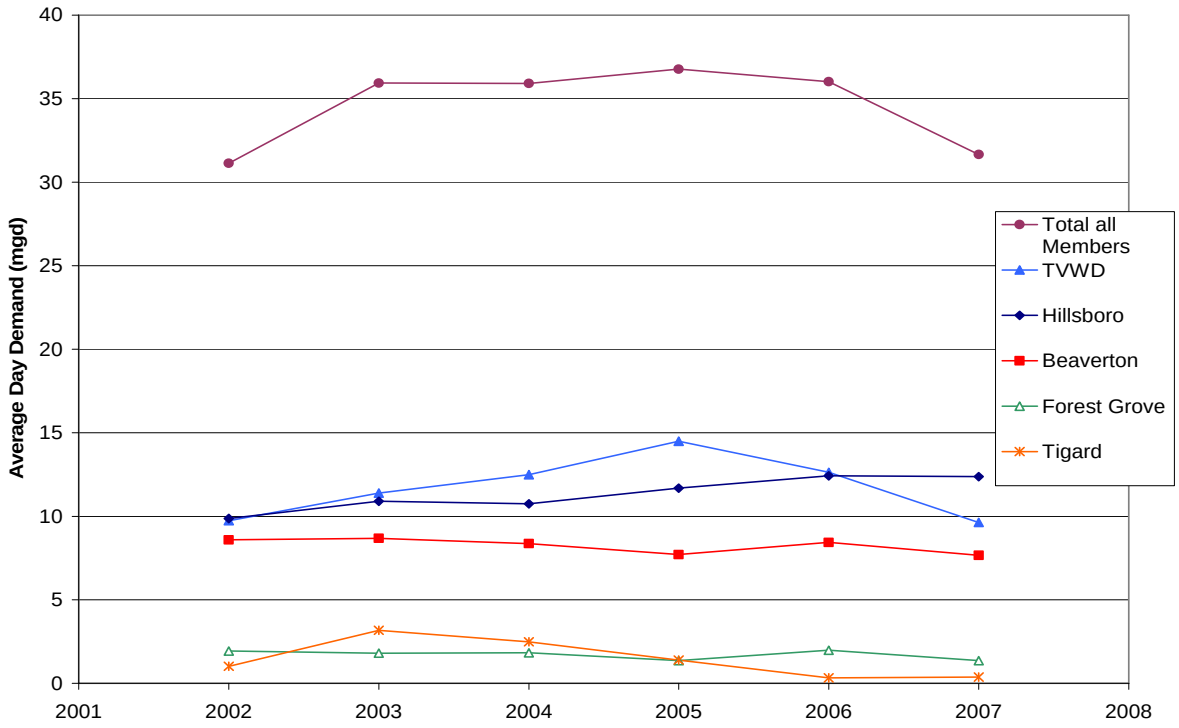


Exhibit 2-21 is a tabular summary of demand records for the JWC member agencies for the period 2002 through 2007. Data include ADD, MDD, MMD, and the MDD to ADD peaking factors based on each member's total supply, as well as the JWC-supplied ADD and the percentage of annual supply from the JWC WTP.

EXHIBIT 2-21
Summary of Annual Demand Data for JWC Member Agencies and Wholesale Customers, 2002-2007

	All Sources						JWC-supplied		
JWC Agency/ Year	Annual Volume (MG)	Overall ADD (mgd)	Overall MDD (mgd)	MDD/ADD Peaking Factor	Maximum Month Volume (MG)	MMD (mgd)	Annual Volume[2] (MG)	ADD (mgd)	Percentage of annual supply from JWC
Wholesale Customers[1]									
2002	1	0.003	ND	ND	0.17	0.01	1	0.003	100%
2003	1	0.003	ND	ND	0.23	0.01	1	0.003	100%
2004	1	0.003	ND	ND	0.23	0.01	1	0.003	100%
2005	44	0.12	ND	ND	11.5	0.37	44	0.12	100%
2006	86	0.24	ND	ND	12.5	0.40	86	0.24	100%
2007	96	0.26	ND	ND	11.6	0.37	96	0.26	100%
Average '06-'07	**91**	**0.25**	**-**	**-**	**12**	**0.39**	**91**	**0.25**	**100%**
Hillsboro									
2002	4,116	11.28	19.27	1.7	494	16.5	3,600	9.9	87%
2003	4,504	12.34	23.53	1.9	607	19.6	3,976	10.9	88%
2004	4,391	12.03	24.72	2.1	578	18.6	3,921	10.7	89%
2005	4,527	12.40	24.46	2.0	699	22.6	4,266	11.7	94%
2006	4,812	13.18	21.93	1.7	621	20.0	4,533	12.4	94%
2007	4,824	13.22	21.25	1.6	606	19.6	4,518	12.4	94%
Average	4,529	12.41	22.53	1.8	601	19.5	4,136	11.3	91%
Forest Grove									
2002	1,160	3.18	5.37	1.7	140	4.5	705	1.93	61%
2003	1,171	3.21	5.82	1.8	162	5.2	658	1.80	56%
2004	1,235	3.38	6.40	1.9	165	5.3	669	1.83	54%
2005	1,073	2.94	5.71	1.9	154	5.0	497	1.36	46%
2006	1,157	3.17	5.36	1.7	155	5.0	724	1.98	63%
2007	1,176	3.22	6.70	2.1	143	4.6	495	1.36	42%
Average	1,162	3.18	5.89	1.9	153	4.9	625	1.7	54%
Beaverton									
2002	3,135	8.59	15.23	1.8	397	12.81	3,134	8.59	100%
2003	3,168	8.68	16.86	1.9	469	15.12	3,168	8.68	100%
2004	3,055	8.37	16.44	2.0	408	13.16	3,055	8.37	100%
2005	2,814	7.71	14.87	1.9	437	14.08	2,814	7.71	100%

EXHIBIT 2-21
Summary of Annual Demand Data for JWC Member Agencies and Wholesale Customers, 2002-2007

	All Sources						JWC-supplied		
JWC Agency/ Year	Annual Volume (MG)	Overall ADD (mgd)	Overall MDD (mgd)	MDD/ADD Peaking Factor	Maximum Month Volume (MG)	MMD (mgd)	Annual Volume[2] (MG)	ADD (mgd)	Percentage of annual supply from JWC
2006	3,078	8.43	15.53	1.8	415	13.38	3,078	8.43	100%
2007	2,871	7.87	13.95	1.8	375	12.11	2,796	7.66	97%
Average	3,020	8.27	15.48	1.9	417	13.4	3,007	8.2	100%
TVWD									
2002	8,680	23.78	48.06	2.0	1,219	39.33	3,552	9.73	41%
2003	8,523	23.35	50.11	2.1	1,345	43.40	4,157	11.39	49%
2004	8,789	24.08	50.11	2.1	1,287	41.53	4,557	12.48	52%
2005	7,953	21.79	52.31	2.4	1,304	42.05	5,290	14.49	67%
2006	8,679	23.78	46.43	2.0	1,286	41.47	4,610	12.63	53%
2007	8,158	22.35	45.07	2.0	1,180	38.08	3,514	9.63	43%
Average	8,464	23.19	48.68	2.1	1,270	41.0	4,280	11.7	51%
Tigard									
2002	2,295	6.29	12.70	2.0	330	10.64	372	1.02	16%
2003	2,408	6.60	14.30	2.2	376	12.13	1,158	3.17	48%
2004	2,382	6.53	13.21	2.0	345	11.13	905	2.48	38%
2005	2,204	6.04	13.38	2.2	342	11.05	509	1.40	23%
2006	2,278	6.24	13.18	2.1	333	10.75	118	0.32	5%
2007	2,120	5.81	12.40	2.1	310	10.01	136	0.37	6%
Average '02-'05	2,322	6.36	13.4	2.1	348	11.24	736	2.02	31
Average '06-'07	2,199	6.02	12.79	2.1	322	10.38	127	0.35	6%

ND= not determined
[1] Wholesale Customers include Westside Lutheran School and the City of North Plains. North Plains began receiving JWC water in June 2005.
[2] Supply used for ASR recharge is not included in production totals. ASR discharge is included.

Individual member agency demands are described further below.

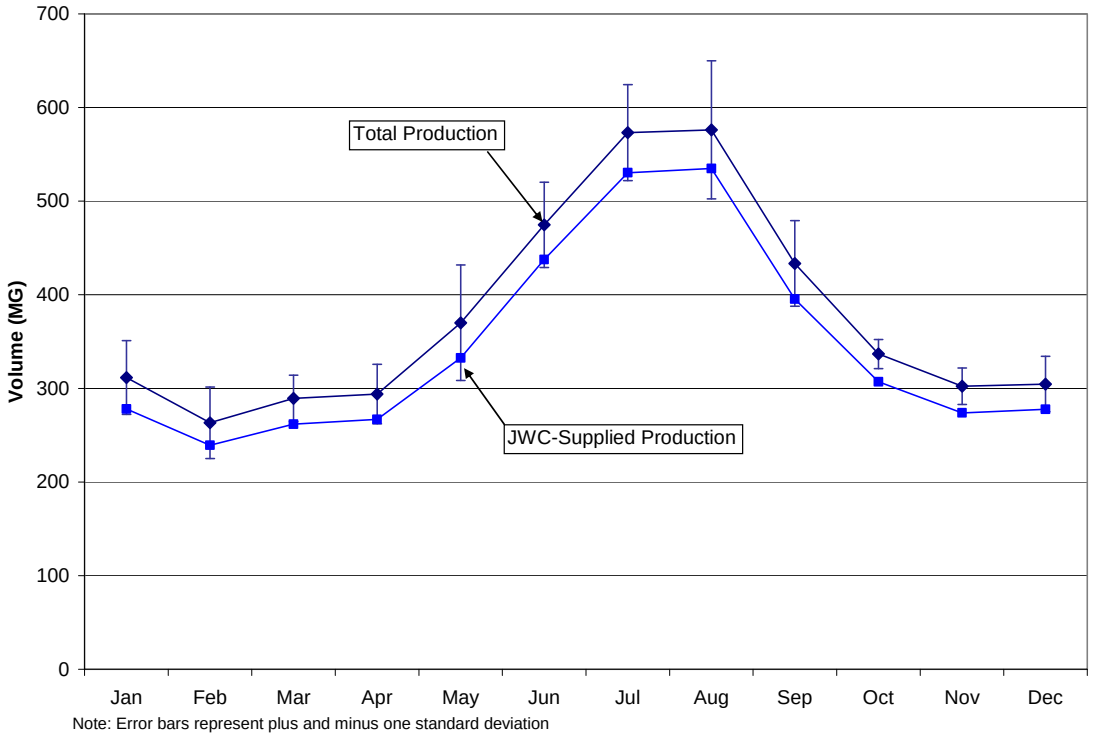
Hillsboro

Hillsboro Water's overall ADD ranged from 11.3 to 13.2 mgd with an average of 12.4 mgd for the six year period. The ADD increased at a steady rate of approximately 0.36 mgd per year since 2002. Even though ADD increased nine percent from 2004 to 2007, the MDD

decreased 14 percent from 24.7 mgd in 2004 to 21.3mgd in 2007. This reduction in maximum day demand may be a result of aggressive conservation programs. Hillsboro will continue to monitor this trend. For the six year period, the MDD ranged from 19.3 to 24.7 mgd, and averaged 22.5 mgd. The MDD to ADD peaking factor for the period averaged 1.8. Since 2005, JWC WTP supplied 94 percent of Hillsboro's demand, with the remainder supplied by the Hillsboro slow sand filter plant.

Exhibit 2-22 shows Hillsboro's average monthly metered production from all sources and from the JWC WTP. Error bars represent plus and minus one standard deviation in the data. July and August are typically the months of highest demand. For the last six years, the maximum month demand occurred in July four years, in June one year, and in August one year. June through September, or one third of the year, accounted for an average of 45 percent of annual demand. The remaining 55 percent of demand was distributed over the remaining eight months (two thirds) of the year.

EXHIBIT 2-22
City of Hillsboro Average Monthly Metered Production (JWC-supplied and Total), 2002-2007



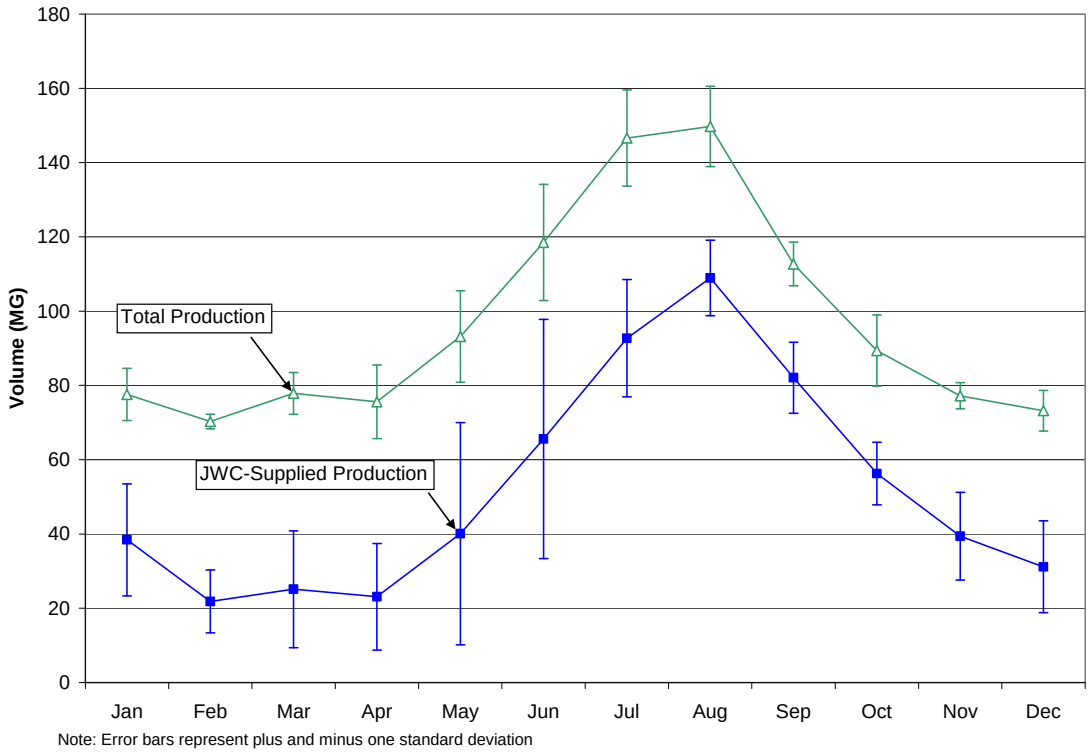
Note: Error bars represent plus and minus one standard deviation

Forest Grove

Forest Grove's ADD fluctuated between a low of 2.9 mgd in 2005 and a high of 3.4 mgd in 2004, averaging 3.2 mgd for the six year period. The MDD ranged from 5.4 to 6.7 mgd, and averaged 5.9 mgd. The MDD to ADD peaking factor for the period averaged 1.9. The JWC WTP supplied approximately 54 percent of city demand, with the balance supplied by the Forest Grove WTP.

Exhibit 2-23 shows Forest Grove's average monthly metered production from all sources and from the JWC WTP. For the last six years, the maximum month demand occurred in July three years, and in August three years. The four month period, June through September accounted for an average of 45 percent of annual demand.

EXHIBIT 2-23
City of Forest Grove Average Monthly Metered Production (JWC-supplied and Total), 2002-2007



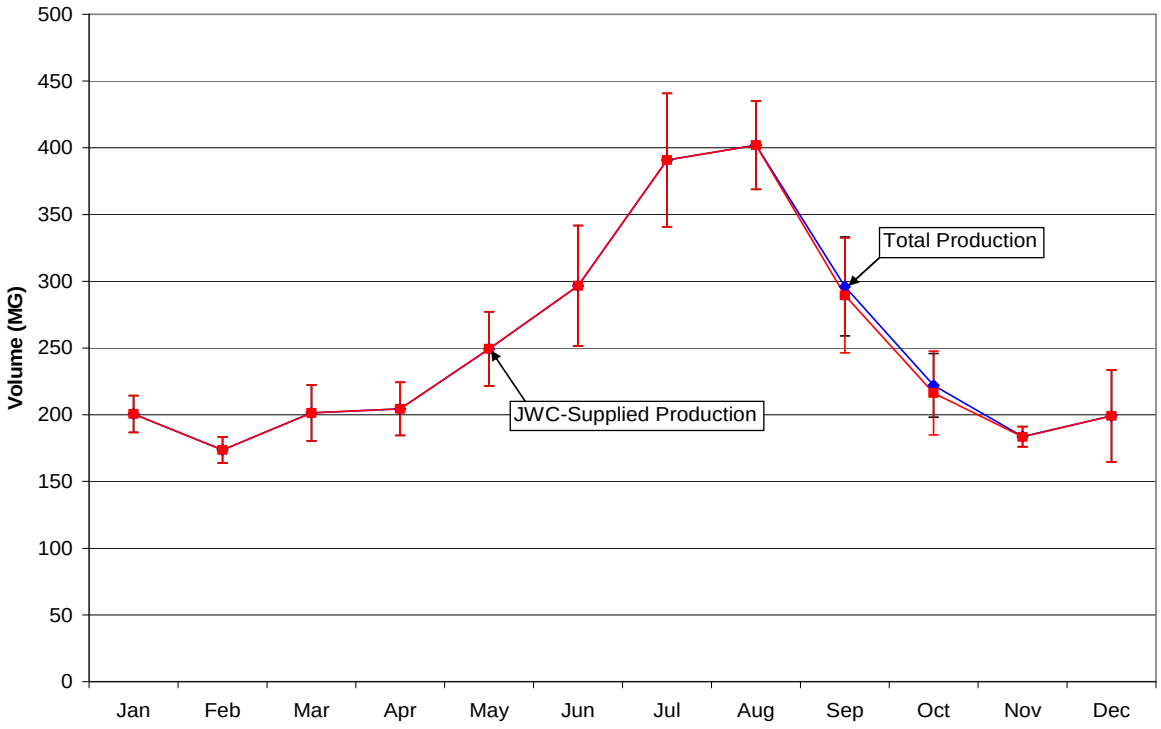
Note: Error bars represent plus and minus one standard deviation

Beaverton

The City of Beaverton receives nearly all of its water from the JWC with the remainder supplied by native ground water wells. Beaverton has an active ASR system to take advantage of JWC WTP supply capacity during the winter months. Water stored during the winter helps meet Beaverton's peak summer demands. Beaverton's ADD fluctuated around an average of approximately 8.3 mgd. The MDD ranged from 14.0 mgd in 2007 to 16.9 mgd in 2003, with an average of 15.5 mgd for the six year period. Conservation measures may have contributed to the lower MDD observed in 2007. The MDD to ADD peaking factor averaged 1.9 with little fluctuation over the 5 year time period.

Exhibit 2-24 shows Beaverton's average monthly metered production from all sources and from the JWC WTP. The JWC is Beaverton's primary water source. The difference between total production and JWC-supplied production in September and October reflects production of Beaverton's native ground water. For the last six years, the maximum month demand occurred in July four years, and in August two years. The four month period, June through September accounted for an average of 46 percent of annual demand.

EXHIBIT 2-24
City of Beaverton Average Monthly Metered Production (JWC-supplied and Total), 2002-2007



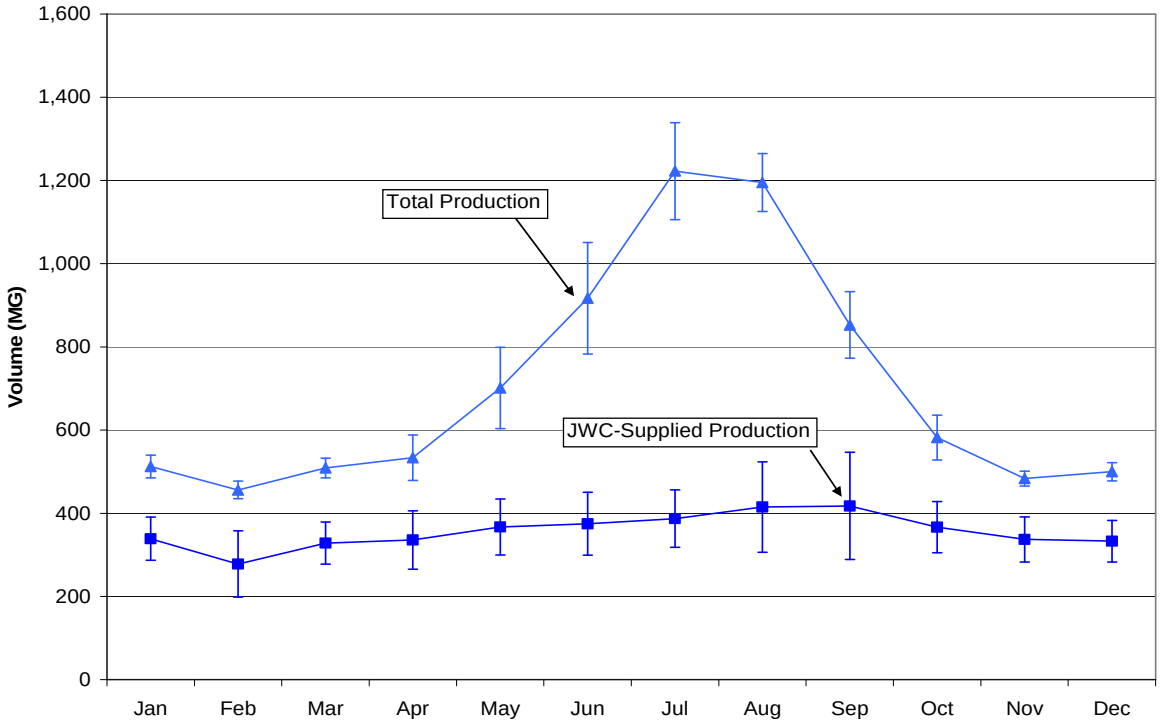
Note: Error bars represent plus and minus one standard deviation

TVWD

TVWD's overall ADD ranged from 21.8 mgd to 24.1 mgd with an average of 23.2 for the six year period. The MDD ranged from 45.1 mgd to 52.3 mgd, and averaged 48.7 mgd. TVWD experienced an approximately 10 percent reduction in MDD between 2005 and 2007 that may be associated with conservation activities. TVWD will continue to monitor this trend. The MDD to ADD peaking factor for the period averaged 2.1. Since 2005, the JWC WTP has supplied 51 percent of TVWD's demand, with the remainder supplied by PWB.

Exhibit 2-25 shows the average monthly metered production from all sources and from the JWC WTP for the 2002 to 2007 period. As shown, the JWC WTP supplied a base demand to TVWD throughout the year, with peak summer demands supplied by TVWD's other sources. July and August are typically the months of peak demand, with the maximum month demand occurring in July for five, and in August one, of the six years. The four month period, June through September accounted for an average of 49 percent of annual demand.

EXHIBIT 2-25
TVWD Average Monthly Metered Production (JWC-supplied and Total), 2002-2007



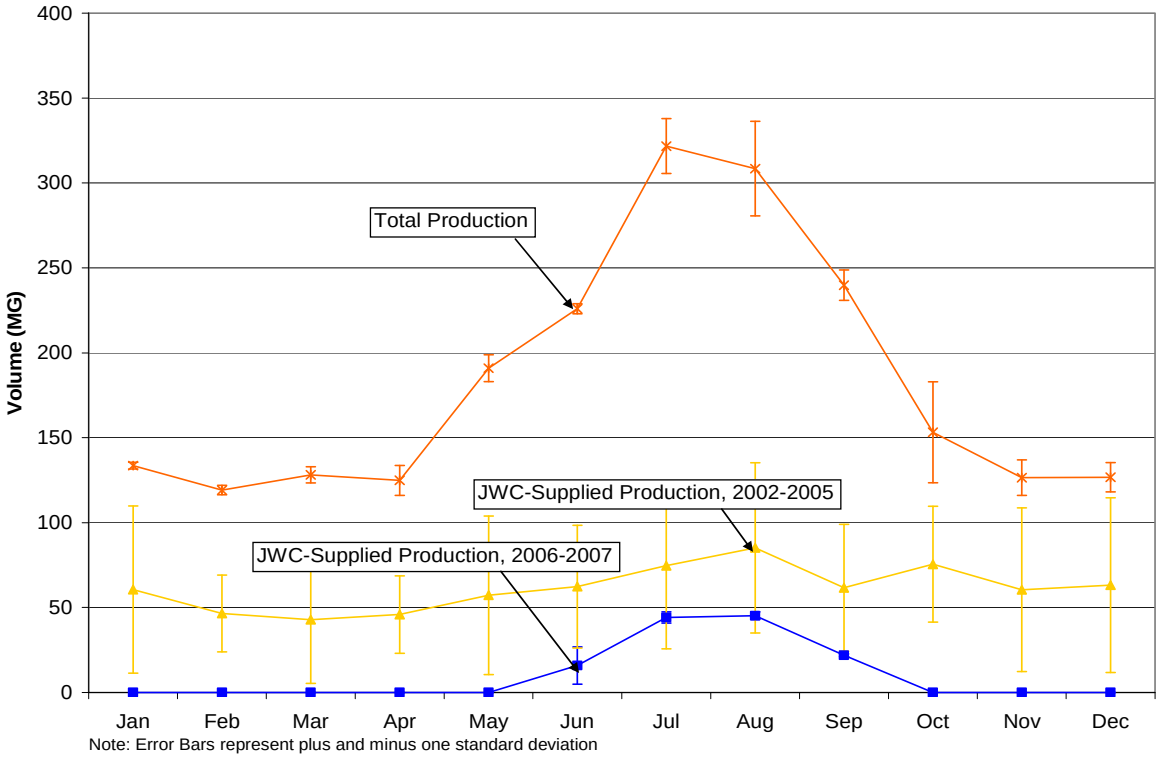
Note: Error bars represent plus and minus one standard deviation

Tigard

Tigard's relationship with the JWC changed in 2006 because of contract requirements of PWB, one of Tigard's other water suppliers. Prior to 2006, Tigard received JWC water throughout the year. Beginning in 2006, JWC supply was used only during the summer months, and represented approximately 6 percent of Tigard's annual supply. Because of this change in relationship, two JWC-supplied monthly production curves are shown on **Exhibit 2-26** Tigard's ADD averaged 6.0 mgd over the six year period. The MDD ranged from 12.4 mgd in 2007 to 14.3 mgd in 2003 with an average of 12.8 mgd. Tigard experienced an approximately 8 percent reduction in MDD over the three year period between 2005 and 2007. This reduction may be associated with conservation activities. Tigard will continue to monitor this trend. The MDD to ADD peaking factor for the period averaged 2.1.

Exhibit 2-26 shows Tigard's average monthly metered production from all sources, and from the JWC WTP for the periods 2002 to 2005 and 2006 to 2007 because of the change in JWC supply. For the last six years, Tigard's maximum month demand occurred in July four years, and in August two years. The four month period, June through September accounted for an average of 49 percent of annual demand.

EXHIBIT 2-26
City of Tigard Average Monthly Metered Production (JWC-supplied and Total), 2002-2007



Note: Error Bars represent plus and minus one standard deviation

Annual Consumption and Unaccounted-for Water

Consumption is equal to the metered or otherwise accounted-for water use within the system. Some members estimate un-metered water used for fire fighting, water main water quality flushing, main breaks, hydrant maintenance, and for construction. All customers served by JWC member agencies are metered.

Unaccounted-for water is equal to the difference between production and metered consumption, and represents the sum of un-metered uses (hydrant flushing, for example), leakage, overflows, evaporation, and inaccuracies of measurement at the production or customer meters. When this difference is divided by the production value, unaccounted-for water is expressed as a percentage of total demand. Leakage represents only a portion of a system's unaccounted-for water. The OWRD administrative rules set a goal for system leakage (a potential portion of unaccounted-for water) of 15 percent or, if feasible, to 10 percent or less.

Exhibit 2-27 lists annual total production and metered consumption values for the period 2002 through 2007, and percent of unaccounted-for water for all JWC member agencies. **Exhibit 2-28** displays the percentage of unaccounted-for water data, graphically.

EXHIBIT 2-27
Summary of Annual Demand, Metered Consumption, and Unaccounted-for Water for JWC Member Agencies, 2002-2007

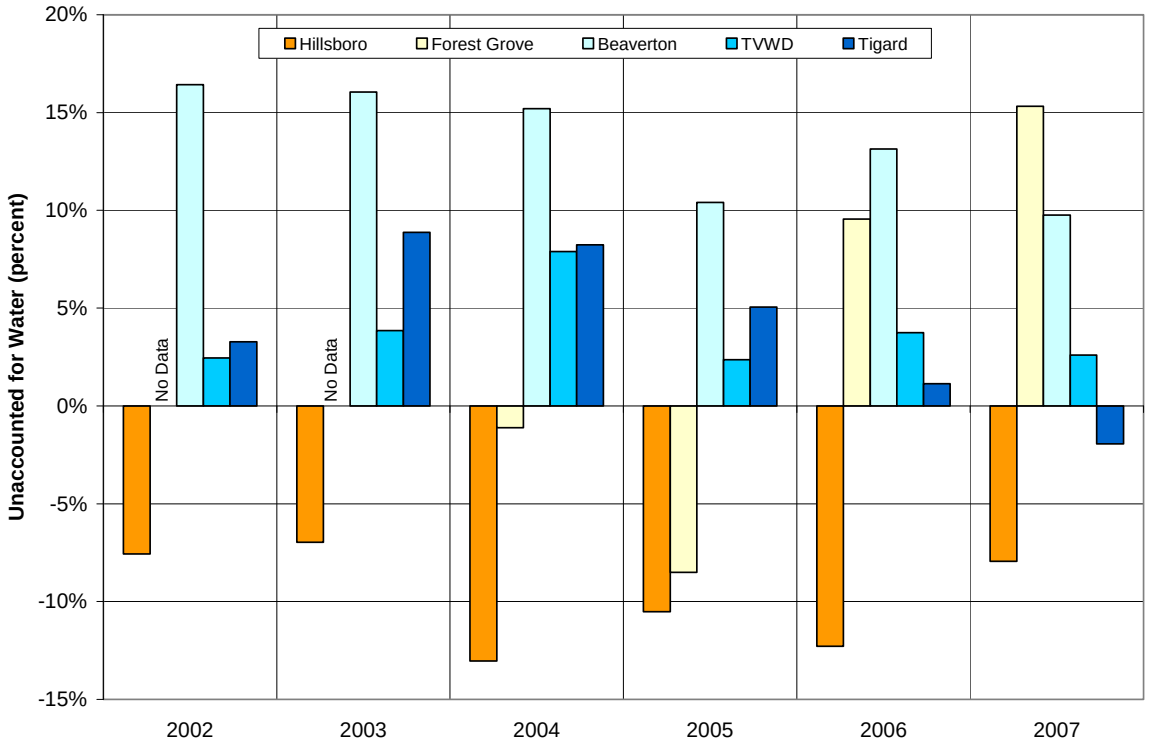
JWC Member/Year	Total Production (MG)	Metered Consumption (MG)	Percent Unaccounted-for Water
Hillsboro			
2002	4,116	4,428	-8%
2003	4,504	4,818	-7%
2004	4,391	4,963	-13%
2005	4,527	5,003	-11%
2006	4,812	5,404	-12%
2007	4,824	5,207	-8%
Average	**4,529**	**4,970**	**-10%**
Forest Grove			
2002	1,160	ND	ND
2003	1,171	ND	ND
2004	1,235	1,249	-1%
2005	1,073	1,165	-9%
2006	1,157	1,046	10%
2007	1,176	995	15%
Average	**1,162**	**1,114**	**4%**

EXHIBIT 2-27
Summary of Annual Demand, Metered Consumption, and Unaccounted-for Water for JWC Member Agencies, 2002-2007

JWC Member/Year	Total Production (MG)	Metered Consumption (MG)	Percent Unaccounted-for Water
Beaverton			
2002	3,135	2,620	16%
2003	3,168	2,659	16%
2004	3,055	2,591	15%
2005	2,814	2,521	10%
2006	3,078	2,673	13%
2007	2,871	2,591	10%
Average	**3,020**	**2,609**	**13%**
TVWD			
2002	8,680	8,468	2%
2003	8,523	8,195	4%
2004	8,789	8,095	8%
2005	7,953	7,764	2%
2006	8,679	8,355	4%
2007	8,158	7,946	3%
Average	**8,464**	**8,137**	**4%**
Tigard			
2002	2,295	2,219	3%
2003	2,408	2,194	9%
2004	2,382	2,185	8%
2005	2,204	2,093	5%
2006	2,278	2,252	1%
2007	2,120	2,161	-2%
Average	**2,315**	**2,207**	**4%**

ND = No data available.

EXHIBIT 2-28
Annual Unaccounted-for Water for JWC members, 2002-2007



Note: Forest Grove data begins in 2004.

As shown in these exhibits, several of the JWC members have reported negative values for unaccounted-for water. This is a physical impossibility, so the sources of the unaccounted-for water error, such as meter inaccuracies or accounting practices, will need to be investigated. Hillsboro's staff has identified several large meters on transmission lines that they would like to replace to improve accuracy. The Cities of Forest Grove and Tigard have had negative and positive unaccounted-for water values, indicating some inconsistency in metering or accounting. The City of Beaverton's unaccounted-for water rate has been consistently positive, averaging 13 percent for the period, but approximately 10 percent in 2005 and 2007. TVWD has reported unaccounted-for water values averaging four percent. In general, JWC agencies report unaccounted-for water rates approaching or below the OWRD goal for system leakage of 10 percent.

Customer Characteristics and Use Patterns

OAR 690-086-0140(6)

Because JWC's individual member agencies have unique customer bases and billing practices, customer characteristics and use patterns are presented separately below. Member agencies bill customers monthly, bi-monthly, and a combination of monthly and bi-monthly depending on customer category. Often the date assigned to billed consumption is the day of meter reading, and refers to consumption during the previous period. Consumption data presented here reflect the bill date. Therefore, peak months may be off-set (delayed) by

approximately one month from demand data. "Summer season" water consumption, was therefore arbitrarily assigned to the four months with the highest monthly consumption. Winter season consumption was assumed to occur in the months of December through March. No irrigation was assumed to occur during the winter season months, and the average winter monthly consumption was applied to a twelve-month period to estimate indoor water consumption for select customer categories. Outdoor water consumption for single- and multi-family residential customers was estimated by subtracting indoor consumption from annual total consumption within customer categories. Indoor and outdoor water consumption was not determined for commercial and industrial customers because seasonal changes in water use may be process related, and not necessarily because of irrigation. Water use by commercial and industrial water customers must be examined individually. All water from irrigation accounts was assigned to outdoor use regardless of when the accounts were billed.

Conservation measures targeting indoor water consumption by residential customers may provide year-round water savings, while measures targeting outdoor water consumption will reduce peak consumption during the summer. The benefit that a system can realize depends on the types of customers and water uses, and the proportion of indoor versus outdoor water uses.

Hillsboro

Hillsboro bills some customers monthly, and others bi-monthly. **Exhibits 2-29 and 2-30** present the annual metered consumption by customer category for the City of Hillsboro for the years 2002 through 2007. Annual metered consumption averaged approximately 4,900 MG over the six year period. Approximately 83 percent of annual consumption was divided approximately equally between the residential and business/industrial customer categories. Wholesale consumption accounted for 11 percent of annual metered consumption.

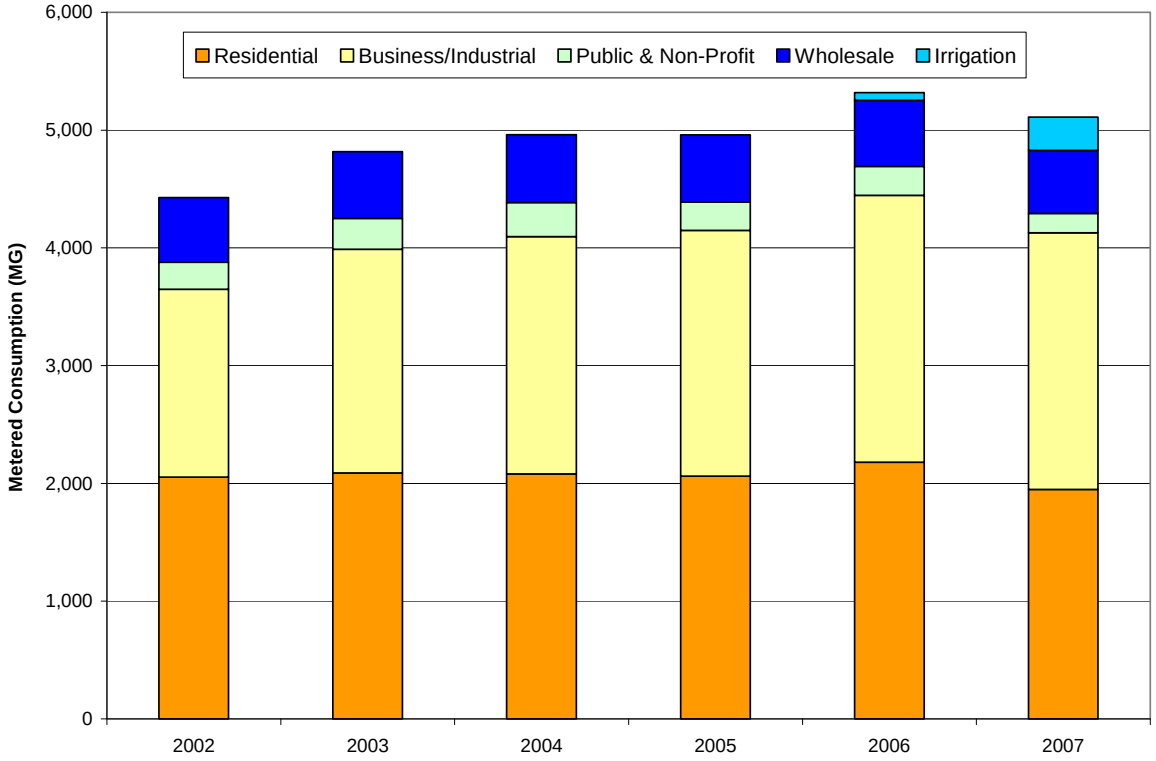
Hillsboro restructured rates significantly in October 2006. The previous rate structure was based on location within or outside the city limits, billing timeframes (monthly or bi-monthly), and included a water usage allowance before consumptive rates were implemented. The new rate design removed water allowances and divided the rate structure by customer category (single-family, multi-family, industrial, commercial, public entities, non-profit, irrigation, and wholesale). New rates were based on the consumptive and peaking characteristics for each customer category. For instance, the new rate structure includes a 3-tier inverted block rate for single-family residential customers as well as inclining blocks for most other classes. Before the rate restructure, Hillsboro only tracked the demands for five customer categories. For comparison with earlier years, the two residential categories were combined in the exhibits. In 2007, multi-family use accounted for 22 percent of total residential consumption. Conservation efforts aimed at both residential and commercial water consumption may prove beneficial for Hillsboro.

EXHIBIT 2-29
Hillsboro Metered Consumption (MG), 2002-2007

Year	Residential	Business/ Industrial	Public & Non-Profit	Wholesale	Irrigation [1]	Total
2002	2,053	1,595	232	547	ND	4,427
2003	2,089	1,900	262	566	ND	4,817
2004	2,080	2,016	290	576	ND	4,962
2005	2,061	2,088	239	570	ND	4,959
2006	2,181	2,266	245	562	64	5,318
2007	1,949	2,178	166	535	283	5,111
Average	**2,069**	**2,007**	**239**	**560**	**174**	**4,932**
Percentage of Use	**42%**	**41%**	**5%**	**11%**	**4%**	**100%**

[1] The irrigation category was introduced in October 2006.

EXHIBIT 2-30
Hillsboro Annual Consumption By Customer Category, 2002-2007



Note: The irrigation account category was introduced in October 2006.

Exhibit 2-31 lists the ten industrial customers and ten customers from all categories with the largest metered water consumption averaged over the three year period October 1, 2004 to September 30, 2007. The ten industrial customers accounted for approximately 35 percent of Hillsboro's total annual consumption, with Intel Corporation alone accounting for 29 percent of the total. The ten top customers regardless of customer category accounted for approximately 69 percent of total consumption.

EXHIBIT 2-31
Hillsboro's Top 10 Industrial and Overall Water Users, Average October 2004 to September 2007

Customer	Category	No. of Accounts	Annual Volume (MG)
Industrial			
Intel	Industrial	16	1,363
IDT	Industrial	2	152
Tri Quint Semi-Conductor	Industrial	3	45
OHKA America Inc	Industrial	1	22
SESMI	Industrial	1	12
Iwasaki Brothers	Industrial	1	11
Hines Nurseries	Industrial	2	9
Linde Electronics	Industrial	1	9
Tokai Carbon USA, Inc	Industrial	1	8
Lattice Semiconductor Co.	Industrial	3	8
		SubTotal	**1,638**
All Categories			
Intel	Industrial	16	1,363
City of Cornelius	Wholesale	3	426
IDT	Industrial	2	152
LA Water Cooperative	Wholesale	1	88
Hillsboro School District	Public	42	75
City of Hillsboro	Public	88	54
City of Gaston	Wholesale	1	47
Tri Quint Semi-Conductor	Industrial	3	45
Clean Water Services	Public	5	31
OHKA America Inc.	Industrial	1	22
		SubTotal	**3,242**

Exhibit 2-32 presents the average monthly billed consumption by customer category from 2002 through 2007. Consumption increased for all customer categories in the peak billing months of July through October. **Exhibit 2-33** shows that the average overall monthly consumption for the summer season averaged approximately 560 MG per month (18 mgd), with 250 MG per month (8 mgd) from residential customers and 210 MG per month (7 mgd) from business and industrial customers. The winter season average was 316 MG per month (11 mgd) and the annual average was 411 MG per month (13 mgd).

EXHIBIT 2-32
Hillsboro Average Monthly Billed Consumption By Customer Category, 2002-2007

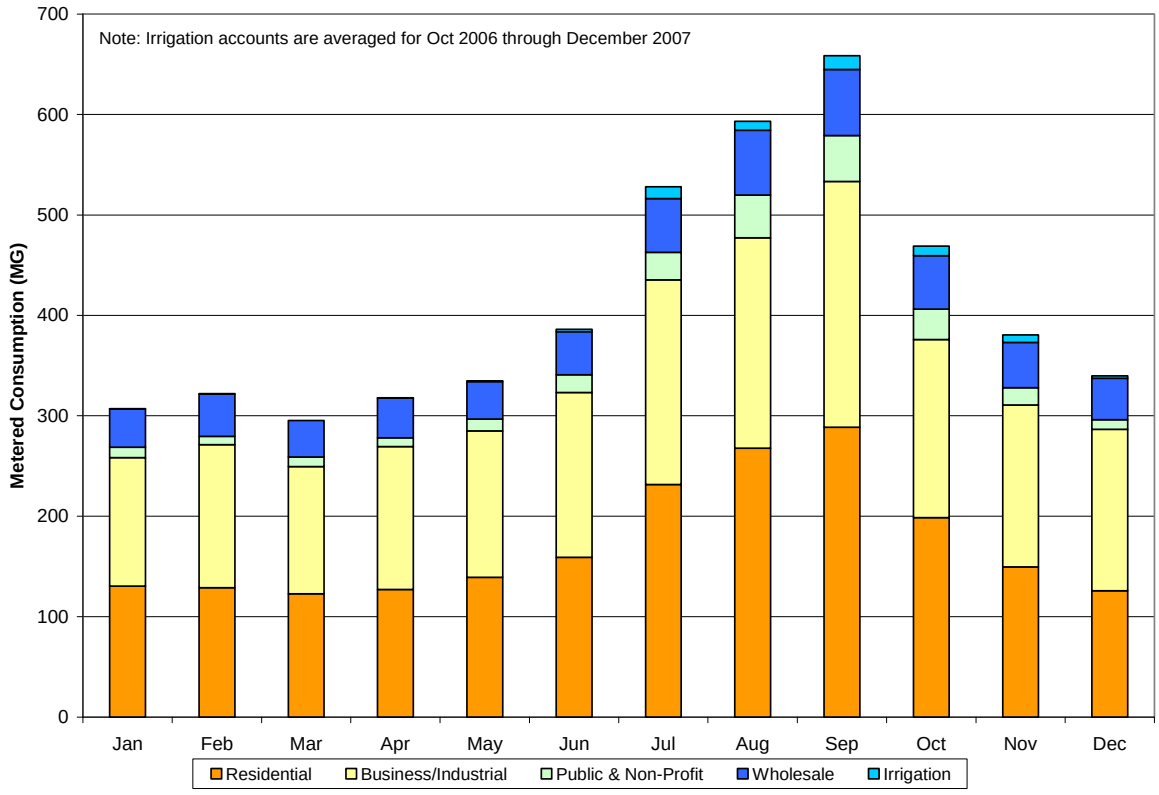


EXHIBIT 2-33
Hillsboro Average Monthly Consumption By Season and Customer Category, 2002-2007

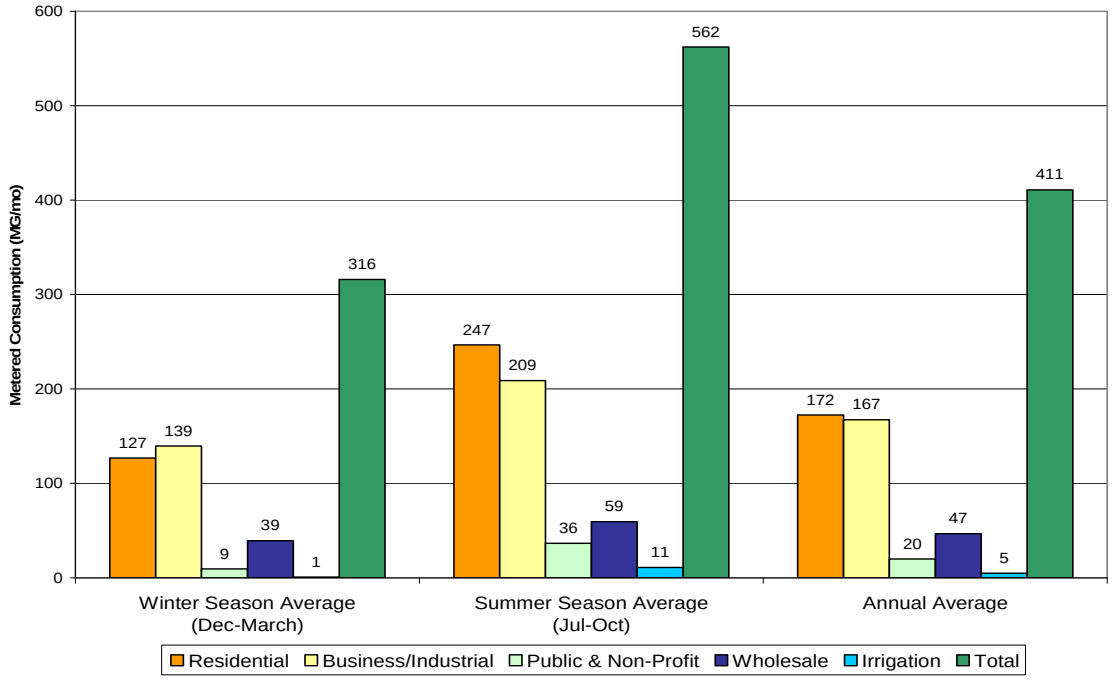
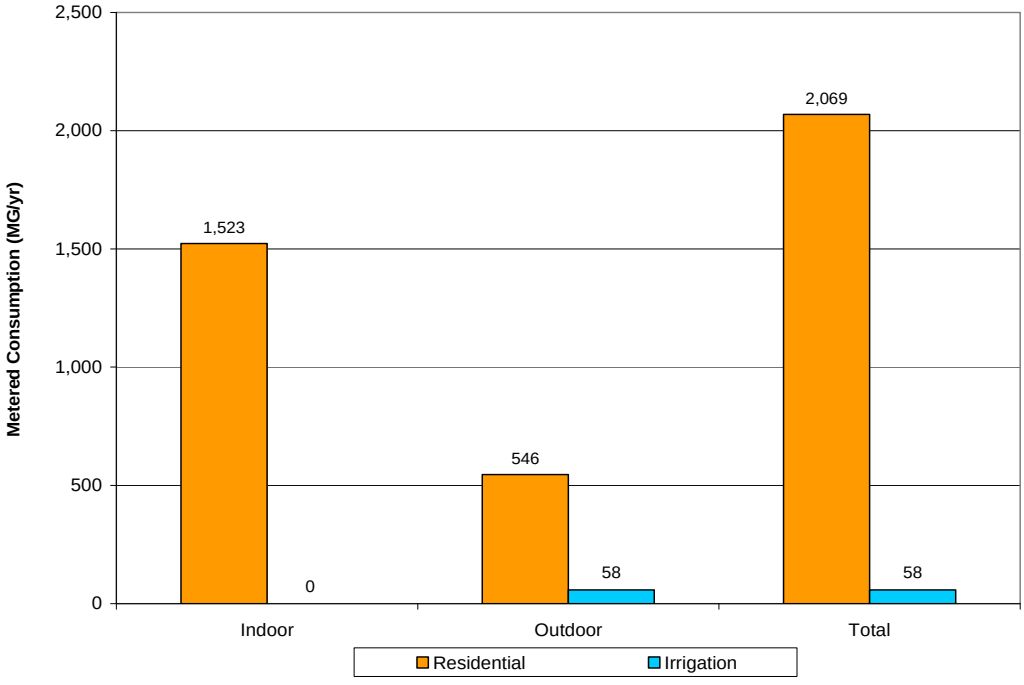


Exhibit 2-34 shows estimated indoor and outdoor water consumption for residential and irrigation accounts. Outdoor use represented approximately 26 percent of annual consumption by residential customers.

EXHIBIT 2-34
Hillsboro Average Annual Indoor and Outdoor Metered Consumption; Residential and Irrigation Customer Categories, 2002-2007



Forest Grove

Exhibits 2-35 and 2-36 present the annual metered consumption by customer category for the City of Forest Grove for the years 2004 through 2007. Annual metered consumption averaged approximately 1,100 MG over the four year period. Residential consumption averaged approximately 61 percent of total metered consumption, with 47 percent attributed to single family residences and 14 percent attributed to multi-family residential accounts. Commercial and industrial customer categories account for another 32 percent of annual consumption, and school and city accounts represented the remaining 7 percent. The reason for the decline in single family residential water consumption over the period may have resulted from a new tiered rate structure for single family residential accounts which was introduced in 2001.

EXHIBIT 2-35
Forest Grove Metered Consumption By Customer Category (MG), 2004-2007

Year	Single-Family	Multi-Family	Total Residential	Commercial	Industrial	School	City	Total
2004	670	141	810	149	225	43	22	1,249
2005	587	160	747	132	224	40	20	1,165
2006	430	165	595	132	230	57	33	1,046
2007	403	156	559	131	210	57	39	995
Average	**522**	**155**	**678**	**136**	**222**	**49**	**28**	**1,114**
Percentage of Use	**47%**	**14%**	**61%**	**12%**	**20%**	**4%**	**3%**	**100%**

EXHIBIT 2-36
Forest Grove Annual Consumption By Customer Category (MG), 2004-2007

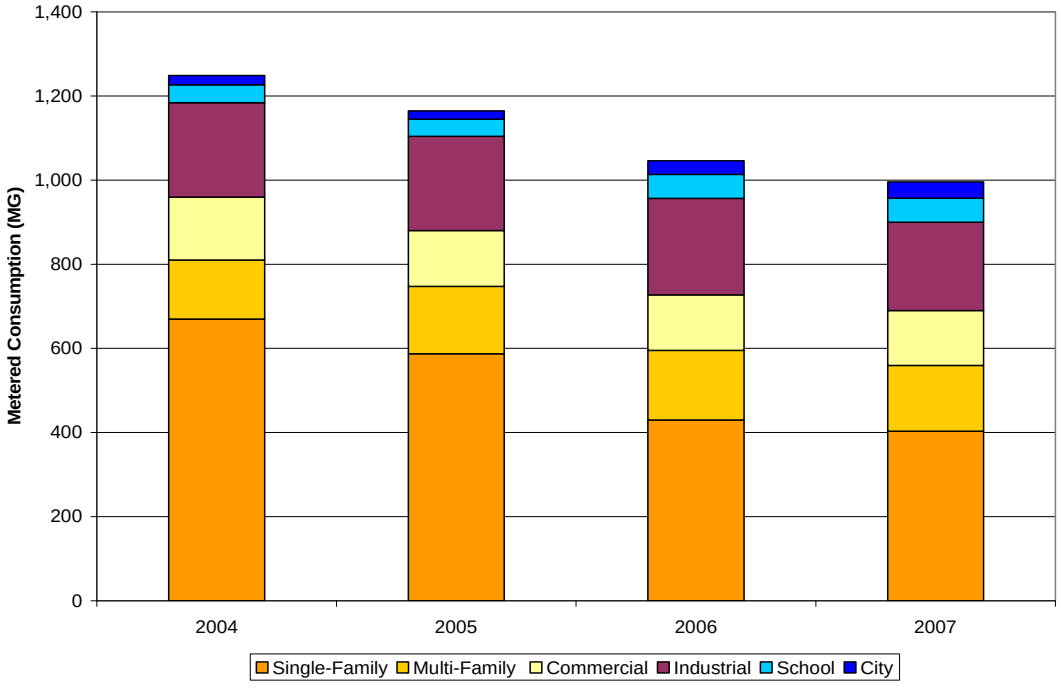


Exhibit 2-37 lists the fifteen customer accounts with the largest metered water consumption from October 2006 through October 2007. These customers represent a mixture of industrial and commercial accounts, and Pacific University's single largest account. The total volume for the accounts listed in Exhibit 2-37 represents approximately 22 percent of Forest Grove's total annual consumption.

EXHIBIT 2-37
Forest Grove's Top 15 Water Users, October 2006 through October 2007

Customer Name	Category	Annual Volume (MG)
Merix	Industrial	101.6
Westak of Oregon	Industrial	24.1
Gray and Company	Industrial	22.7
Pacific University[1]	Schools	20.4
Lieb Cold Storage LLC	Industrial	17.7
New Season Foods, Inc.	Commercial	6.6
Cedar Canyon Bottled Water	Industrial	6.6
New Season Foods, Inc.	Industrial	6.6
McMenamins Grand Lodge	Commercial	6.5
Safeway #406	Industrial	5.2
Tuality Health Care	Commercial	4.6
FG Business Park Condos	Commercial	4.5
Alterra Healthcare Corp	Industrial	4.4
Clean Water Services	Commercial	4.4
Oregon Roses	Commercial	4.4
	Total	**240**

[1] This is the largest of Pacific University's several accounts.

Exhibit 2-38 presents the average monthly billed consumption by customer category for the four year period. Forest Grove bills all customers monthly. Peak months were June through September. **Exhibit 2-39** shows that the average overall monthly consumption for the summer season averaged approximately 125 MG per month (4 mgd), with 77 MG per month (2.5 mgd) for residential customers and 37 MG per month (1.2 mgd) for commercial and industrial customers.

EXHIBIT 2-38
Forest Grove Average Monthly Billed Consumption By Customer Category (MG), 2004-2007

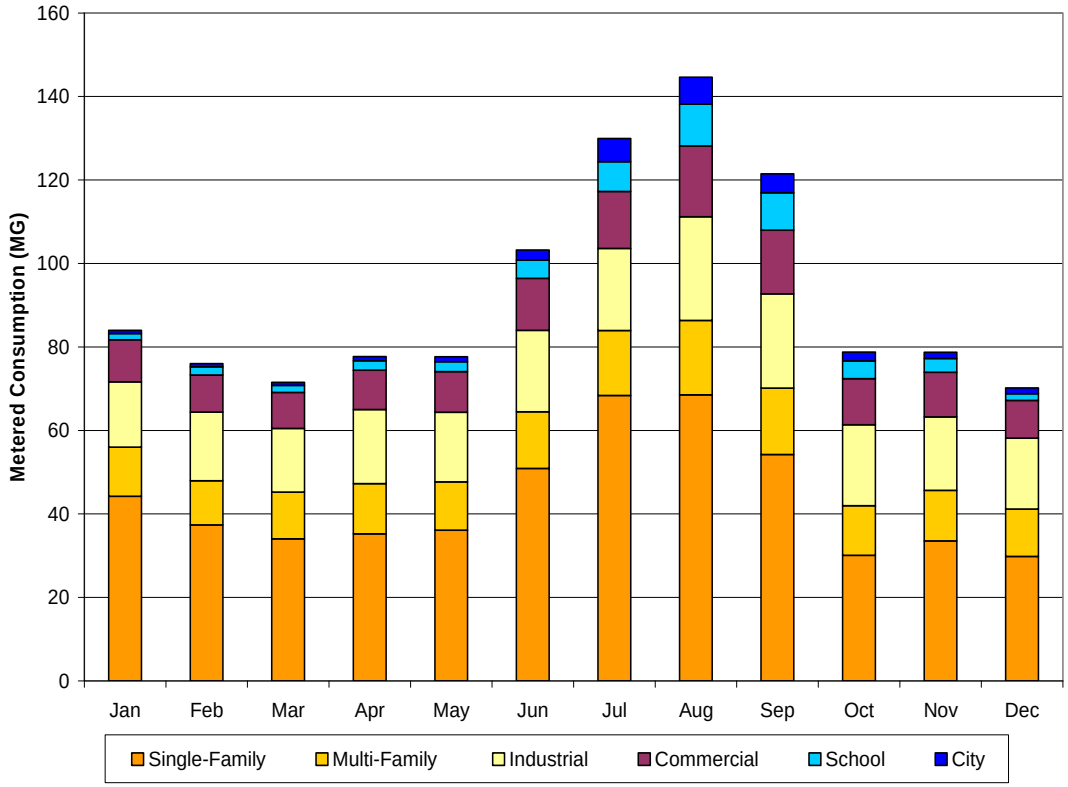


EXHIBIT 2-39
Forest Grove Average Monthly Consumption By Season and Customer Category (MG/mo), 2004-2007

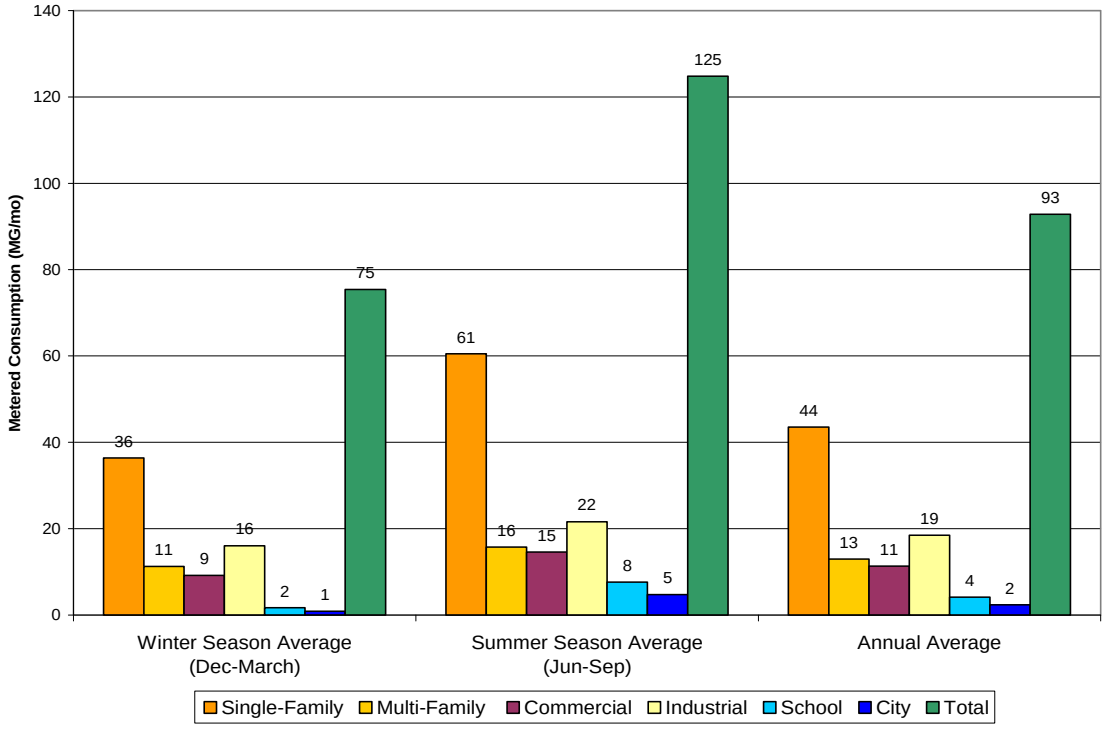
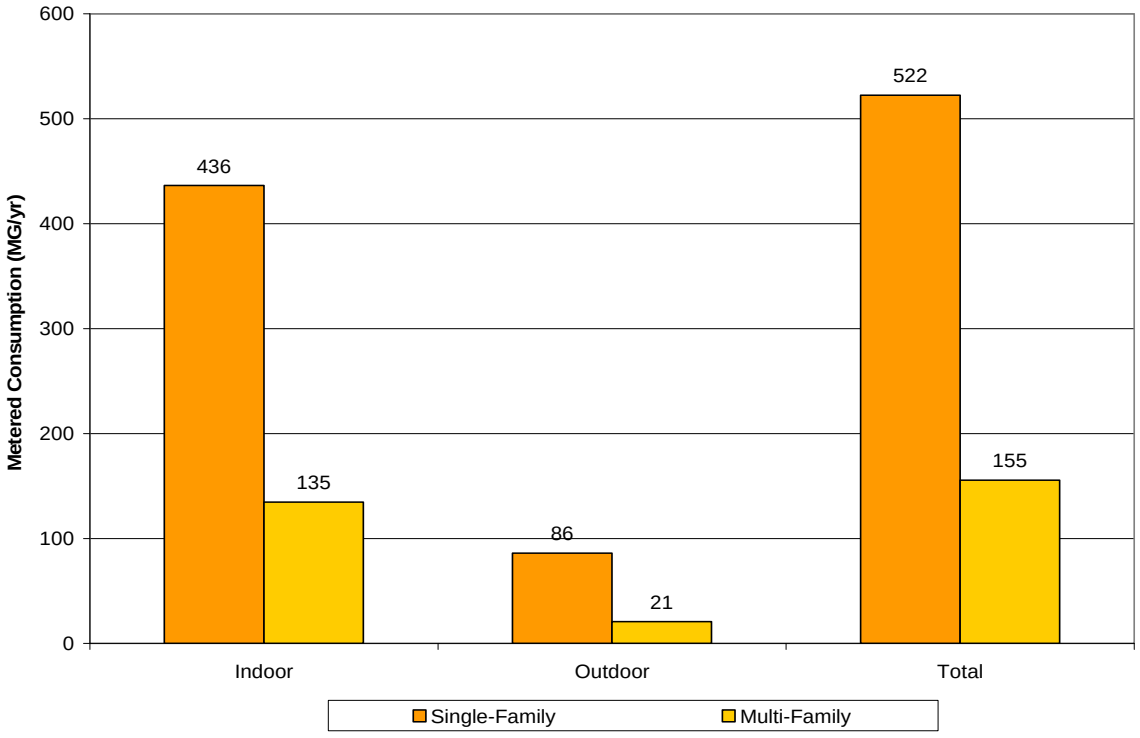


Exhibit 2-40 shows estimated indoor and outdoor water consumption for the residential customer categories. Outdoor use represented approximately 16 percent of annual consumption by single family residential customers, and 13 percent of annual consumption by multi-family residential customers.

EXHIBIT 2-40
Forest Grove Average Annual Indoor and Outdoor Metered Consumption; Residential Customer Categories, 2004-2007



Beaverton

Exhibits 2-41 and 2-42 present the annual metered consumption by customer category for the City of Beaverton for the years 2002 through 2007. Annual metered consumption averaged approximately 2,600 MG over the six year period. Residential consumption averaged approximately 70 percent of total metered consumption, with 42 percent attributed to single-family residences, and 28 percent attributed to multi-family residential accounts. The commercial category accounted for another 20 percent of annual consumption, and fire, irrigation, and public facility accounts represented the remaining 9 percent.

EXHIBIT 2-41
Beaverton Metered Consumption By Customer Category (MG), 2004-2007

Year	Single-Family	Multi-Family[1]	Total Residential	Commercial	Fire	Irrigation	Public Facilities	Total
2002	1,087	754	1,841	534	0.1	215	30	2,620
2003	1,123	751	1,874	527	0.2	229	29	2,659
2004	1,092	734	1,826	521	0.3	215	28	2,591
2005	1,050	723	1,774	510	0.0	208	30	2,521
2006	1,126	728	1,854	539	0.5	246	33	2,673
2007	1,077	737	1,814	537	0.0	210	30	2,591
Average	**1,093**	**738**	**1,830**	**528**	**0.2**	**221**	**30**	**2,609**
Percentage of Use	**42%**	**28%**	**70%**	**20%**	**0%**	**8%**	**1%**	**100%**

[1] Multi-Family includes all residences with more than 4 units

EXHIBIT 2-42
Beaverton Annual Consumption By Customer Category, 2002-2007

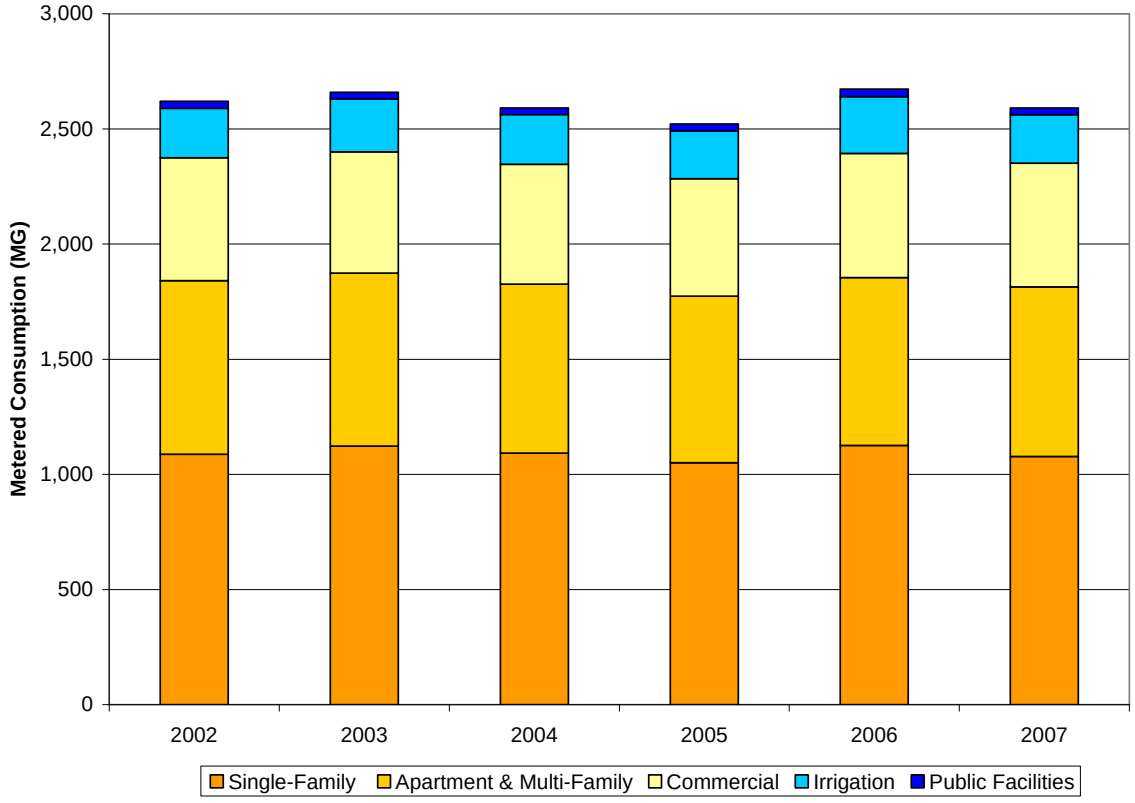


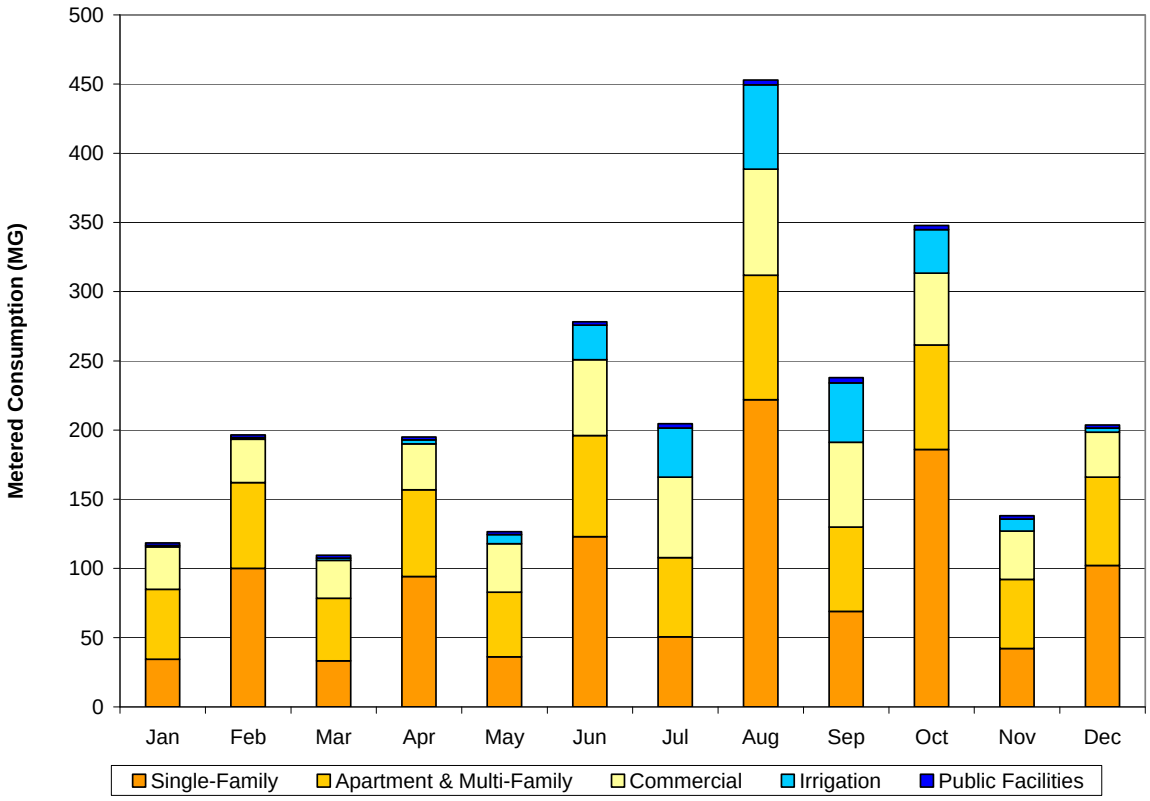
Exhibit 2-43 lists the ten customers with the largest metered water consumption for fiscal year 2006-2007. The majority of these accounts represent multi-family residential use. These ten accounts represented approximately 10 percent of Beaverton's total annual consumption.

EXHIBIT 2-43
Beaverton Top Ten Largest Water Consumers, Fiscal Year 2006-2007

Customer	Customer Type	Annual Volume (MG)
Sterling Pointe Apartments	Multi-Family	46
Glenbrook Apartments	Multi-Family	33
Beaverton School District	Public Facility	30
La Salle Apartments	Multi-Family	27
Parkside Business Center	Commercial	24
Fountain Park Apartments	Multi-Family	22
Country Gable Apartments	Multi-Family	22
Murrayhill Home Owners Association	Multi-Family	21
Center Development of Oregon	Multi-Family	19
Westbrook Homeowners Association	Multi-Family	18
	Total	**263**

Beaverton bills commercial and multi-family residential accounts monthly and single-family residential accounts bimonthly. **Exhibit 2-44** shows average monthly billed consumption from city billing records for the period 2002 through 2007. The four month period July through October was selected as the period of peak consumption.

EXHIBIT 2-44
Beaverton Average Monthly Billed Consumption By Customer Category, 2002-2007



As shown in **Exhibit 2-45**, the overall average monthly consumption in the summer season was approximately 311 MG per month (10.1 mgd) with 132 MG per month (4.3 mgd), or 43 percent from single family residential customers.

EXHIBIT 2-45
Beaverton Average Monthly Consumption By Season and Customer Category, 2002-2007

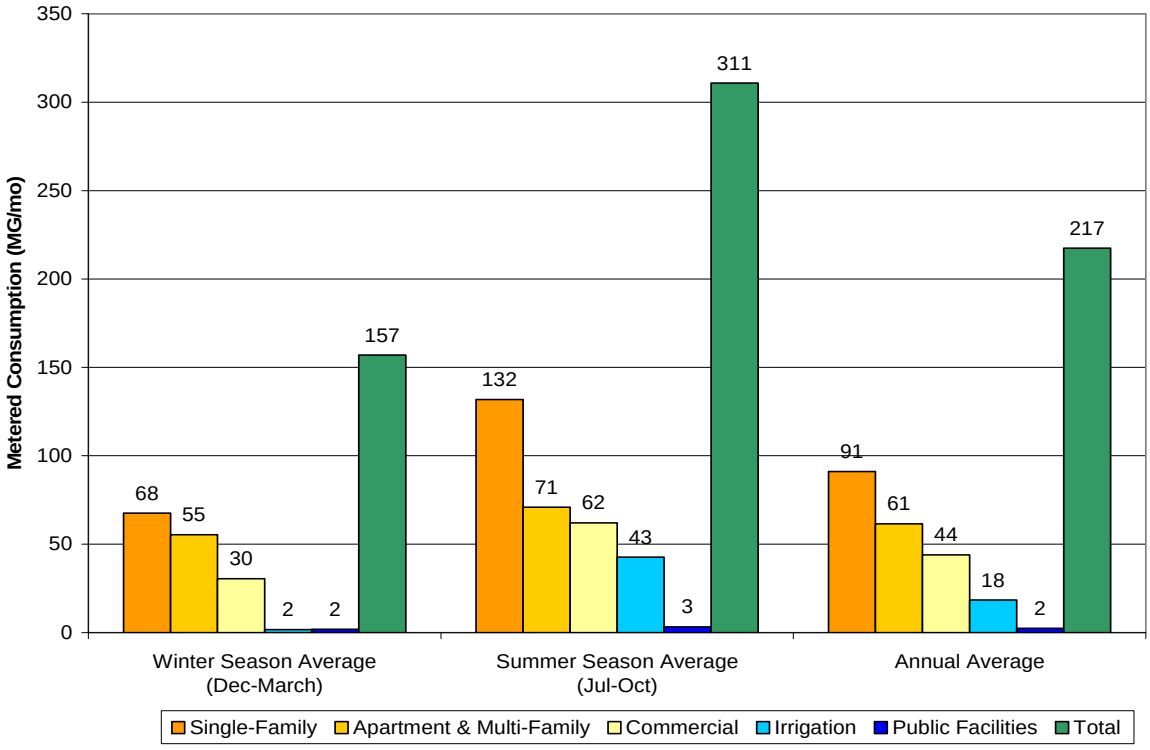
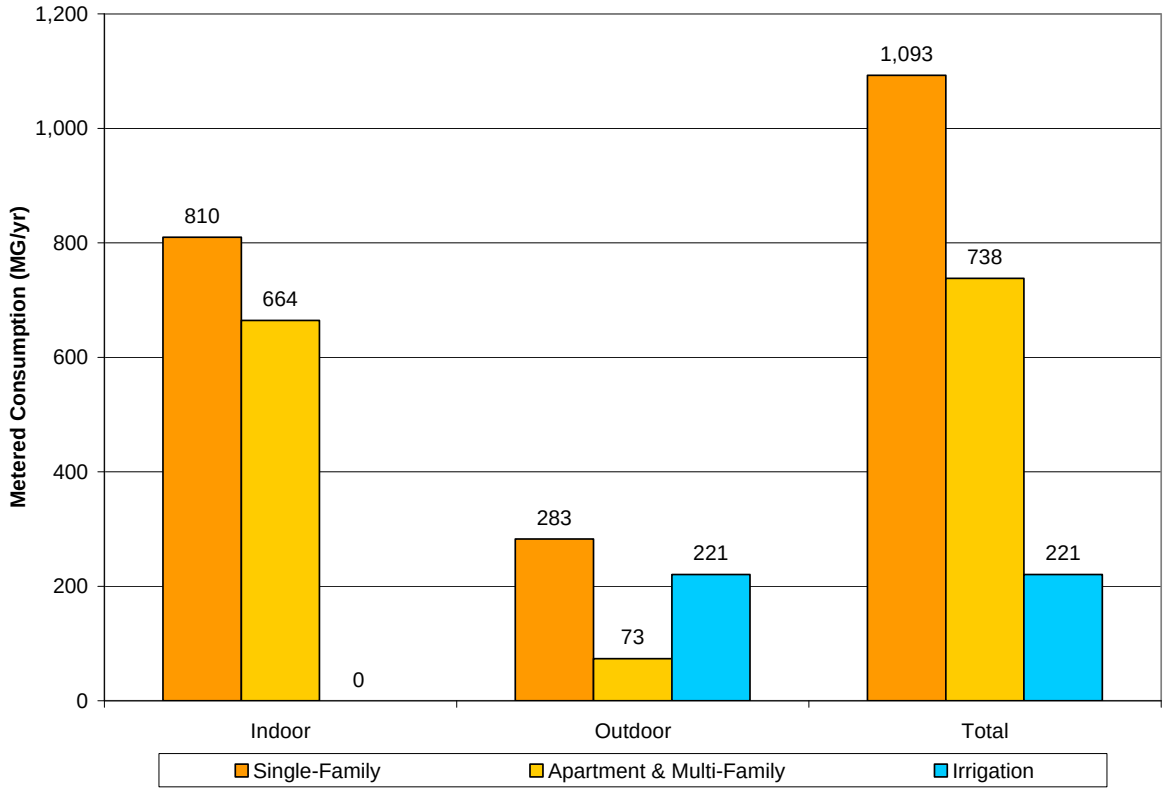


Exhibit 2-46 shows estimated indoor and outdoor water consumption for residential and irrigation customers. Outdoor use represented approximately 26 percent of annual consumption by single family residential customers, and 10 percent of annual consumption by multi-family residential customers.

EXHIBIT 2-46
Beaverton Average Annual Indoor and Outdoor Metered Consumption; Select Customer Categories, 2002-2007



TVWD

Exhibits 2-47 and 2-48 present the annual metered consumption by customer category for TVWD for the years 2002 through 2007. Annual metered consumption averaged approximately 8,100 MG over the six year period. Residential consumption averaged approximately 71 percent of total metered consumption, with 52 percent attributed to single family residences and 19 percent attributed to multi-family residential accounts. The commercial and industrial categories accounted for another 23 percent of annual consumption, and fire, irrigation, and wholesale accounts represented the remaining seven percent.

EXHIBIT 2-47
TVWD Annual Consumption By Customer Category (MG), 2002-2007

Year	Single-Family	Multi-Family	Total Residential	Com-mercial	Indus-trial	Fire	Irrigation	Whole-sale	Total
2002	4,195	1,454	5,649	1,307	574	2	426	511	8,468
2003	4,316	1,449	5,766	1,319	544	0	461	106	8,195
2004	4,270	1,468	5,738	1,340	487	1	457	72	8,095
2005	4,035	1,488	5,523	1,312	452	1	414	63	7,764
2006	4,335	1,573	5,908	1,414	493	1	486	53	8,355
2007	4,089	1,540	5,629	1,321	505	3	422	66	7,946
Average[1]	**4,209**	**1,504**	**5,702**	**1,341**	**496**	**1**	**448**	**72**	**8,071**
Percentage of Use	**52%**	**19%**	**71%**	**17%**	**6%**	**0%**	**6%**	**1%**	**100%**

[1] Average values for 2003 to 2007 to reflect change in wholesale use between 2002 and 2003.

EXHIBIT 2-48
TVWD Annual Consumption By Customer Category, 2002-2007

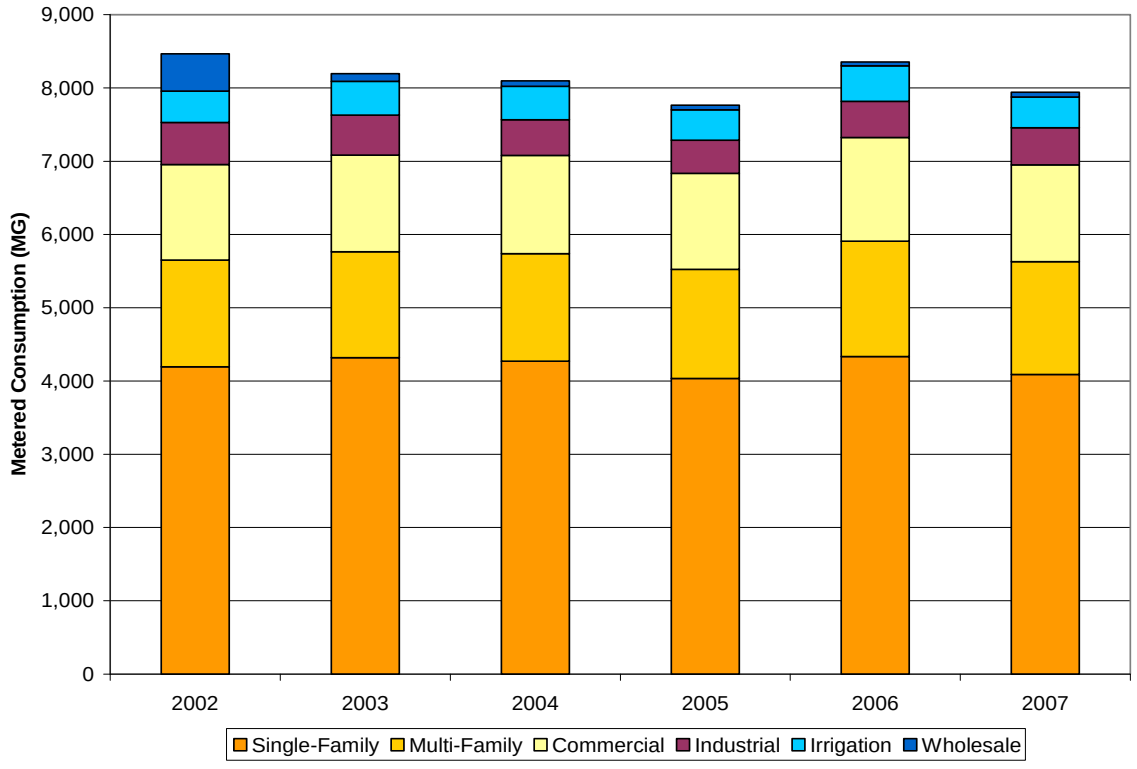


Exhibit 2-49 presents a summary of twelve customers with the largest metered water consumption from Fiscal Year 2005-2006 and Fiscal Year 2006-2007, and includes the average annual volume consumed during the two-year period. For each fiscal year, the top ten accounts represented approximately 11 percent of total metered consumption.

EXHIBIT 2-49
TVWD's Top 12 Largest Water Consumers, Fiscal Years 2005-2006 to 2006-2007

Customer	Customer Type	Average Annual Volume (MG)
Maxim Integrated Products Inc	Industrial	192
Providence Health Systems	Commercial	109
Intel Oregon	Industrial	114
Nike	Industrial	87
Heritage Village Mobile Park	Multi-Family	77
Tualatin Hills Park & Rec Dist	Commercial	68
Cedar Mill Crossing[1]	Multi-Family	62
Resers Fine Foods	Industrial	66
Tektronix	Industrial	52
Beaverton School District #48[1]	Commercial	47
Simpson Property Group[2]	Multi-Family	38
Panzer Nursery[2]	Commercial	36

[1] FY 2005-2006 only
[2] FY 2006-2007 only

TVWD bills all accounts bi-monthly. **Exhibit 2-50** shows average monthly billed consumption from city billing records for the period 2002 through 2007. The months of peak billed consumption were July through October. As shown in **Exhibit 2-51**, the overall average monthly consumption in the summer season was approximately 982 MG per month (32 mgd) with approximately 506 MG per month (16 mgd), or 52 percent from single-family residential customers. The winter average for single-family residential customers was 254 MG per month (8.3 mgd).

EXHIBIT 2-50
TVWD Average Monthly Billed Consumption By Customer Category, 2002-2007

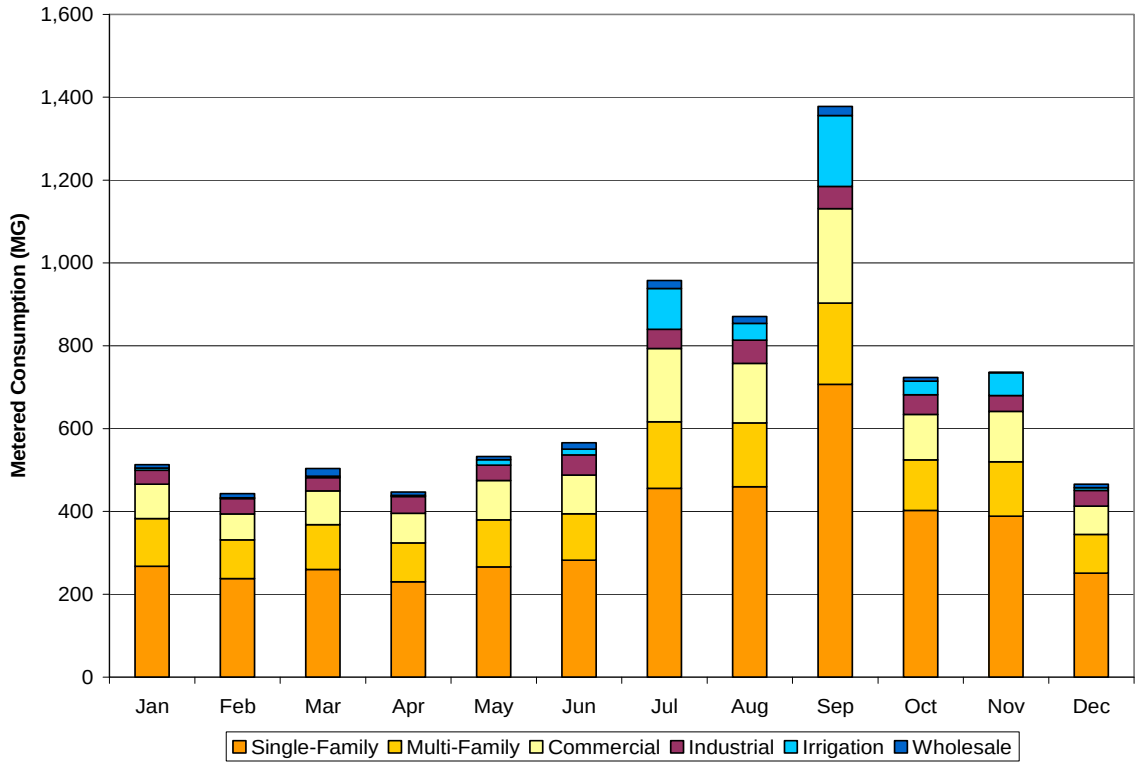


EXHIBIT 2-51
TVWD Average Monthly Consumption By Season and Customer Category, 2002-2007

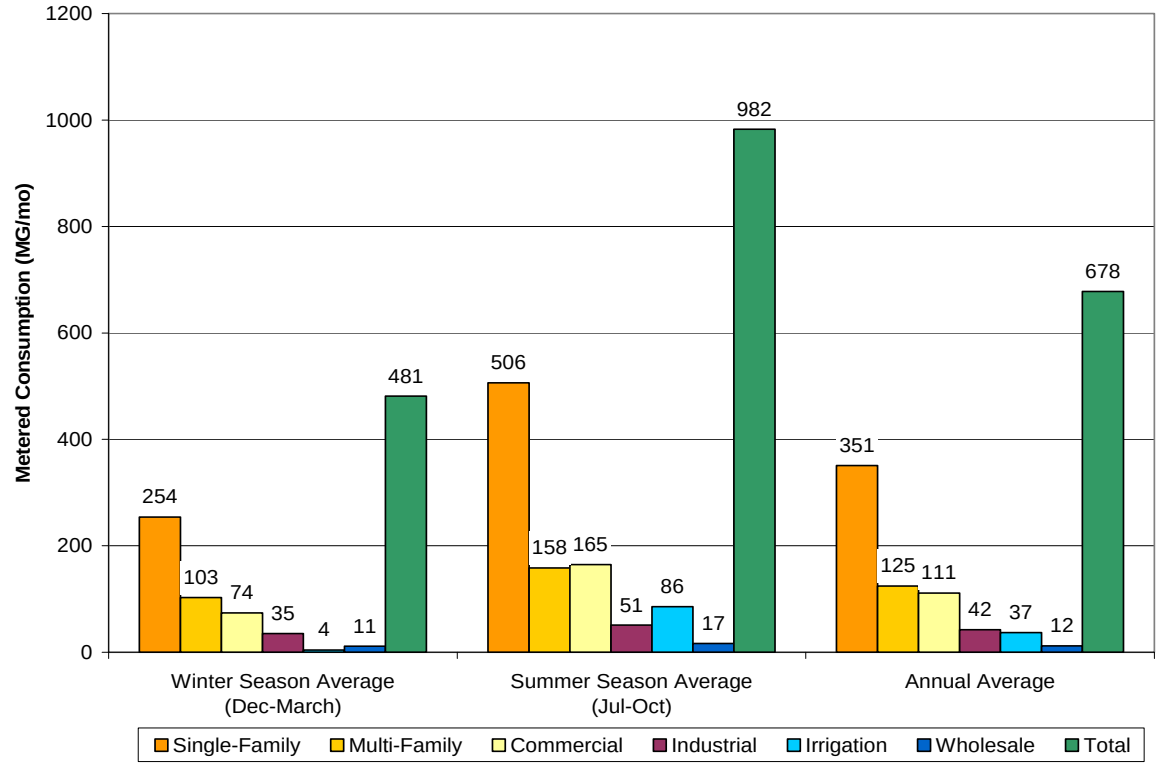
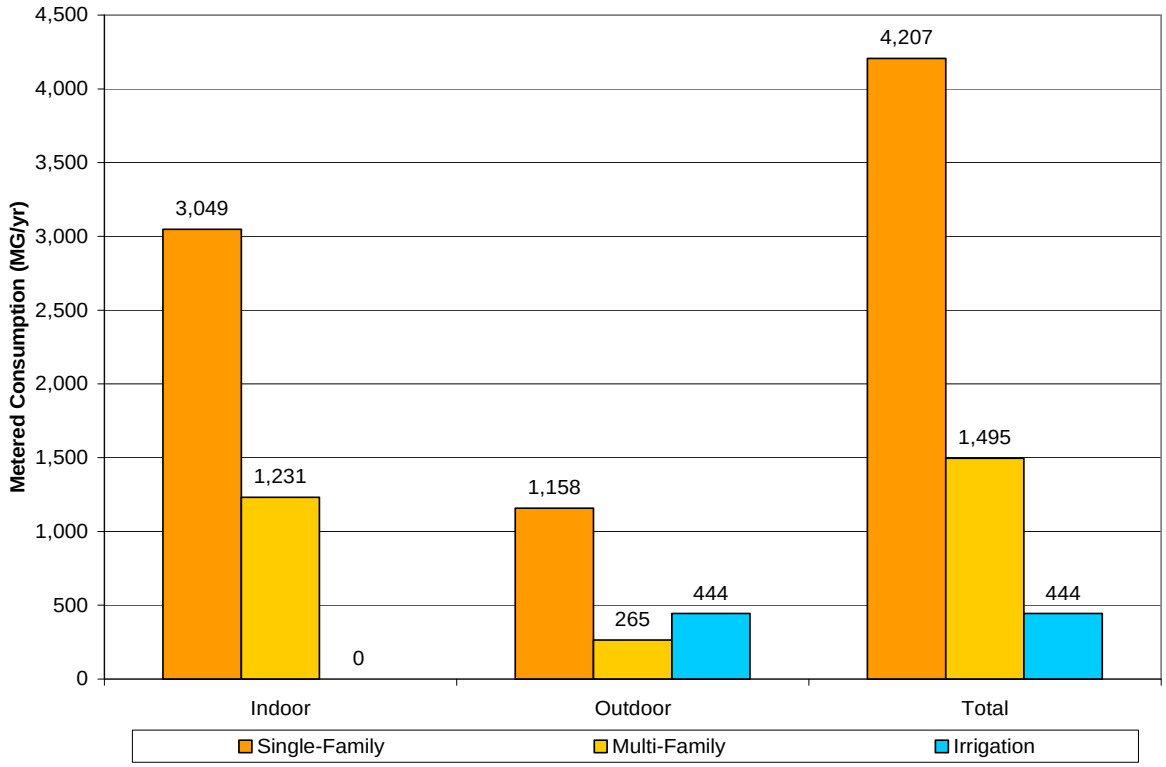


Exhibit 2-52 shows estimated indoor and outdoor water consumption for residential and irrigation customer categories. Outdoor use represented approximately 28 percent of annual consumption by single-family residential customers and 18 percent of annual consumption by multi-family residential customers.

EXHIBIT 2-52
TVWD Average Annual Indoor and Outdoor Metered Consumption; Select Customer Categories, 2002-2007



Tigard

Exhibits 2-53 and 2-54 present the annual metered consumption by customer category for the City of Tigard for the years 2002 through 2007. Annual metered consumption averaged approximately 2,200 MG over the six year period. Residential consumption averaged approximately 81 percent of total metered consumption, with 60 percent attributed to single-family residences and 21 percent attributed to multi-family residential accounts. The commercial and industrial categories accounted for another 16 percent of annual consumption, and fire and irrigation accounts represented the remaining three percent.

EXHIBIT 2-53
Tigard Annual Consumption By Customer Category (MG), 2002-2007

Year	Single-Family	Multi-Family	Total Residential	Commercial	Industrial	Irrigation	Fire	Total
2002	1,290	486	1,776	343	28	73	0	**2,219**
2003	1,313	444	1,758	341	20	74	2	**2,194**
2004	1,299	457	1,757	327	19	70	13	**2,185**
2005	1,254	441	1,695	316	15	63	3	**2,093**
2006	1,367	462	1,829	327	10	80	4	**2,252**
2007	1,308	447	1,755	310	15	80	3	**2,161**
Average	**1,305**	**456**	**1,762**	**327**	**18**	**74**	**4**	**2,184**
Percentage of Use	**60%**	**21%**	**81%**	**15%**	**1%**	**3%**	**0%**	**100%**

EXHIBIT 2-54
Tigard Annual Consumption By Customer Category, 2002-2007

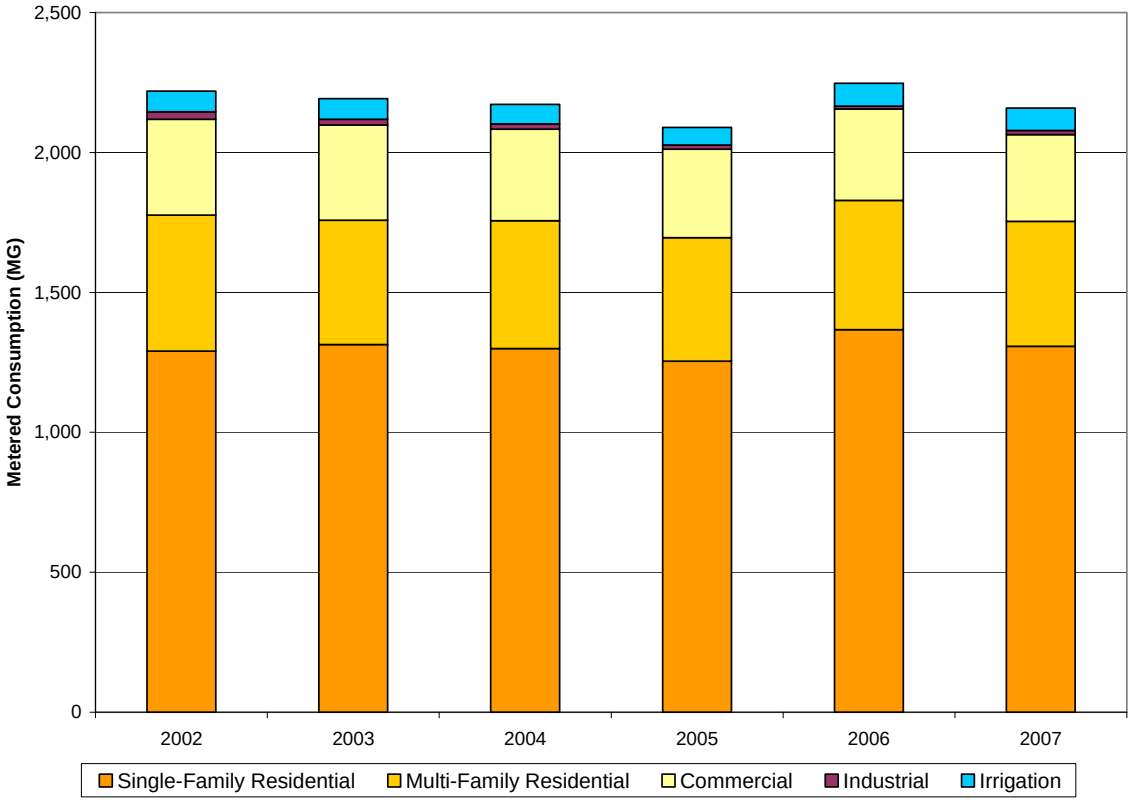


Exhibit 2-55 lists the ten customer accounts with the largest metered water consumption from 2004 through 2007, and the average annual volume consumed over the period. Six of these accounts represent multi-family residential use. These ten accounts represented approximately 5 percent of Tigard's total annual consumption.

EXHIBIT 2-55
Tigard's Top Ten Largest Water Consumers, Average Annual Metered Volume, 2004-2007

Customer	Customer Type	Average Annual Volume (MG)
Royal Mobile Villa	Multi-Family	16
Eldorado Mobile Villa	Multi-Family	15
Tualatin View Apartments	Multi-Family	13
Mountain View Mobile Park	Multi-Family	13
King Village Mobile	Multi-Family	10
Summer Creek Apartments	Multi-Family	9
Tigard High School	Commercial	7
Williams Controls Inc	Industrial	7
Pacific Realty Association	Commercial	6
Pacific Realty Association	Commercial	6
	Total	**102**

Tigard bills all accounts bi-monthly. **Exhibit 2-56** shows average monthly billed consumption from city billing records for the period 2002 through 2007. The four month period July through October were selected as the months of peak billed consumption. As shown in **Exhibit 2-57**, the overall average monthly consumption in the summer season was approximately 270 MG per month (9 mgd) with approximately 165 MG per month (5 mgd), or 61 percent from single-family residential customers. The winter average for single-family residential customers was 76 MG per month (2.5 mgd).

EXHIBIT 2-56
Tigard Average Monthly Billed Consumption By Customer Category, 2002-2007

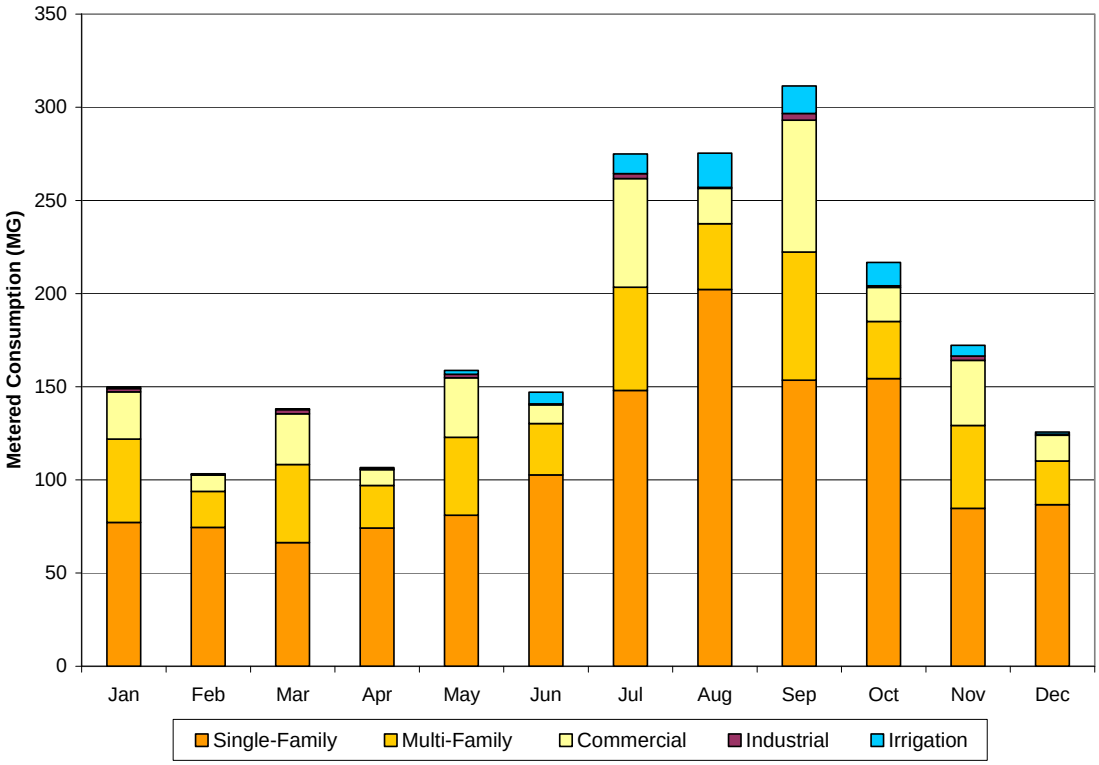


EXHIBIT 2-57
Tigard Average Monthly Consumption By Season and Customer Category, 2002-2007

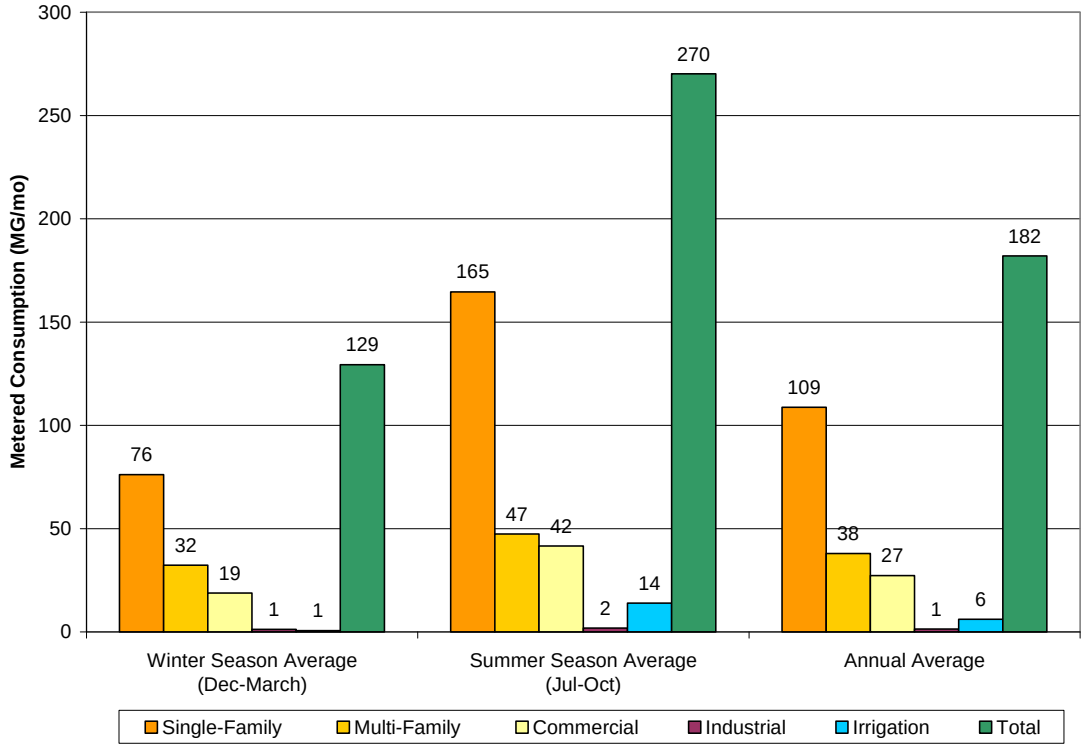
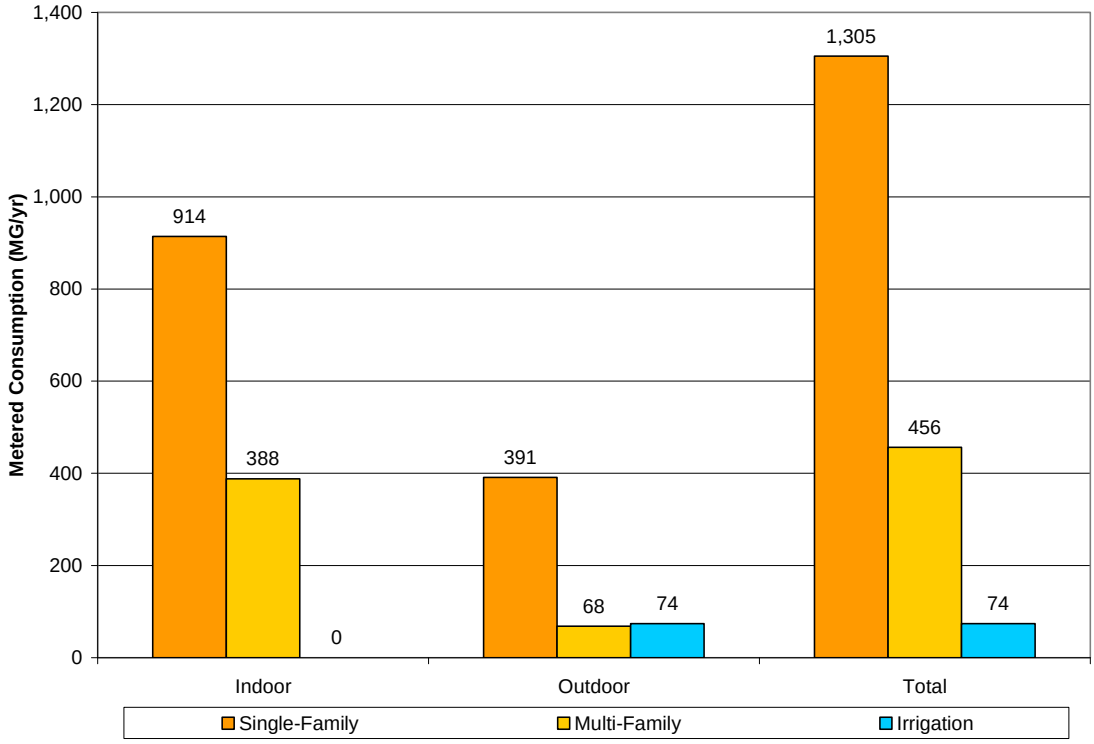


Exhibit 2-58 shows estimated indoor and outdoor water consumption for residential and irrigation customers. Outdoor use represented approximately 30 percent of annual consumption by single-family residential customers and 15 percent of annual consumption by multi-family residential customers.

EXHIBIT 2-58
Tigard Average Annual Indoor and Outdoor Metered Consumption; Select Customer Categories, 2002-2007



Per Capita Demand

Exhibit 2-59 presents the overall system, and residential per capita demands for the JWC members. Demand from all sources and total population data from 2007 were used to estimate overall system average day per capita demand.[6] Residential per capita demand was estimated based on the proportion of residential water use within each system. Overall system per capita average and maximum day demands ranged from 100 gpcd to 170 gpcd, and 210 gpcd to 310 gpcd, respectively. Larger overall system per capita demands can result from greater proportions of commercial and industrial water uses. The residential per capita average day demands, including both single-family and multi-family residences, ranged from 70 gpcd to 90 gpcd.

[6] Because Hillsboro's metered consumption values were greater than demand, metered consumption was used to estimate per capita demand for Hillsboro.

EXHIBIT 2-59
Per Capita Demand Estimates for JWC Member Agencies, 2007

JWC Member	ADD (mgd)	Average MDD/ADD Peaking Factor	2007 Population	Overall ADD per capita (gpcd)[2]	Overall MDD per capita (gpcd)[2]	Average Residential Percentage of Total Use[3]	Residential ADD per capita (gpcd)[2]
Hillsboro	14.3[1]	1.8	81,600	170	310	42%	70
Forest Grove	3.2	1.9	20,900	150	280	61%	90
Beaverton	7.9	1.9	66,000	120	220	70%	80
TVWD	22.4	2.1	193,400	120	250	71%	90
Tigard	5.8	2.1	57,000	100	210	80%	80

[1] Based on consumption rather than demand values.

[2] Values rounded to the nearest 10 gallons.

[3] Values are the sum of single-family and multi-family use.

Water Rights

OAR 690-086-0140(5)

The JWC's use of water is authorized by numerous water rights, including rights for the use of live flow, storage rights, and secondary rights to use stored water. Most of these water rights authorize the use of water for municipal purposes and many of the rights have been certificated or are in the process of being certificated.

In addition to the water rights used by the JWC, the individual member agencies hold surface and ground water rights for use outside of the JWC system. These water rights are mostly for municipal use but also include water for industrial use, irrigation, and wildlife. The majority of these non-JWC rights are certificated. **Exhibit 2-60** provides a summary of both JWC water rights and water rights held by member agencies.

JWC Water Rights

Direct Diversion (Live Flow) Water Rights

The JWC uses water under a number of water rights authorizing the use of live flow. These rights are summarized below.

The JWC has one permitted water right in its name (permit S-50879), which allows up to 75.0 cfs to be diverted from Scoggins Creek for municipal purposes. The priority date of this permit is June 9, 1988, which makes it a junior water right in the Tualatin River Basin. This right is subordinate to the fill schedule of Scoggins Reservoir, is limited to the period of October 1 through May 31, and requires bypass of 20 cfs from October 1 through November 30 and 15 cfs from December 1 through May 31.

EXHIBIT 2-60
Summary of JWC and Member Agency Water Rights

Source	Priority Date	Application and Permit	Certificate, Claim or Transfer, or Registration	Entity name on water right	Type of Beneficial Use	Authorized Rate (cfs)	Authorized Volume	Maximum Rate of Withdrawal to Date		2007 Average Withdrawal	Five-Year Average Withdrawal	Authorized Date for Completion	Critical Ground Water Area, Ground Water Limited Area
								Instantaneous (cfs)	Annually	Monthly / Daily (MG)	Monthly / Daily (MG)		
JWC Water Rights													
Sain Creek	1/22/1912	A: S-2016 P: S-1136	c. 81026	City of Hillsboro	MU	3.00	n/a	3.00				Certificated - no action pending	n/a
Sain Creek	5/1/1915	A: S-4250 P: S-2443	c. 81027	City of Hillsboro	MU	2.00	n/a	2.00				Certificated - no action pending	n/a
Tualatin River	8/15/1930	A: S-13681 P: S-10408	c. 67891	City of Hillsboro	MU	9.00	n/a	9.00				Certificated - no action pending	n/a
Tualatin River	2/6/1974	A: S-51643 P: S-46423	c. 85913	City of Hillsboro	MU	43.00	n/a	43				Certificated - no action pending	n/a
Tualatin River	7/15/1980	A: S-60357 P: S-45455	c. 85914	City of Beaverton	MU	25.00	n/a	25.00				Certificated - no action pending	n/a
Roaring and Clear Creeks and Tualatin River	4/28/1976	A: S-54203 P: S-40615	c.85916	City of Forest Grove	MU	38.26 (JWC portion of this WR is 33 cfs from Tualatin River)	n/a	33				Certificated - no action pending	n/a
Scoggins Creek	6/9/1988	A: S-69637 P: S-50879		Joint Water Commission	MU	75.00	n/a	0	0			10/1/2000 - extension application pending	n/a
Middle Fork of the North Fork Trask River (Barney Reservoir)	6/26/1958 & 12/10/1965	A: R-32420 P: R-4890	c. 81024	City of Hillsboro	MU	n/a	12,600 AF & 7,400 AF	n/a	20,000 AF	963 / 31.7	1,052 / 34.6	Certificated – no action pending	n/a
Middle Fork of the North Fork Trask River and Barney Reservoir	6/26/1958	A: S-32421 P: S-32139	c. 81020	City of Hillsboro	MU	38.70	n/a	38.70				Certificated - no action pending	n/a
Barney Reservoir	6/24/1971	A: S-48359 P: S-37837	c. 81022	City of Forest Grove	MU	n/a	500 AF	n/a	500 AF			Certificated - no action pending	n/a
Middle Fork of the North Fork Trask River (in Barney Reservoir)	12/23/1971	A: R-49807 P: R-5773	c. 81023	City of Hillsboro	PA	n/a	2,000 AF	n/a	2,000 AF			Certificated - no action pending	n/a
Barney Reservoir	7/8/1971	A: S-48420 P: S-35782	c. 81021	City of Hillsboro	PA	30.00	n/a	30.00				Certificated - no action pending	n/a
Scoggins Creek	2/20/1963	A: R-38449 P: R-5777	c. 81149	Bureau of Reclamation	IR, MU,WQ,FI & RC	n/a	total of 60,000 AF (13.500 AF for MU by JWC agencies)	n/a	60,000 AF			Certificated - no action pending	n/a
Scoggins Creek and Reservoir, Carpenter, Gales, Dairy and McKay Creeks and Tualatin River	2/20/1963	A: S-38447 P: S-35792		Bureau of Reclamation	IR, RC, MU, FI, & WQ	366.8 total	n/a	72.5 cfs for JWC	Up to 13,500 AF for JWC			Determination of Proof on IR Portion. Oct. 1, 2000 for remaining portion.	n/a

EXHIBIT 2-60
Summary of JWC and Member Agency Water Rights

Source	Priority Date	Application and Permit	Certificate, Claim or Transfer, or Registration	Entity name on water right	Type of Beneficial Use	Authorized Rate (cfs)	Authorized Volume	Maximum Rate of Withdrawal to Date		2007 Average Withdrawal	Five-Year Average Withdrawal	Authorized Date for Completion	Critical Ground Water Area, Ground Water Limited Area
								Instantaneous (cfs)	Annually	Monthly / Daily (MG)	Monthly / Daily (MG)		
Non-JWC Water Rights held By Member Agencies													
City of Forest Grove													
Branches of Clear Creek	3/29/1917	A; S-5460 P: S-3318	c. 2194	City of Forest Grove	MU	0.80	n/a	0.80		56.7 / 1.86	44.8 / 1.47	Certificated - no action pending	n/a
Four Branches of Clear Creek	4/16/1935	A: S-15790 P: S-12034	c. 13471	City of Forest Grove	MU	1.00	n/a	1.00				Certificated - no action pending	n/a
Branches of Clear Creek	7/27/1939	A: S-18298 P: S-13944	c. 13797	City of Forest Grove	MU	1.00	n/a	1.00				Certificated - no action pending	n/a
Gales Creek	2/14/1947	A: S-22251 P: S-17549	c.85513	City of Forest Grove	MU	4.46	n/a	4.46				Certificated – no action pending	n/a
Roaring and Clear Creeks and Tualatin River	4/28/1976	A: S-54203 P: S-40615		City of Forest Grove	MU	38.26 (Forest Grove's portion of this right: 2.43 cfs from Roaring Creek and 2.83 from Clear Creek)	n/a	2.43 cfs from Roaring Creek and 2.83 from Clear Creek				10/1/2002 COBU pending	n/a
City of Beaverton													
ground water, tributary to Sylvan and Unnamed Creeks	Well #1:1932, Well #2:1945	N/A	GR-343	City of Beaverton	MU	3.06	n/a	3.00		6.3 / 0.21	1.1 / 0.036	n/a	CGWA: Cooper Mtn-Bull Mtn GWLA: Chehalem Mtn, Parrett Mtn, and Sherwood-Dammasch-Wilsonville
Bull Run and Tualatin River		ASR LL 002		City of Beaverton and TVWD	ASR	10 MGD	1.2 billion gallons	5.42	506.8 MG	106.3 / 3.54	74.8 / 2.49		
Tualatin Valley Water District													
ground water, a tributary to Beaverdam Creek	1/21/1959	A: G-1351 P: G-1229	c. 86081	Aloha Huber Water District	MU	0.58	116 AF	0.58	Up to 116 AF	0	0	Certificated - no action pending	CGWA: Cooper Mtn-Bull Mtn GWLA: Chehalem Mtn, Parrett Mtn, and Sherwood-Dammasch-Wilsonville
ground water, a tributary to Beaverton Creek	5/2/1957	A: G-637 P: G-588	c. 36440	Aloha Huber Water District	MU	1.10	n/a	1.10		0	0	Certificated - no action pending	CGWA: Cooper Mtn-Bull Mtn GWLA: Chehalem Mtn, Parrett Mtn, and Sherwood-Dammasch-Wilsonville
ground water, a tributary to Butternut Creek	2/23/1962	A: G-2242 P: G-2064	c. 36441	Aloha Huber Water District	MU	2.20	n/a	2.20		0	0	Certificated - no action pending	CGWA: Cooper Mtn-Bull Mtn GWLA: Chehalem Mtn, Parrett Mtn, and Sherwood-Dammasch-Wilsonville
Bull Run and Tualatin River		ASR LL 002		City of Beaverton and TVWD	ASR	10 MGD	1.2 billion gallons			0	0		
Willamette River	6/19/1973	A: S-50693 P: S-49240		Willamette River Water Coalition	I/M & MU	202.00	n/a	0	0	0	0	10/1/2047	n/a

EXHIBIT 2-60
Summary of JWC and Member Agency Water Rights

Source	Priority Date	Application and Permit	Certificate, Claim or Transfer, or Registration	Entity name on water right	Type of Beneficial Use	Authorized Rate (cfs)	Authorized Volume	Maximum Rate of Withdrawal to Date		2007 Average Withdrawal	Five-Year Average Withdrawal	Authorized Date for Completion	Critical Ground Water Area, Ground Water Limited Area
								Instantaneous (cfs)	Annually	Monthly / Daily (MG)	Monthly / Daily (MG)		
City of Tigard													
ground water, tributary to Unnamed Stream	1949	N/A	GR-615	Tigard Water District	MU	1.11	n/a	1.11	152.2 MG			n/a	CGWA: Cooper Mtn-Bull Mtn GWLA: Chehalem Mtn, Parrett Mtn, and Sherwood-Dammasch-Wilsonville
ground water, tributary to Spring Creek	4/25/1947	N/A	GR-616	Tigard Water District	MU	0.45	n/a	0.45	91.2 MG			n/a	CGWA: Cooper Mtn-Bull MtnGWLA: Chehalem Mtn, Parrett Mtn, and Sherwood-Dammasch-Wilsonville
ground water, a tributary to Fanno Creek	9/16/1957	A: G-760 P: G-655	c. 85872	City of Tigard	MU	0.78	n/a	0.78	83.4 MG	9.8 / 0.32	9.8 / 0.32	n/a	CGWA: Cooper Mtn-Bull Mtn GWLA: Chehalem Mtn, Parrett Mtn, and Sherwood-Dammasch-Wilsonville
ground water, a tributary to Fanno Creek	11/19/1965	A: G-3301 P: G-2999	c. 85871	City of Tigard	MU	0.63	n/a	0.63	98.7 MG			n/a	CGWA: Cooper Mtn-Bull Mtn GWLA: Chehalem Mtn, Parrett Mtn, and Sherwood-Dammasch-Wilsonville
ground water, a tributary to Fanno Creek	4/25/1966	A: G-3466 P: G-3270	c. 85870	City of Tigard	MU	0.67	n/a	0.67	136.9 MG			n/a	CGWA: Cooper Mtn-Bull Mtn GWLA: Chehalem Mtn, Parrett Mtn, and Sherwood-Dammasch-Wilsonville
Bull Run and Tualatin River	n/a	ASR LL 005		City of Tigard	ASR	19.5	400 million gallons	5.4	145 MG	13.6 / 0.44	21.1 / 0.70		Wilsonville
Tualatin River	8/10/1967	A: S-43923 P: S-32306	c. 40617	City of Tigard	IR	0.38	75.25 AF	0.38	up to 75.25 AF	0 / 0	0 / 0	Certificated - no action pending	n/a
Fanno Creek	1/18/1940	A: S-18535 P: S-14172	c. 57788	Arthur Prier	IR	0.06	11.25 AF	0.06	up to 11.25 AF	0 / 0	No data	Certificated - no action pending	n/a
Summer Creek	6/14/1993	A: S-73445 P: S-52018		City of Tigard	Reservoir Maintenance for Wetland Enhancement	0.034	n/a	0	0	0 / 0	0 / 0	10/1/1999	n/a
Willamette River	6/19/1973	A: S-50693 P: S-49240		Willamette River Water Coalition	MU & IND	202	0 AF	0	0	0 / 0	0 / 0	10/1/2047	n/a
Unnamed stream, tributary to Fanno Creek	5/4/1967 3/7/1968	A: R-43554 P: R-5070	c. 40488	Herbert Stark	IR & RC	n/a	23 AF (6 AF for irrigation and 17 AF for recreation)	n/a	up to 23 AF	No data	No data	Certificated - no action pending	n/a
Unnamed Stream and Reservoir	5/4/1967 3/7/1968	A: S-43555 P: S-32879	c. 40489	Herbert Stark	IR & RC	0.06 (0.01 cfs for irrigation and 0.05 cfs for recreation)	1.5 AF	0.06	up to 1.5 AF	No data	No data	Certificated - no action pending	n/a

The two most senior live flow water rights within the JWC are in the name of the City of Hillsboro. Certificate 81026 with a priority date of January 22, 1912, authorizes diversion of up to 3.0 cfs, and certificate 81027 with a priority date of May 1, 1915, authorizes diversion of up to 2.0 cfs. The source for both rights is Sain Creek, which flows into Scoggins Creek at Hagg Lake. The certificates authorize the use of water for municipal purposes. The points of diversion for these rights are now on Sain Creek and at the Scoggins Dam outlet, with re-diversion authorized at JWC's Spring Hill Intake.

The next most senior water right, certificate 67891, is also in the name of the City of Hillsboro. Certificate 67891 has a priority date of August 15, 1930, and authorizes diversion of up to 9.0 cfs from the Tualatin River for municipal purposes. The authorized points of diversion are at the Haines Falls Intake and at the Spring Hill Intake.

The remaining JWC water rights for live flow are as follows. Certificate 85913, in the name of the City of Hillsboro, has a February 6, 1974, priority date. This water right authorizes the use of up to 43.0 cfs from the Tualatin River for municipal purposes.

Certificate 85916, in the name of the City of Forest Grove, has an April 28, 1976, priority date. This certificate used by the JWC authorizes the use of up to 33.0 cfs from the Tualatin River.

Certificate 85914, in the name of the City of Beaverton, has a priority date of July 15, 1980, and authorizes diversion of up to 25.0 cfs from the Tualatin River for municipal purposes.

Storage Rights and Secondary Rights to Use Stored Water

In addition to using direct diversion or "live flow" water rights, the JWC uses water rights to store water and secondary water rights to use the stored water in order to meet the existing water demands within its system. These water rights are associated with Barney Reservoir and Scoggins Reservoir (Hagg Lake).

The storage and secondary rights associated with Barney Reservoir are certificates 81020, 81021, 81023, and 81024 in the name of the City of Hillsboro and 81022 in the name of the City of Forest Grove. Certificates 81023 and 81024, combined, authorize storage of up to 20,000 acre-feet of water from the Middle Fork of the North Fork Trask River in Barney Reservoir. Certificate 81023 has a December 23, 1971, priority date and authorizes storage of water for pollution abatement. Certificate 81024 has priority dates of June 26, 1958, and December 10, 1965, and authorizes storage for municipal purposes.

Certificates 81020, 81021 and 81022 authorize the use of the water stored in Barney Reservoir. Certificate 81020, with a June 26, 1958, priority date, authorizes use of up to 38.70 cfs for municipal purposes. Certificate 81021 has a priority date of July 8, 1971, and authorizes the use of 30.0 cfs for pollution abatement. Certificate 81022 has a priority date of June 24, 1971, and authorizes the use of 500 acre-fee for municipal purposes. The stored water in the reservoir is currently allocated among JWC members by agreements through the Barney Reservoir Joint Ownership Commission.

The storage and secondary water rights associated with Scoggins Reservoir are Certificate 81149 and Permit S-35792. Certificate 81149 is held in the name of the Bureau of Reclamation and authorizes storage of up to 60,000 acre feet from Scoggins Creek for irrigation, municipal, water quality, fish, and recreation purposes. Permit S-35792 is also held in the

name of the Bureau of Reclamation, and includes water stored in Scoggins Reservoir as a source. The Bureau of Reclamation has contracts with JWC agencies (Hillsboro, Forest Grove, and Beaverton) to provide 13,500 acre-feet of stored water for municipal purposes. In 2006, a determination of satisfactory proof was issued for permit S-35792 on 212.5 cfs managed by the Tualatin Valley Irrigation District for irrigation use. The residual portions of the right, including for municipal use, remain to be certificated.

Reservoir Storage and Release Management

The JWC actively participates in the Tualatin River Flow Management Technical Committee. This committee provides a mechanism for the coordination and management of flow in the Tualatin River. The members of the committee are technical staff who possess detailed knowledge of specific flow and water quality characteristics of the Tualatin River and represent several stakeholders in the basin including the following agencies:

- Oregon Water Resources Department – Watermaster District 18
- Clean Water Services
- Joint Water Commission
- City of Hillsboro
- City of Forest Grove
- Tualatin Valley Irrigation District
- Lake Oswego Corporation
- Washington County Parks – Hagg Lake

In 2007, the Tualatin River Flow Management Technical Committee prepared its twentieth annual report documenting the flow management of the Tualatin River. In addition to detailing reservoir releases and river withdrawals for each agency, these reports also highlight overall basin characteristics, such as precipitation patterns, water quality, and improvement projects. The JWC appreciates the efforts of the Watermaster and its partners on the Flow Management Committee. The communication and coordination among various Tualatin River users that comes from this committee is invaluable to our organization. The annual flow reports can be viewed on the Washington County Watermaster's website (District 18) at http://www.co.washington.or.us/Watermaster/index.cfm

Non-JWC Water Rights Held By Member Agencies

Four of the JWC member agencies hold individual water rights. A description of these water rights follows.

City of Forest Grove

The City of Forest Grove has its own water treatment facility and holds a number of live flow water rights that can be used in conjunction with its JWC water supply. Forest Grove has three certificates authorizing use of live flow of up to 2.80 cfs from branches of Clear Creek, a tributary of Gales Creek, for municipal purposes. The priority dates for these rights range from March 29, 1917, to July 27, 1939. Additionally, Forest Grove holds a water right certificate (85513) for the use of 4.46 cfs from Gales Creek for municipal use with a priority date of February 14, 1947. Forest Grove also holds permit S-40615. The portion of permit S-40615 used by the city authorizes use of up to 2.43 cfs from Roaring Creek, and 2.83 cfs

from Clear Creek for municipal purposes. Permit S-40615 has an April 28, 1976, priority date, and currently has a development timeline of October 1, 2002. A claim of beneficial use was submitted for this portion of the permit.

City of Beaverton

The City of Beaverton holds one ground water right (ground water registration) and a limited license for the use of water for Aquifer Storage and Recovery (ASR).

Ground water registration, GR-343, dating from January 21, 1957, claims 3.0 cfs for municipal purposes from two wells.

City of Beaverton and TVWD ASR Programs

Since 1999, the City of Beaverton has been developing an ASR program under ASR Limited License #002 (LL 002) that was jointly issued to Beaverton and TVWD. The source water for the joint ASR limited license is the Tualatin River authorized under Beaverton's existing municipal water right permit S-45455 and Bull Run water via Portland Water Bureau.

To date, three ASR wells have been developed by the City of Beaverton: ASR 1 (a.k.a., Hanson Road Well), ASR 2, and ASR 4. Combined, these wells store approximately 450 million gallons per year and have a short-term peak delivery capacity of 6 mgd (ASR 1 at 1 mgd, ASR 2 at 2 mgd, and ASR 4 at 3 mgd). ASR 3, which is located in the southern part of Beaverton near the City of Tigard and the city's Urban Growth Boundary, most likely will be developed as a 0.75-mgd ASR well that will store up to 100 million gallons per year.

TVWD partnered with the City of Beaverton to complete the initial ASR feasibility studies in the Tualatin Basin and developed a work plan for testing of the Schuepbach Well, which was retrofitted for ASR. However, data showed that limited water could be stored at this site. TVWD retrofitted the Grabhorn Well on Cooper Mountain for ASR. Pilot testing of the Grabhorn Well began in May 2008. This well is expected to yield 2.9 mgd, with a storage capacity of up to 300 million gallons per year.

The joint ASR LL 002 was submitted to OWRD in June 2008 for a second 5-year extension to allow TVWD and Beaverton to continue to test and expand their ASR programs. OWRD approval of the 5-year extension is anticipated.

TVWD

TVWD has three certificated ground water rights. Certificates 36440 and 36441 authorize the use of 1.10 cfs and 2.20 cfs, respectively for municipal use. Water right certificate 86081 authorizes the use of up to 0.58 cfs from ground water for municipal use. At the present time TVWD's ground water is used as an emergency back-up supply.

In addition to TVWD's ground water rights, the district is part of the Willamette River Water Coalition, which holds water right permit S-49240. This permit authorizes diversion of 202 cfs for municipal and industrial purposes from the Willamette River. OWRD has issued a final order for an extension of time to October 1, 2047, for this permit.

City of Tigard

Tigard has two ground water registrations for up to a total of 1.56 cfs (GR-615 and GR-616). Tigard also has three certificated ground water rights: 85870 for 0.67 cfs, 85871 for 0.63 cfs, and 85872 for 0.78 cfs. All of the ground water rights are for municipal use and are located within the Tualatin River Basin.

In addition to its ground water rights, Tigard has six surface water rights. Tigard has two certificated water rights for irrigation: certificate 57788 for 0.06 cfs from Fanno Creek; and certificate 40617 for 0.38 cfs from the Tualatin River. Tigard also holds certificate 40488, which authorizes storage of up to a total of 23 acre-feet for irrigation and recreation from Summer Creek, and certificate 40489, which authorizes the use of 0.01 cfs for irrigation and 0.05 cfs for recreation from an unnamed stream and reservoir. Further, Tigard holds permit S-52018 for water from Summer Creek for wildlife use, though the city has not yet developed this permit. Tigard also is a member of the Willamette River Water Coalition, which holds permit S-49240 for use of water from the Willamette River.

City of Tigard ASR Program

Tigard was issued ASR Limited License #005 (LL 005) in December 2001, which authorized ASR pilot testing for a period of five years (until December 2006). Since the original limited license was issued, two modifications have been approved by OWRD (April 2005 and February 2007). In its current form, LL 005 authorizes use of up to 9 cfs of water from a combination of Bull Run (City of Portland ORS 538.420) and Tualatin River (Permit S-46423 in the name of Hillsboro) for implementing ASR in the Columbia River Basalt Group aquifer using up to five ASR wells. The use is limited to a maximum storage volume of 400 million gallons (MG), a maximum per well injection rate of 1,750 gpm, a maximum combined injection rate of 4,040 gpm (9 cfs), a maximum per well recovery rate of 1,750 gpm, and a maximum combined recovery rate of 8,750 gpm.

Aquatic Resource Concerns

The JWC's water rights authorize diversions on the Tualatin River and tributary creeks, and the Middle Fork of the North Fork Trask River. The Tualatin River and many of its tributaries are on the Department of Environmental Quality's (DEQ) 303(d) list for several water quality issues, including temperature, pH, phosphorus, *Enterococcus*, dissolved oxygen, and chlorophyll. The Tualatin River mainstem is listed as water quality limited from RM 0.0 to 80.8. The following tributaries are also listed for multiple parameters: Carpenter Creek RM 0.0 to 6.8; Dairy Creek RM 0.0 to 10.1; Fanno Creek RM 0.0 to 13.9; Gales Creek RM 0.0 to 20.0; McKay Creek RM 0.0 to 22.7 and Scoggins Creek RM 0.0 to 5.1. The Trask River was on DEQ's 303(d) list in 2002 (last cycle reported) for seasonal impairment of dissolved oxygen.

Some JWC members hold water rights on the Willamette River. According to the DEQ, the Willamette River is 303(d) listed for multiple water quality impairments within the reach of the permitted points of diversion. Some of the water quality impairments are alkalinity, arsenic, Chlorophyll a, DDT, dissolved oxygen, *E coli*, fecal coliform, mercury, PCB, pH, temperature, and zinc. A full list of water quality limiting parameters for the Tualatin, Trask, and Willamette Rivers can be found in DEQ's Water Quality Assessment – Oregon's

2004/2006 Integrated Report Database at
http://www.deq.state.or.us/wq/assessment/rpt0406/search.asp

The listed fish species that occur in the Tualatin and Trask Rivers are summarized in **Exhibit 2-61.** Since two JWC members hold water rights for use of the Willamette River the table below also includes Willamette River Basin listed fish species.

EXHIBIT 2-61
Native Fish Species that Occur Within the Tualatin, Trask, and Willamette River Basins that are Listed as Sensitive, Threatened, or Endangered Under the Oregon or Federal Endangered Species Acts

Species	River System/(ESU)	State Listing Status[1]	Federal Listing Status[1]
Coastal Cutthroat trout *(Oncorhynchus clarki clarki)*	Trask (Lower Columbia River)	Sensitive - Vulnerable	
Coastal Steelhead *(Oncorhynchus mykiss)*	Trask	Sensitive - Vulnerable	
Coastal Coho salmon *(Oncorhynchus kisutch)*	Trask		Threatened
Winter-run Steelhead trout (*Oncorhynchus mykiss*)	Tualatin (Lower Columbia River) (Upper Willamette River)	Sensitive - Critical Sensitive - Vulnerable	Threatened
Spring-run Chinook salmon (*Oncorhynchus tshawytscha*)	Tualatin (Lower Columbia River) (Upper Willamette River)	Sensitive - Critical	Threatened
Coho salmon (*Oncorhynchus kisutch*)	Lower Columbia River	Endangered	Threatened
Chum salmon (oncorhynchus keta)	Lower Columbia River	Sensitive - Critical	
Pacific lamprey (lampetra tridentata)	Columbia River System	Sensitive - Vulnerable	

[1] State and federal listing status obtained from: Oregon List of Threatened and Endangered Fish and Wildlife Species, online at http://www.dfw.state.or.us/threatened_endangered/t_e.html

Evaluation of Water Rights and Supply

690-086-0140(3)

The amount of water available to satisfy the JWC's water rights is a function of water right priority date, stream flow, and stored water. As with all waters in the state of Oregon, the waters of the Tualatin and Trask Rivers are administered through OWRD's water right process. The Tualatin River has numerous water rights for consumptive uses such as irrigation, industrial and municipal uses, and non-consumptive uses such as recreation, fish protection and pollution abatement. These water rights are all regulated under the prior appropriation system. During water shortages, senior water rights have priority, and the junior water rights may be curtailed or regulated off to serve the senior water right owner's needs.

Almost all precipitation in the Tualatin River Basin falls as rain during the months of November through April. This leads to high winter flows, with peak flows on the magnitude of 2,000 to 3,200 cfs. Little precipitation occurs during the low-flow months of May through October. The lowest river flows, typically less than 200 cfs, occur during the months of July, August, and September.[7] In the months of June through September, the Tualatin River yields less than 2 percent of its total annual discharge.[8] For the JWC and its member agencies, summertime water demands are largely met by releases from the Scoggins and Barney Reservoirs, and from non-JWC water supply sources.

Water rights in the Tualatin River Basin date back to 1880. The most senior JWC live flow right (certificate 81026, priority date of January 22, 1912) has the potential to be regulated off. Twice in the past six years, every Tualatin River live flow right used by the JWC was regulated off because of low flows and junior priority dates. River flow is managed to maintain 150 cfs at the Farmington gauge located at RM 33.3.[9]

The Tualatin River Basin Watermaster generally regulates off JWC's certificates 85913, 85914, and 85916 in mid-May to early June. The two Sain Creek water rights are periodically regulated off in September. In an average year, these live flow water rights are available for use again in mid-October or early November.

To provide water during low-flow summer months, JWC members rely on stored water, and as needed, individual member agencies rely on ASR, City of Portland, and non-JWC water rights. Starting in early June, JWC's releases from Scoggins and Barney Reservoirs can average 115 acre-feet per day for 140 days. The JWC stored water is generally not needed from November through April or May. During that period water is stored for the following low-flow months.

Prospects for new native ground water sources for JWC members currently are limited because portions of the combined JWC service area are located within both a Critical Ground Water Area and Ground Water Limited Area. Issuance of new ground water rights currently is prohibited and the density of exempt ground water development is limited in the Cooper Mountain – Bull Mountain Critical Ground Water Area, and new permits for municipal supply currently are prohibited in the Chehalem Mountain, Parrett Mountain, and Sherwood/Dammasch/Wilsonville Ground Water Limited Areas.

[7] USGS: *Sediment Oxygen Demand in the Tualatin River Basin*, Oregon 1992-1996.

[8] http://www.epa.gov/fedrgstr/EPA-IMPACT/2001/December/Day-13/i30775.htm

[9] USGS: *Tualatin River Basin Water Quality Assessment.*

SECTION 3

Water Conservation

This section satisfies the requirements of OAR 690-086-0150.

Introduction

This section of the WMCP addresses the water conservation activities undertaken by the JWC member agencies, as well as programs implemented at a regional level that result in reduced water use by JWC agencies and their customers. Each member agency's current conservation efforts and those planned for the future are described.

The section discusses regional conservation efforts, particularly by the JWC's Events and Education Committee (JWC EEC) and the Regional Water Providers Consortium (RWPC). As required by OAR 690-086-150(1), the status of conservation measures, presented in the JWC's 2003 *Water Management Plan Update* and approved by OWRD, will be discussed. Descriptions of the individual conservation efforts of the five JWC member agencies follow.

While each of the five JWC member agencies has chosen to implement water conservation in different ways appropriate to utility size and circumstances, the overall picture shows these water utilities take conservation very seriously and are moving deliberately to enhance their conservation efforts consistent with their other service obligations. Moreover, the efforts of the RWPC multiply the effectiveness of the JWC agencies' own efforts, and take advantage of regional synergies to maximize conservation awareness and action.

Regional Water Conservation Efforts

JWC Events and Education Committee

The JWC EEC was formed during the drought of 2001 to coordinate JWC partner conservation efforts. The group was originally called the "Westside Water Providers" because the City of Tigard was not a member of the JWC at that time. (The Westside Water Providers is referenced in the 2003 *JWC Water Management Plan Update: Water Conservation Plan*.) After Tigard became a JWC partner, the group became the JWC EEC.

The JWC EEC oversees public participation, joint public messaging, and outreach efforts in conservation and water science. Key objectives of the group include: increasing name recognition for the JWC and educating Washington County customers about water conservation, backflow prevention, and the significance of the Tualatin Basin for water supply. The JWC EEC has primarily used its website and joint Washington County events to reach its audience, along with public relations and occasional paid-media efforts. The annual events and website budget is $5,000 and the JWC holds $10,000 in reserve for any potential marketing campaigns.

The EEC launched a new website in July 2007 that includes an indoor and outdoor conservation tip section and a "Ten Gallon Challenge," that encourages customers to

explore ways to save ten gallons of water every day. The site also contains a link to the RWPC website, www.conserveh2o.org. This website is the primary water conservation website for the tri-county area (Washington, Multnomah, and Clackamas Counties.) All JWC partners are members in the RWPC, share in development costs for the RWPC website, and rely on links to its extensive information, rather than duplicating web development individually.

The EEC participates in Washington County events that draw attendance from throughout the county. The following are descriptions of the activities in which the EEC has chosen to participate:

Washington County Fairs

The JWC uses this event to promote its high quality drinking water and educational water programs, including water conservation, to the entire county. Approximately 10,000 people attend the fair over a four-day period, and the JWC booth is staffed by two JWC partner representatives at all times. JWC distributes free, fresh, cold water to hot and thirsty fair-goers as a means to engage in discussions about water conservation. Fair booth staffers from Hillsboro, Forest Grove, Beaverton, Tigard and TVWD also hand out silicon bracelets, mood pencils and writing tablets promoting the JWC website. Displays always include a water conservation component and illustrate a water educational theme, such as promotion of the Ten Gallon Challenge.

Public Works Fairs

JWC representatives celebrate public works with other public agencies at this Washington Square Mall event. JWC representatives draw kids in with an interactive activity, such as making buttons with water conservation messages, while they showcase regional supply and storage issues for the parents. The booth display provides information on saving water and other water topics. Tualatin Valley Cable Access films the event and broadcasts a show highlighting each participant, so the JWC usually does a short segment on saving water.

Community Action Fairs

The JWC participates in the Washington County Community Action Fair because it serves all of Washington County. The Fair's objective is to provide information and other forms of utility assistance to minorities and other low-income groups. The Fair changes venues every couple of years and has been located in Hillsboro, Beaverton, and Aloha in recent years. The JWC staffs this event with at least one bilingual agency representative and hands out water-saving devices with tips in English and Spanish for lowering water usage.

Naturescaping Workshops

The JWC co-sponsors Naturescaping Workshops throughout Washington County with its partner, Clean Water Services. These workshops are free to the public and teach landscaping techniques incorporating native and low-water use plants that also attract bees, birds, and butterflies. The objective of the workshops is to lower peak season water use. Workshops have been held in Tigard, Beaverton, and Hillsboro.

JWC's Transmission Line Inspection Project

In 2006, JWC decided to inspect the transmission lines to determine their condition and integrity. The goals of the inspection project included the following.

- Assess pipe condition, including conducting a leak survey.
- Identify areas where the pipe's mortar coating may be damaged.
- Excavate and visually inspect suspected areas of corrosion.
- Install cathodic protection and/or monitoring devices to facilitate future monitoring of corrosion potential.
- Recommend corrective measures if necessary.

Between August 2007 and December 2008, JWC spent over $1,100,000 to evaluate 19 miles of large transmission line. This effort included excavation, visual inspection, and physical testing. All excavated sites were in very good condition. No corrective measures were indicated. The JWC will consider another assessment by approximately 2025 to update system conditions.

Regional Water Providers Consortium

A unique and invaluable component of the JWC member agencies' water conservation programming is their participation in the RWPC. The RWPC was formed in 1996 by an Intergovernmental Agreement to coordinate the implementation of the Regional Water Supply Plan for the Portland Metropolitan Area. The conservation organization, the Columbia-Willamette Water Conservation Committee (CWWCC) was formed in 1993 and existed as a separate entity, though most of the member agencies were the same as the RWPC. The RWPC managers decided to bring the CWWCC under the RWPC to make the structure and budget easier to manage. Participation in the RWPC and the Consortium Conservation Committee (CCC) is voluntary and is funded through membership dues. An entity cannot participate in the CCC without first belonging to the RWPC, with the exception of Newberg, which was allowed to participate solely in the conservation portion because it had been a CWWCC member before the merger. All JWC agencies are RWPC members and are active participants in program implementation, planning, and events. By working together the member agencies can maximize their marketing dollars and effectiveness. The CCC also provides a forum where conservation programs and new technologies can be discussed, and new partnerships are formed.

As members of the RWPC, water providers retain full authority to manage their individual water systems. The RWPC has many functions, including intergovernmental coordination, source water protection strategy development and implementation, water conservation program implementation, emergency planning and response coordination, and public education. The RWPC is made up of a Board, Executive Committee, Technical Committee and Conservation Committee. The City of Portland provides staffing to the RWPC. Annual reports for 2005-2006 and 2007-2008, produced by the RWPC, are provided in **Appendix C**.

As part of the 1995 Portland Metropolitan Area Regional Water Supply Plan, a range of water demand management and conservation options were identified and evaluated to help

prioritize resource allocation. The RWPC coordinated an update to the 1995 assessment as a component of the *Regional Water Supply Plan Update* completed in 2003. The update used a computer model, and data from individual water providers, to determine costs and benefits of conservation programs on a regional level. The Executive Summary from the *Update of the Regional Water Supply Plan Conservation Element* is presented in **Appendix D**.

The RWPC's conservation objectives are summarized as follows:

- Plan and implement regional programs and events focused on reducing peak summer water use.
- Effectively encourage customers to visit and use the RWPC website www.conserveh2o.org.
- Integrate consistent conservation messages into the daily lives of customers.
- Develop and implement effective monitoring and reporting techniques to verify program effectiveness.
- Invite stakeholder participation in conservation program development.
- Seek economies of scale by facilitating the joint efforts of the region's water conservation professionals.
- Foster public awareness of the RWPC's collaborative efforts.

To accomplish these goals, the RWPC has a two-person conservation staff that pursues a multi-pronged conservation effort while using the input and expertise of the member agencies' conservation professionals, including:

- **Media campaigns.** Each summer, the RWPC runs a major water conservation campaign on Portland area television and radio stations. In 2008, this campaign expanded to run May through August for radio (3,220 spots on 25 stations) and June through August for television (125 spots on KGW along with 177 PSA spots and 60 bonus spots). In addition, there were four live interviews with regional conservation staff that aired – one on TV and three on the radio – and several articles that ran in various print mediums including *The Oregonian*, *Beaverton Valley Times,* and *NW Renovation Magazine* to promote water efficiency awareness.
- **Development of outreach materials.** The RWPC staff, in collaboration with member agency staff, develops water conservation materials for the use of its member agencies and for RWPC specific events. Each agency receives a certain quantity of each item, with the option to order additional pieces. The RWPC then orders them in bulk, which achieves significant economies of scale. All materials are also accessible as pdf files on the RWPC website. The RWPC also regularly purchases various water conservation devices and supplies member agencies with items for distribution to customers, such as outdoor watering gauges and shower timers. In addition to purchasing devices, the RWPC evaluates public reception of devices as well as distribution and installation success rates whenever feasible. For instance, the RWPC determined that the public liked the shower timer idea, but was put off by the large, ugly, star-shaped timers it was distributing. After researching timer options, a sleeker, more attractive model was found

that is manufactured in Australia. Orders were placed and the RWPC expects that the new timers will be used more than the old models.

Conservation kits have been a key outreach material used by all of the JWC agencies. The RWPC and staff from member agencies have developed both indoor and outdoor conservation kits that are distributed to the public at a variety of events throughout the metro area. Many of the JWC members also distribute the conservation kits to their own customers upon request. However, customers may also request individual items, if they don't think they will use every item in the kit. The following details the contents of each kit.

Indoor Kit:

- One 5-minute shower timer
- One faucet aerator 2.0 gpm max flow rate
- One faucet aerator 1.5 gpm max flow rate
- One showerhead 2.0 gpm max flow rate
- Two toilet leak detector tablets
- Instruction sheet in English and Spanish

Outdoor Kit:

- Two 2-inch rain gauges
- One plastic hose nozzle with variable spray
- One hose timer 5-120 minutes
- One package of drought resistant plant seeds
- Information sheet on evapotranspiration
- Brochure on general outdoor conservation tips
- Brochure on lawn planting and care

- **Outreach events.** The RWPC conservation staff, along with staff from member agencies, tend informational booths at numerous community and regional events that include:

  1) *Salmon Festival* – the RWPC staffs a booth to teach kids water conservation during this October weekend environmental festival at Oxbow Park.

  2) *OLCA Exposition* – Staff provides information on outdoor conservation programs to professional landscapers at the Oregon Landscape Contractor's Association show in December.

  3) *Build, Remodel and Landscape Show* – Staff provides information on high efficiency toilets (HET: toilets that use less than 1.6 gallons per flush) and other water-saving appliances at this January show.

  4) *Yard, Garden and Patio Show* – Staff usually focuses on building healthy soil and planting water-wise plants at this garden show in February.

  5) *Metro Tour of Natural Delights* – Staff hands out water gauges, water-wise seeds and water-efficient plant booklets at one of the stops on this tour.

6) *Numerous Nursery Events* – Throughout the tri-county region, the RWPC sponsors water conservation themed events at various nurseries including Drakes 7 Dees, Al's Garden Centers, Farmington Gardens, and Portland Nurseries.

7) *Children's Clean Water Festival* – The RWPC provides funding for this festival, as well as a kid-themed conservation activity for a booth in the Exhibit Hall.

8) *Rose Festival* – The RWPC sponsors two water-conservation-themed performances at the Waterfront Festival and hands out water-conserving devices and information.

This year alone, RWPC staff promoted water conservation at 16 such events. It is estimated that, in 2008, contact was made at these events with about 41,000 people and 11,000 water conservation pieces were distributed.

- **School programs.** The RWPC staff contracts with vendors to develop and present water conservation programs at elementary schools in the region. Currently, there are two programs, one for grades K-2 and one for grades 3-5. Each member agency is entitled to one free program per year at a school in its service area. The two shows offered by the RWPC rotate sponsorship year to year. Currently, Mad Science is touring and performing "What do you know about H2O?" for the upper grades. Next year, the "Where's Rosie" puppet show for K-2nd grade will be back for their contract year. In addition, agencies can purchase additional presentations from either vendor at a fixed price negotiated by the RWPC. The School Program also includes a packet of conservation materials that is distributed to teachers.

- **Website.** The RWPC website, www.conserveh2o.org, is a professionally-executed site devoted to conservation. This site's content was developed with feedback and input from the member agencies and RWPC staff. The site is assessed and upgraded regularly and there is a consultant dedicated to the site for over 20 hours per month. JWC member agencies are interactive in providing information and supporting the data needs of this website. Among many other things, the site contains:

- Redesigned MyH20 Water Savings Calculator – Has a more user-friendly interface and data saving capability so visitors can calculate their own "water footprint."

- Newsletter – Quarterly information about saving water around the home and RWPC–sponsored events.

- Weekly Watering Number – A number posted weekly on the website that informs customers how many inches of water they should apply to turf in different parts of the metropolitan area for that week. The number is based on evapotranspiration rates. The weekly number is calculated by the consulting firm, *Water Management Group,* using data gathered from weather stations placed strategically around the region. Included in the mix is Hillsboro's Stadium station, which was a conservation project completed and described in the 2003 Water Conservation Plan.

- Interactive H_2OUSE – Visitors are invited to navigate from room-to-room and into the garden to discover room-appropriate water conservation tips for indoors and outdoors.

- The RWPC website received over 47,000 visitors and approximately 100,000 page views between July 1, 2007, and August 14, 2008. Staff are currently working to develop a

Google analytics program and Drupal content management system, so that in-house staff can more easily maintain the site and get more disaggregated data on how the site is being used. The new content management system will also ensure the site's American with Disabilities Act compliance.

- **Property Manager Workshops.** RWPC and representatives from member agencies conduct two workshops per year for professionals who have a large impact on outdoor water use. This demographic includes: landscape and irrigation industry members, landscape architects and designers, homeowners' association staffs, and other stakeholder organizations. This initiative is expanding, having begun with 18 people at the first workshop 18 months ago. The most recent event attracted 58 attendees. To gain access to a broader audience, the RWPC has joined the Metropolitan Housing Managers Association to increase the ability to provide presentations at Association events. Moreover, at this year's Oregon Landscape Contractors Association convention, the RWPC will be both a vendor and a presenter.
- **Collaboration.** Perhaps the most important function of the RWPC conservation staff is to facilitate ongoing and effective collaboration among the region's conservation professionals and to ensure that all agencies will benefit from the RWPC's programming. The RWPC members also benefit from pooling the resources of the individual agencies to reach a broader audience and develop more effective programs. The RWPC is a key component of water conservation outreach and marketing in the Portland metro region for all member agencies.

Children's Clean Water Festival

The Clean Water Festival hosts between 1300 and 1800 4th and 5th grade students from the Portland Metro area in an event that teaches about the environmental and scientific impacts we have on water and water has on us. Experts from Oregon and Washington volunteer to teach 25-minute classes on water science and watershed ecology at Portland Community College's Sylvania campus. The RWPC provides $5,000 in funding to hold the event. Hillsboro, TVWD, and Tigard conservation representatives are active members of the Clean Water Festival Committee and also provide additional funding to this event.

Status Report on Previous JWC WMCP

OAR 690-086-150(1)

The last JWC WMCP approved by the OWRD was developed in 2003. Section 2.4 of that plan laid out a set of conservation recommendations and an associated implementation schedule. Following are the recommendations from the 2003 *JWC Water Management Plan Update*, and their current status. Even though the City of Tigard was not a JWC member agency in 2003, the JWC has extended these recommendations to all current members.

Recommendation 1: Annual Water Audits. Beginning in 2004, annual water audits should be conducted by Hillsboro, Forest Grove, Beaverton, and TVWD for the previous calendar year.

A water audit is completed annually. As the managing agency of the JWC, Hillsboro coordinates the collection of data for the annual JWC water audit and submits audit results to the OWRD.

Recommendation 2: Rebate Programs. All member agencies should consider the possible expansion of rebate programs to include landscaping practices, which improve the ability to water effectively (i.e. rain switches on auto systems, hose timers, aeration, etc.). This program was successfully pilot tested by Gresham and Tigard, and is currently being explored by Hillsboro and TVWD.

- **Hillsboro.** Since 2003, Hillsboro has provided a rebate for water-efficient clothes washers. Additional information on this rebate program will be provided later in this section.

  Along with several other water agencies in the Portland metropolitan area, and in conjunction with the USEPA WaterSense program, Hillsboro launched an intensive six-month rebate program for high efficiency toilets (HETs) in January 2009, with the goal of stimulating transformation of the toilet market in the region. In 2012, Hillsboro is planning to start a more comprehensive rebate program, including outdoor components. To that end, Hillsboro and Beaverton were awarded a SB 1069 grant to study the feasibility of offering WaterSense rebates for various end uses. The city will also join WaterSense as a promotional partner.

- **Forest Grove.** Forest Grove developed a program to provide a rebate for water-efficient clothes washers and dishwashers. The City of Forest Grove has begun discussing rebate program alternatives that would best serve its customers. The city is expecting to review another agency's rebate feasibility study (due sometime in May 2010) to help determine what type of rebate program to adopt. The city currently is updating its Master Plan, to be followed with a rate study. (Master Plan adoption is anticipated in late June 2010). During the rate study, the city will evaluate funding options for the expanded rebate program.

- **Beaverton.** Beaverton has determined that limited staffing precludes it from conducting effective rebate programs. In coordination with Hillsboro, Beaverton was awarded a Senate Bill (SB) 1069 grant to study the feasibility of offering WaterSense rebates for various end uses. The city will, however, participate in such programs that may be adopted by the JWC in the future.

- **TVWD.** In 2002, TVWD introduced a rebate for washing machines. In 2004, more landscape rebates were added to include a comprehensive rebate program to cover lawn aeration, hose bib timers, rain sensors, and pressure regulators. These rebates are for the actual cost, up to $50. After the further addition of toilet and dishwasher rebates in 2005, TVWD launched a rebate for up to $200 toward the purchase of weather based irrigation controller technology to encourage people to use this newer technology. TVWD is also joining other regional water providers in an HET promotion beginning January 2009. In addition to promoting HET's, the existing TVWD toilet rebate will apply toward the purchase of these fixtures.

- **Tigard.** Since 2002, Tigard's Landscape Reimbursement Program has focused on reducing peak-season demand by providing rebates for outdoor water-efficiency

measures such as drip irrigation, pressure regulators for irrigation systems, rain sensors or switches, and hose timers. Tigard is also planning to join other water providers in a HET rebate program beginning January 2009 and is considering implementation of various other rebate programs over the next several years.

Recommendation 3: Residential Evapotranspiration Programs. All member agencies should consider the expansion of the ET program to include the residential sector. Individual agencies should make ET available on websites and should provide additional education for public regarding ET. Implementation decision should be made in 2004.

All member agencies agreed to expand the ET program through the RWPC. The ET program is currently being researched through the RWPC through member agency pilot programs and market transformation data collection. Through discussions at public outreach events, it was also determined that the general public did not have a good understanding of ET. The RWPC decided to focus efforts on educating the public on this useful tool and includes on its website the Weekly Watering Number for different sub-regions of the metropolitan area.

- **Hillsboro.** Hillsboro's website provides a link to the RWPC site, which includes the Weekly Watering Number for different sub-regions of the metropolitan area. A Hillsboro weather station, built as a former conservation project, is one of the stations used to gather data for determining the watering number of the week for western Washington County. In addition, Hillsboro is closely monitoring TVWD's ET Controller pilot program, and will use information generated by that program to determine the value of a similar program for its customers. The EPA plans to add ET irrigation controllers to its WaterSense product list in 2009. Hillsboro staff will evaluate the feasibility of including the controllers in Hillsboro's future WaterSense rebate program.
- **Forest Grove.** Forest Grove's website provides a link to the RWPC site, which includes the Weekly Watering Number. Forest Grove is considering offering rebates for weather-based irrigation controllers.
- **Beaverton.** Beaverton's website provides a link to the RWPC site, which includes the Weekly Watering Number.
- **TVWD.** TVWD staff dedicated many hours of staff time in assisting with the development of the Weekly Watering Number in partnership with the RWPC. TVWD links their website to the RWPC website to promote this weekly watering number. TVWD conducts many workshops and presentations to educate their customers on ET and water efficient landscape practices. Staff talk to residential customers, commercial customers, associations, master gardeners, garden groups, and community colleges about using ET. Since June 2006, TVWD has offered rebates of up to $200 for residential weather-based irrigation controllers. TVWD has also conducted pilot studies regarding the installation of ET irrigation controllers and soil moisture sensors. TVWD is using an on-site weather station to control the irrigation at its water efficient demonstration garden.
- **Tigard.** Tigard's website provides a link to the RWPC site, which includes the Weekly Watering Number. Tigard also provides rebates for rain sensors and switches for outdoor irrigation systems.

Recommendation 4: Public Education. All member agencies should continue to support public education programs, focusing on peak season reduction.

- All members offer extensive public education programs including a variety of community and school based programs through the RWPC and individually. The details of each member agencies programs will be discussed in further detail later in this section.

Recommendation 5: Conservation Websites. All member agencies should expand conservation information on regional and individual websites.

- **JWC.** The JWC's website includes an innovative "10-Gallon Challenge" incentive program, which demonstrates to residential customers the volumes of water that could be saved daily through various behavioral or equipment changes. The importance of these savings is brought home by showing the total water that could be saved over a day, week, month, or year if every JWC customer saved 10 gallons per day. Indoor and outdoor water conservation tips are presented.
  - Website Link: http://www.jwcwater.org/
- **Hillsboro.** Hillsboro is updating its water department website, and will be posting additional conservation education materials on that site by mid-2010. The city's rebate forms are already posted, along with links to the RWPC's conservation website, JWC's website, and Water Conservation Calendar contest winner pictures.
  - Website Link: http://www.ci.hillsboro.or.us/Water/
- **Forest Grove.** Forest Grove's website provides a variety of indoor and outdoor water conservation information and tips.
  - Website Link: http://www.forestgrove-or.gov/city-services/public-works-water.html
- **Beaverton.** Beaverton's website provides a variety of water conservation information including gardening tips to conserve water, how to plan and maintain a water wise garden, planning for lawns, general indoor and outdoor conservation tips, water reservoirs and conservation and a link to the RWPC site.
  - Website Link: http://www.beavertonoregon.gov/departments/publicworks/utilities/waterconservation.aspx
- **TVWD.** TVWD updated its entire website in 2008 to create a more usable interface and also update information to ensure it is up to date and accurate. The website provides information about the importance of conservation and why conservation is needed, how to fix water leaks, how to conserve water in residential households (both indoors and outdoors), how to conserve water and services available for commercial customers, available rebates for water efficient devices, and how to design water-efficient landscapes. In addition, the website contains links to resources like the Maximum Performance list for toilets, water barrel information, ET information and links to the EPA WaterSense program and the RWPC, as well as many other links for further

information. TVWD also created direct email links to the conservation program so a customer can directly email TVWD conservation staff regarding any specific questions.

  - Website Link: http://www.tvwd.org/conservation--rebates.aspx

- **Tigard.** Tigard's website provides a variety of water conservation information including a request for customers to participate in a voluntary summer watering program (one inch per week watering), a variety of indoor and outdoor conservation tips, water calendar contest winners, information on contents of conservation kits and how to obtain them, a summer lawn watering guide, school education programs available, the water smart landscape reimbursement program, a rain barrel fact sheet, and a link to the RWPC site.

  - Website Link: http://www.tigard-or.gov/city_hall/departments/water/conservation/default.asp

- **RWPC.** See above for an extensive list of information available on the RWPC Conservation website. All of the JWC partners contribute funding for development and implementation of site elements and site promotion.

  - Website Link: http://www.conserveh2o.org/

Report on Current WMCP Required Measures

The following section contains descriptions of the current status of each of the JWC member agencies' conservation programming required under OAR 690-086-0150 (4).

The JWC supports conservation through dues paid to regional water conservation organizations and through its individual member's conservation efforts. Each JWC member and wholesale customer pays a portion of the monthly operations and maintenance and administrative expenses for the JWC-owned facilities based on the amount of water supplied to each entity.

In addition to each agency's individual conservation measures, the JWC's rate structure encourages conservation. Each of the JWC member agencies pays for operations and maintenance expenses for the JWC Water Treatment Plant facilities, including administrative expenses, on a monthly basis. The charge is based on the amount of water use at the member agency's master meter connections. Each member agency's total metered water use is multiplied by the operation and maintenance expense rate. The method for calculating the expense rate is based on a 12-month rolling average of the operational and maintenance costs. This rate structure encourages conservation since lower water use by a particular member agency or wholesale water customer results in lower payments owed to the JWC.

Likewise, each JWC wholesale member agency receives similar monetary benefits for lower water use. Payments for wholesale water are based on the amount of water use at the wholesale agency's master meter connection multiplied by the wholesale water rate.

Following is a description of the current status of JWC member agencies' conservation programming required under OAR 690-086-0150 (4).

City of Hillsboro

The following subsection presents a description of the current status of Hillsboro's conservation programming.

Water Use Measurement and Reporting

The City of Hillsboro manages the water use measurement and reporting program for the JWC's water rights and for Hillsboro's individual facilities. The JWC's water withdrawals are measured at two raw water meters in the raw water pipelines between the intake facility at the Spring Hill Pump Station and the JWC Water Treatment Plant. The City of Hillsboro's water withdrawals at the Cherry Grove Water Treatment Plant are measured at raw water meters between the intake and the water treatment plant. The water withdrawal measurements are used for reporting that complies with the measurement standards in OAR Chapter 690, Division 85. Hillsboro's water use records can be found on the OWRD webpage (http://www.wrd.state.or.us/OWRD/WR/water_use_report.shtml).

In addition to the measurement and reporting required by the water use reporting program, Hillsboro and JWC submit weekly withdrawal reports to the District 18 Watermaster during the peak season to coordinate stored water releases and instream flows.

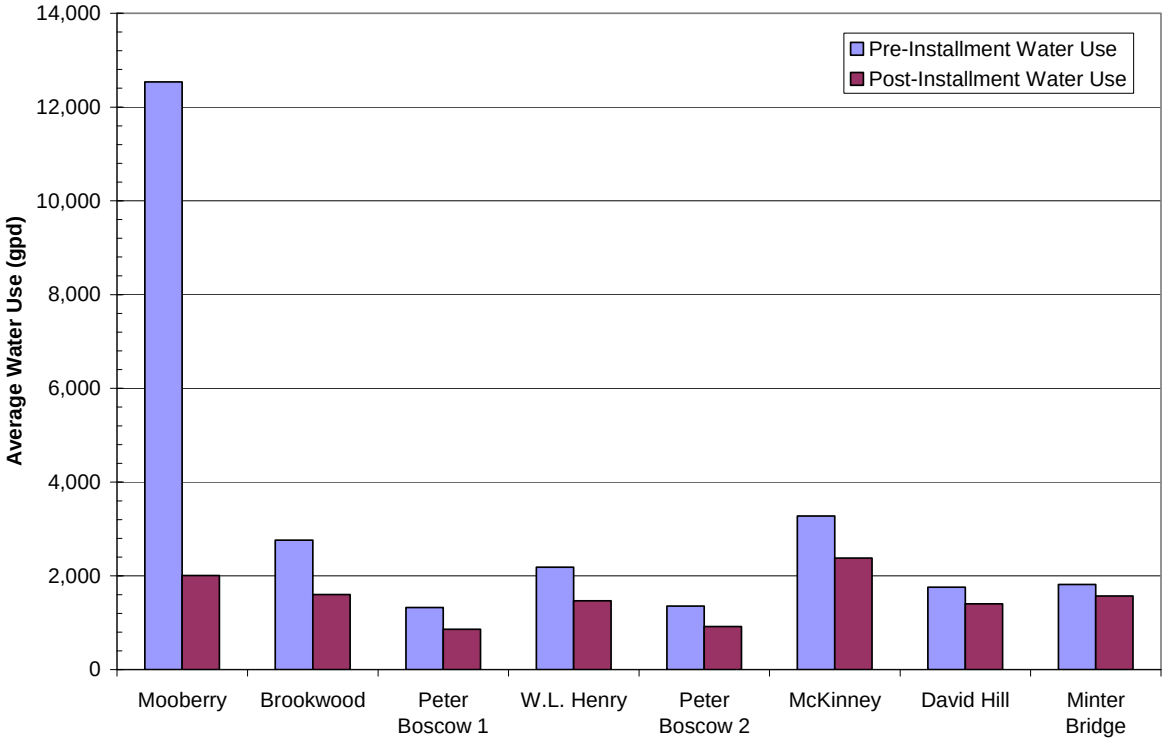
Conservation Highlights

The City of Hillsboro has implemented a variety of conservation measures and plans significant program enhancements over the next several years. Highlights include:

- Hillsboro provides a rich and varied menu of water conservation education programs to its customers. The city also participates in and takes maximum advantage of regional and sub-regional conservation education opportunities.
- In 2006, Hillsboro modified its rate structure to provide even more conservation incentives than were embedded in the previous rates. The new rate design removed water allowances and includes a 3-tier inverted block rate for single-family residential customers as well as inclining blocks for most other classes.
- Hillsboro is installing an AMR (automated meter reading) system that will be fully-operational by approximately 2020. All new meters will be installed as AMR meters, and existing meters will be replaced over a 10 year period. The meters will enhance conservation signals to customers and increase the rate of leak detection.
- Hillsboro's residential per capita water use has decreased from 97 gallons per capita per day (gpcd) in 2002 to 78 gpcd in 2007, a 20 percent reduction. However, the total system per capita use has remained steady (an average of 163 gpcd) because of increasing industrial use. Industrial customers, such as Intel, IDT, Genentech, and Solar World, account for 35 percent of Hillsboro's total system usage.
- Hillsboro's award-winning school audit program resulted in average water savings of more than 60 percent at eight area schools. Before and after water use data from these schools are presented in **Exhibit 3-1**. Based on these results, the Hillsboro School District has implemented similar measures at other schools and plans to continue retrofitting

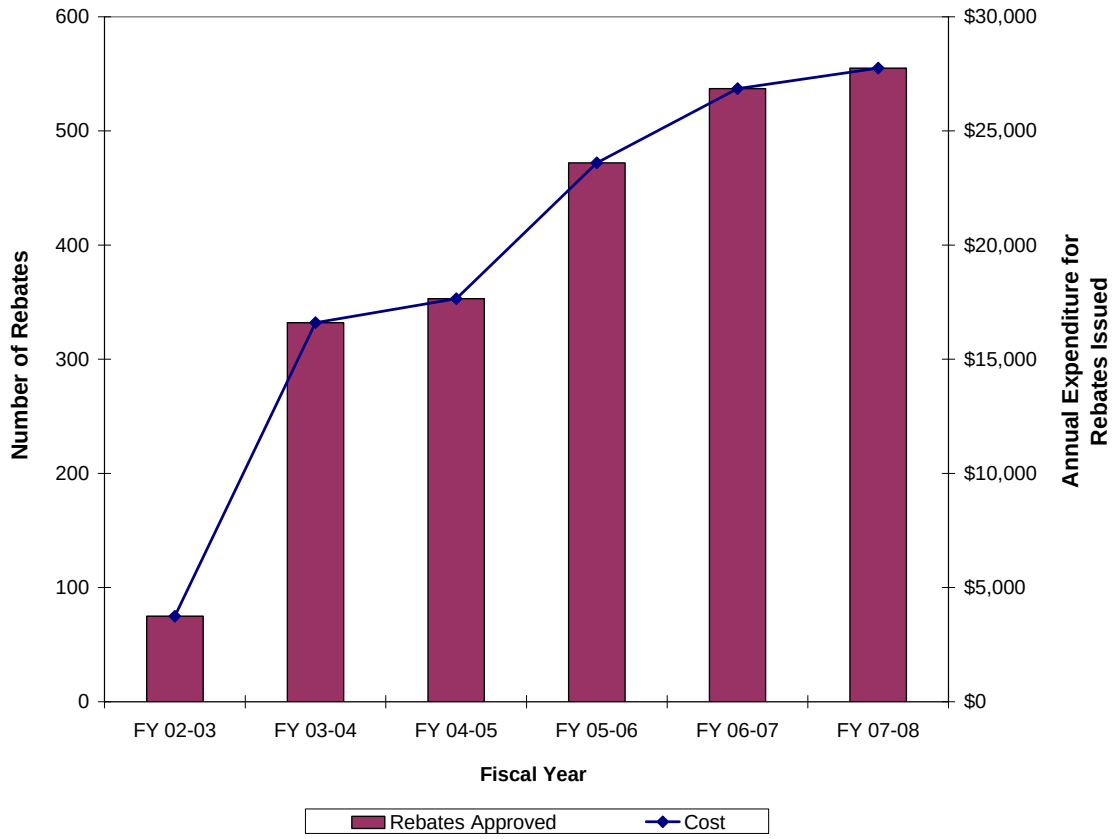
two schools each summer until all of the older schools have updated plumbing fixtures installed and leaks have been repaired.

EXHIBIT 3-1
Comparison of School-year Water Consumption Rates Before and After Installing Indoor Conservation Devices at Select Hillsboro Schools



- Hillsboro's ongoing clothes washer rebate program continues to be popular among customers and to generate water savings. **Exhibit 3-2** shows the number of rebates approved annually since FY 2002-2003. Though there are too many variables in residential household use to be able to identify monthly savings attributed to a water-wise washer on an individual customer account, replacing an old top loaded model with a new water-efficient model will save over 20 gallons per load. Assuming the average household runs about six loads per week, the yearly savings for one machine is over 6,000 gallons. Hillsboro had provided a total of 2,324 rebates by the end of FY 2007-2008, which translates into a yearly savings of 13.9 million gallons, or approximately enough water to meet the average demand of 190 single-family homes for an entire year. The city is planning to implement a much broader set of rebate programs beginning in 2012.
- Hillsboro historically has been one of the most active participants in the RWPC CCC. In addition to taking an active role in program development and implementation, Hillsboro's committee representative is currently chairing both the CCC and its Youth Education Subcommittee. This is her second year as CCC Chair and she has chaired the Youth Education Subcommittee for 10 years.

EXHIBIT 3-2
Hillsboro Washing Machine Rebate Program: Annual Number of Washing Machine Rebates and Annual Cost, FY 2002-2003 to FY 2007-2008



Conservation Measures Required of All Suppliers

OAR 690-086-0150(4) requires all municipal water suppliers to implement a particular set of conservation measures. Following are descriptions of Hillsboro's implementation to date and 5-year benchmarks for these measures.

Annual water audit. Hillsboro conducts an annual water audit and sends it to OWRD along with the annual water audits it collects from the other JWC members. Hillsboro calculates the city's unaccounted-for water as the difference between 1) water produced by the Cherry Grove water treatment plant plus water delivered to Hillsboro from the JWC Water Treatment Plant, and 2) water sold to wholesale customers, retail customers, and the volume of water used for distribution system flushing and construction purposes. The volume of water used for distribution system flushing is estimated and recorded by Hillsboro staff. Historically, the water used for construction purposes has been managed through Hillsboro's bulk water program and water use has been estimated by individual contractors.

Hillsboro currently has negative unaccounted-for water and will be taking several steps over the next few years to correct this apparent meter or accounting inaccuracy. These steps include purchasing a new accounting system, installing an Automated Meter Reading

(AMR) system, improving the bulk water program, replacing all sonic meters in the city's meter testing and maintenance program, and adding additional benchmarks in the leak detection program.

No known unmetered or other authorized or unauthorized uses exist for the JWC Water Treatment Plant or transmission system. The city measures the unaccounted-for water in the JWC transmission system between the finished water meters and the member agency master meters. This loss historically has been less than 4 percent. The city also measures the difference between the raw and finished water meters at the JWC water treatment plant to estimate in-plant water use, and water production efficiency.

> *Benchmark:* Hillsboro will continue to conduct its annual water audits and to collect the annual water audits from the JWC members and distribute the information to OWRD. Hillsboro will install an Automated Meter Reading (AMR) system. Hillsboro is also currently working on revising and improving its bulk water program used for construction purposes. The proposed revisions include requiring contractors to rent a hydrant meter instead of estimating water use. The hydrant meters will be used to accurately measure water use as a basis for volumetric billing in addition to the base service fees. The new program and policy will be adopted by the city's Utilities Commission by the end of 2010.

Metering. The City of Hillsboro is completely metered.

> *Benchmark*: The city is currently working on installing an automated meter reading (AMR) system that will be fully installed within 10 years. The AMR Neptune meters are equipped with notification alarms for continuously-running meters that indicate a leak is present or for meters that run for 18 hours, indicating a smaller leak may be present. Hillsboro will also continue to meter all connections.

Meter testing and maintenance. The City of Hillsboro manages the meter testing and maintenance program for the city's master meters and the JWC meters. Hillsboro and the JWC have a biennial testing and maintenance program for meters less than three inches in diameter. Meters larger than three inches in diameter are tested annually by Oregon Meter Repair. Any meters that fail testing are either rebuilt or replaced.

> *Benchmark:* The City of Hillsboro will replace all Hillsboro and JWC sonic meters with magnetic flow meters in the next treatment plant expansion project scheduled to occur between 2016 and 2020. Hillsboro consulted with meter specialists and consultants to determine that the existing sonic meters are most likely responsible for the negative unaccounted-for water as described in the Water Supplier Description section. The meters are over ten years old and cannot be calibrated. The new automated meter reading system also will alert customers and water department staff when meters fail to function properly.

Rate structure. Hillsboro's rate structure has contained a conservation component for many years, but it was improved in 2006 to further encourage conservation. In 2006, the city conducted an extensive rate study that analyzed the peaking of each customer class and recommended a tiered rate structure based on those peaking factors. In addition, all water allowances were removed and a third inclined tier was added for residential customers. The tiered rate structure for each customer class is now based on peaking factors for that

particular class. There are currently eight customer classes in the city's rate structure including single-family residential, multi-family residential, commercial, industrial, public users, non-profit, irrigation, and wholesale. The net impact of these rate changes is that customers pay a higher unit cost for high water use and are therefore encouraged to conserve water to save money.

> *Benchmark:* The city will evaluate the potential impact on water conservation of adjusting its tiered rates during the next rate study planned for 2013. Hillsboro will continue to analyze the monthly and seasonal peaking of each customer category and compare those factors to the rate structure.

Leak detection. Hillsboro currently has negative unaccounted-for water. This is most likely because of inaccurate flow measurement by the sonic master meters, as described previously. The city has recently hired a consultant to complete hydraulic modeling of the distribution system. The modeling calibration for the system has estimated that the unaccounted-for water rate is less than 10 percent.

The JWC also completed a transmission line inspection survey that determined that the structural integrity of the transmission mains from the JWC treatment plant to each partner was sound. The study was completed in fall 2008.

> *Benchmark:* Since the actual unaccounted-for water cannot be validated through the water audits, Hillsboro will continue regular leak surveys and line maintenance to continue to decrease the loss in the system. Hillsboro will use the new AMR program to more closely monitor for leaks resulting in even less water loss.

Public education. Hillsboro has programs in place to educate customers of all ages on efficient water use. The city communicates regularly with its customers via brochures, bill inserts, city newsletters, its website, local outreach events and other media outlets. Hillsboro runs local programs and outreach activities as described in the following paragraphs. Hillsboro also manages programs and outreach efforts for the JWC and actively participates in educational development and implementation efforts for the RWPC.

Hillsboro's public education program is managed by a State of Oregon certified teacher, with a Master's Degree in teaching. Having a certified teacher run the program has allowed the city to tailor its programs for maximum value among students. School lessons are also tailored to match proper developmental stages for students and ensure that the lessons meet state benchmarks and curriculum guidelines. This specific lesson targeting results in an improved level of acceptance from teachers and deepens the city's ability to reach more students in more schools.

The city hosts an annual calendar contest in which elementary school students enter water-themed drawings (primarily featuring water-wise tips) for a calendar. The first calendar printed for 2005 embodied the theme, "Catch on to Saving Water." The theme for the 2009 calendar is "Give Water Conservation a Hand." Announcements for the yearly contest also share information about other school programs that the Water Department offers including stage shows for school assemblies and in-class presentations. Teachers often call for a presentation and then encourage their students to participate in the contest by illustrating the new water facts and conservation tips they have learned.

The Hillsboro Water Department puts a high priority on educational programs with a primary focus of reducing peak season water use. One of the programs the Water Department currently promotes is a partnership with the Parks Department in a community garden program. The city encourages the community gardeners to use water-wise gardening practices and provides information on the "how-to's" of water-wise gardening at the gardeners yearly kick-off meeting. The city also provides needed equipment and supplies for water-wise gardening. Tools and supplies include: soaker hoses, compost, water-wise seeds, hose nozzles, and special nozzles called "Aqua Spikes." An Aqua Spike can be screwed on to a soda bottle full of water and inserted into the ground. Water is gradually delivered directly to the root-zone of nearby plantings, with very little water lost to evaporation.

The city provides youth education in the form of classroom and school presentations and public events. Presentations are chosen based on grade of students and State of Oregon Teacher Standards and Practices benchmarks. Some of the presentations offered in the classroom include:

K-2nd (Primary Benchmarks: Water Cycle, Weather):

***Where's Rosie?* Puppet Show –** A puppet show that was developed by the RWPC to teach the water cycle and water conservation to Kindergarteners, 1st and 2nd graders. Hillsboro typically sponsors 8-10 *Rosie* performances in venues such as the schools and libraries. The show is performed by a professional puppet theater company.

Incredible Journey – A *Project Wet* curriculum activity that uses beads for graphing a water drop's journey through the water cycle.

3rd & 4th (Primary Benchmarks: Communities, Environment, Water Cycle):

Drop in the Bucket – Another *Project Wet* activity that visually demonstrates how little fresh water there is actually available in the world for drinking.

Common Water – A *Project Wet* activity that was modified by staff to include a lesson on Hillsboro city history. Students learn how the water available in the Tualatin Watershed is the same amount as what was available 200 years ago. They see how the water needs to be shared with people, plants, animals, fish, the river, etc.

Incredible, Edible Aquifer – An activity that teaches about point source pollution and what happens if an aquifer is depleted by too much use.

The Long Haul – An activity that teaches how water was retrieved before pipes made the process as easy as turning on the tap. Students discuss how much less water was used back then per person and why, and if they would find ways to use less if they still had to haul water today. The lesson ends with ideas about how to reduce water use in current society, why that is still important, and why we should never take drinking water for granted.

Mad Science "What do you know about H_2O?" – An assembly program that was developed by a joint venture between Mad Science and the RWPC that teaches water science and conservation. This is a new program in the 2008/2009 school year and replaces the "Rockin' Water Road Show," a previous music assembly program that was geared toward teaching upper elementary students how to conserve water.

Upper Elementary (Primary Benchmarks: Basic Chemistry, States of Matter and Physical Properties):

Water Quality and Quantity – Teaches students the importance of high quality water and what that means to supply issues. Students are taught that high quality water is not available in endless quantities and as supplies are stretched, source quality can deteriorate.

6th Grade and Above:

From Source to Tap - This in-depth lesson teaches students to care about their water and their watershed. It emphasizes how water demands grow, but sources often don't and how all life in a watershed is dependent on the supply. It also includes conversation about conservation from an infrastructure perspective – how it's important that Hillsboro find and repair leaks in its transmission and distribution lines and why it's important to keep water loss to a minimum. The lesson ends with focus on the students and their water usage. How much water do they use? What kind of demands does that put on the system? Why is it important to find and repair leaks at home? What is the student's "water footprint" on the environment and finally, what actions can they take to save water?

All Ages:

Seven Steps for Water Efficient Gardening – This activity is commonly used at summer events to promote water-wise plant choices and teach proper planting techniques. Kids and adults choose water-wise seeds from a plethora of choices and then plant the seeds in a peat pot. While they follow the planting steps that are detailed in signage and also explained by staff, participants learn why it's important to amend dirt with compost to increase nutrient load and water-holding capacity and why they should use mulch to reduce evaporation and suppress weeds. Finally, they are encouraged to water regularly until the seeds are established, then reduce or eliminate watering altogether.

Hillsboro staff also presents to other community organizations, both child and adult-oriented. Those groups include Boy and Girl Scout troops, the AARP, community garden groups and civic organizations. The presentations are tailored to the individual group, such as a "Seven Steps to Water-Wise Gardening" presentation for gardening groups.

Hillsboro also takes the lead in organizing and providing staffing for water conservation outreach at regional events such as the Washington County Fair, the Public Works Fair and the annual Community Action Fair, which is specifically aimed at low-income and minority citizens. Particular attention is paid at regional events to provide information in both English and Spanish, as Washington County has a significant Latino population.

Hillsboro has a Water Department website that includes some information about water conservation. However, they continue to rely heavily on the RWPC website to provide more detailed information and web tools for assistance in water-wise planning. This makes the most sense for Hillsboro as it provides a significant portion of the funding for CCC programs. Hillsboro served on the panel to select the web design firm for the RWPC and actively participates in web development for the www.conserveh2o.org site.

> *Benchmark*: Hillsboro will continue its aggressive public outreach conservation program. Hillsboro also will update the Hillsboro Water Department website to include more information on indoor and outdoor conservation tips by mid-2010. The

city will revamp overall site layout to make the information more accessible. The rebate forms are already posted along with calendar contest winners and links to the RWPC's conservation website.

Additional Conservation Measures

OAR 690-086-0150 (6) requires municipal water suppliers serving a population greater than 7,500 to implement an additional set of conservation measures or to provide documentation showing that implementation of the measures is neither feasible nor appropriate for ensuring the efficient use of water and the prevention of waste. Following are descriptions of Hillsboro's implementation to date and 5-year benchmarks for these measures.

System-wide leak repair. Despite the fact that its system unaccounted-for water rate is likely at or under 10 percent, the Hillsboro Water Department has a program to replace its oldest steel pipelines through a 15 year program. These lines were installed more than 50 years ago, and are more prone to leaks and breaks than other piping materials, resulting in water loss and potential water quality problems. During the 2008-2009 fiscal year, the Hillsboro Utilities Commission invested $1.3 million to replace pipelines in E. Main Street, NE Edison Street, SE Oak, SE Alder, SE 11th, SE 12th and SE 21st. Selection of these projects is coordinated each year with the Public Works Department to avoid cuts into new streets built by Public Works.

Hillsboro has continued its policy (adopted in a 1988 resolution) to adjust the leak portion of a customer's bill, if the customer repairs the leak within 10 days of it being reported. The program is designed to encourage customers to identify and repair leaks in a timely manner.

Benchmark: Hillsboro will continue to maintain the leak adjustment policy and budget. The city will also continue to maintain an annual budget for the steel line replacement program targeting high priority aging infrastructure.

Benchmark: The Hillsboro will continue to adjust customer bills when leaks are repaired.

Technical and financial assistance. Hillsboro has recently provided technical and financial assistance to the Hillsboro School District and Intel, its largest institutional and industrial customers. In 2008, the Pacific Northwest Section of AWWA deemed its School Audit Program the best non-residential conservation program run by a middle-sized agency. The water savings for the schools were illustrated in the Conservation Highlights section. For Intel, Hillsboro hired a consultant (SBW Consulting) to provide a list of implementation recommendations, along with a cost/benefit analysis for which recommendations had the quickest payback. In addition to providing the audit and recommendation report, Hillsboro and consultant staff also installed low-flow showerheads, low-flow aerators and low-flow pre-rinse sprayheads on Intel's four campuses. This resulted in an immediate savings of 322,000 gallons per year.

Hillsboro sets aside $10,000 in its conservation budget each year to offer technical and financial incentives to other non-profits and industrial customers throughout Hillsboro. Hillsboro continues to offer landscape audits to residential customers as well. Hillsboro also

offers free indoor and outdoor conservation kits to its customers through the previously described events and to individual customers upon request.

Hillsboro continues to partner with its Parks Department to provide technical assistance to landscapers and gardeners. After completion of the successful weather station venture, the two departments worked together again on Hillsboro's very first community garden project. The Water Department provided educational materials, water-conserving tools (such as rain gauges, soaker hoses, hose nozzles, water-wise seeds and aqua spikes) along with a load of compost for amending the soil to improve its water-holding capabilities. The garden had a very successful first year and most of the gardeners used the devices, which provided water-wise gardening examples for the entire community. Because of its success, the Water Department continues to provide an annual spring load of compost that is delivered to the site for use by the gardeners and also replenishes any tools that have broken or disappeared.

> *Benchmark*: The Parks Department is considering expansion of its Community Garden program to other sites and the Water Department will take its water-wise message, educational materials and water-conserving tools to those sites as well. Hillsboro will also work with Master Gardeners at the Washington County Fair Complex Demonstration Garden to provide an educational showcase of water-wise gardening techniques for the general public.
>
> *Benchmark*: Hillsboro will become a member of the Alliance for Water Efficiency by 2010. This new broad-based, non-profit organization is dedicated to the efficient and sustainable use of water and provides a clear and authoritative national voice for conservation. The Alliance for Water Efficiency provides comprehensive information, represents the interest of water efficiency, coordinates green building initiatives, trains water conservation professionals, educates water users, and provides a voice and platform for water use efficiency and water conservation.

Retrofits and replacement. Hillsboro continues to offer a $50 washing machine rebate with approximately $30,000 budgeted per year. The rebate program has been very popular and Hillsboro has continued to increase its conservation budget to match the rebate demands from the community.

Staff has also provided technical assistance, funding and water-saving devices to the Hillsboro School District and Intel for the replacement of toilets, showerheads, aerators and pre-rinse sprayheads.

Benchmark: By 2011, Hillsboro (in conjunction with the City of Beaverton) plans to complete a feasibility study on the most cost effective rebate programs within EPA's new WaterSense certification and labeling program. The feasibility study will analyze the types of rebate programs including landscape rebates, washing machines, low flow and high efficiency toilets, and weather-based irrigation controllers. The program will analyze the water savings and complete a cost benefit analysis of the different types of rebates including projected budgets for each organization. The results will be presented to the Hillsboro Utilities Commission with a recommendation for an update to the City's rebate program by 2012.

Benchmark: Hillsboro will monitor TVWD's ET controller pilot program and will use data generated by that program to evaluate whether a similar program would be suitable for Hillsboro customers.

Hillsboro is running a waterless urinal pilot program with Forest Hills Lutheran School. Hillsboro paid for the urinals and will monitor water usage to see what impacts the change makes on water consumption. Forest Hills has agreed to provide feedback on ease of use and maintenance issues.

Benchmark: By 2012, Hillsboro will obtain data and determine how well waterless urinals work in a school setting and will evaluate the feasibility of encouraging Hillsboro School District and other non-profit, industrial, or commercial sites to consider making the change.

Rate structures and billing schedules. Hillsboro adopted a new conservation-promoting rate structure in October 2006. The new structure established additional customer classes, eliminated conservation-discouraging water allowances and added a third tier for the residential class of customers.

Benchmark: Hillsboro will continue to promote conservation based rate structures. Hillsboro will conduct a rate study by 2013, and determine if the adopted rate structure had the expected conservation results on water use by each customer category.

Water reuse and recycling. Clean Water Services (CWS) provides water reuse in Washington County. CWS is exploring new water reuse opportunities with the Oregon Department of Environmental Quality (DEQ). Hillsboro encourages customers, especially industrial water users, to investigate water reuse options. Hillsboro especially encourages the elimination of single-pass cooling, and provides technical assistance on improving cooling tower efficiencies on request.

Benchmark: Hillsboro completed a preliminary feasibility study related to water reuse in the city's high volume industrial areas. The study will be included in the next Hillsboro Water Master Plan in 2009.

City of Forest Grove

Following is a description of the current status of Forest Grove's conservation programming.

Water Use Measurement and Reporting

The City of Forest Grove has a water use measurement and reporting program that complies with the measurement standards in OAR Chapter 690, Division 85. Production records from the Forest Grove Water Treatment Plant and from the JWC Water Treatment Plant are used to determine total annual water production. There is one production meter at the Forest Grove Water Treatment Plant. The metering at the JWC Water Treatment Plant is described in the Hillsboro section. The city's water use records can be found on the OWRD webpage. (http://www.wrd.state.or.us/OWRD/WR/water_use_report.shtml).

Conservation Highlights

The City of Forest Grove has implemented a variety of conservation measures and plans significant program enhancements over the next several years. Highlights include the following:

- Forest Grove is considering ways to modify its computer system to help it better track water use and system losses.
- Forest Grove is assessing the results of a test of Automated Meter Reading equipment to determine its efficacy for all residential customers.
- Forest Grove's energy utility includes water conservation fixtures in its home audit program. The city is also considering how to best enhance the water conservation components of the home audit.
- Forest Grove will consider significantly expanding its current rebate programs for water-efficient clothes washers and dishwashers to also include toilets, landscape equipment, and weather-based irrigation controllers.
- Forest Grove's per-capita total water use has decreased from 168 gpcd in 2003 to 131 gpcd in 2007, a 22 percent reduction.

Conservation Measures Required of All Suppliers

OAR 690-086-0150(4) requires all municipal water suppliers to implement a particular set of conservation measures. Following are descriptions of Forest Grove's implementation to date and 5-year benchmarks for these measures.

Annual water audit. Forest Grove conducts an annual audit and submits the results to the JWC. Hillsboro submits the combined audit report to OWRD for the JWC member agencies. The city measures unaccounted-for water as the difference between: (1) Forest Grove water treatment plant plus delivered flow from JWC water treatment plant, and (2) water sold to customers. The calculation is based on monthly records. Historically, unaccounted water has ranged from 10 percent to 15 percent. The city purchased a new accounting system in 2007, which will improve its ability to estimate unaccounted-for water.

> *Benchmark*: By 2011, Forest Grove will improve water audit record keeping, and consider ways of changing computer software to better compare and report water use.

Metering. Forest Grove is completely metered.

Benchmark: Forest Grove will continue to meter all connections.

Meter testing and maintenance. Forest Grove tests 40 compound meters on an annual basis to check for accuracy. The city also has a meter replacement program in which all meters, including residential and commercial meters, are replaced every 15 years.

In addition, Forest Grove has installed about 100 AMR meters as a test. These AMR meters have proven to save time and to increase accuracy. As a result, Forest Grove has initiated the process to convert all meters.

Benchmark: Forest Grove will convert all meters to AMR meters within the next 5 to 7 years.

Rate structure. Forest Grove has a volumetric rate for each of the four customer classes (single-family residential, multi-family residential, commercial, and industrial). The single-family rate (which accounts for approximately 47 percent of consumption) is a three-tier increasing-block structure.

Benchmark: Forest Grove will continue a volumetric rate for each customer class, and will continue its three-tier rate structure for the single-family customer category.

Leak detection. Twelve percent of Forest Grove's distribution system is sonically leak tested annually. Approximately 1 percent of the distribution is replaced on an annual basis.

Benchmark: Forest Grove will continue its current leak detection and repair program.

Public Education. Forest Grove holds an annual open house at which there is a water conservation table and indoor and outdoor conservation kits are distributed. In addition, the city participates in various events coordinated by the RWPC and JWC EEC (see above). In addition, the city offers two RWPC school presentations per year. Conservation information is included with water bills. The city's website includes conservation information and tips.

Benchmark: Forest Grove will continue the public education activities described above.

Benchmark: By 2012, Forest Grove will expand its website to include more water conservation information including a link to ET data.

Additional Conservation Measures

OAR 690-086-0150 (6) requires municipal water suppliers serving a population greater than 7,500 to implement an additional set of conservation measures or to provide documentation showing that implementation of the measures is neither feasible nor appropriate. Following are descriptions of Forest Grove's implementation to date and 5-year benchmarks for these measures.

System-wide leak repair. Forest Grove implemented the recommendations of the 2000 Water Master Plan, which recommended a capital budget of $907,400 (in 2000 dollars) for 1999 through 2005 for replacement of 6-10 inch diameter pipe. The 2009 through 2013 budget is approximately $1.4M (in 2009 dollars).

A full inspection of the water system is conducted every four years. In addition to this scheduled program, the city's public works department conducts visual inspections and follows up on customer complaints of water leaks. If a leak is identified, the water line is replaced.

Forest Grove also has a policy to adjust the leak portion of a customer's bill, if the customer repairs the leak after being notified of the leak. Although Forest Grove does not require repairs to be made within a specific time limit, the city will not consider a partial bill adjustment until the leak is repaired. The program is designed to encourage customers to identify and repair leaks in a timely manner.

> *Benchmark*: Forest Grove will continue its current system-wide leak repair program.

Technical and financial assistance. Forest Grove has implemented a leak repair incentive program. If a leak that has resulted in a bill increase is identified and repaired by the resident, the city will investigate the issue on a case-by-case basis and refund at the commercial rate, currently $1.51 per 1,000 gallons.

In addition, Forest Grove Light and Power (FGL&P) conducts a home energy audit program, during which auditors install low flow showerheads and faucet aerators.

> *Benchmark*: Within 5 years, Forest Grove will evaluate expanding the current home energy audit program to include more water conservation consultation.

Retrofits and replacement. Forest Grove provides a rebate for low-water-use washing machines and dishwashers in partnership with FGL&P.

> *Benchmark*: In 2010, Forest Grove will evaluate the potential costs, market penetration, and water savings from expansion of the rebate program to also include toilets, landscape equipment, and weather-based irrigation controllers.

Rate structures and billing schedules. Forest Grove's rate structure and associated benchmark was described in the previous section. In addition to the described rate structure, Forest Grove will continue its program of providing conservation messages on its water bills.

Water reuse and recycling. Clean Water Services (CWS) is working with DEQ and exploring new water reuse opportunities. Clean Water Services' Forest Grove Wastewater Treatment Facility serves portions of Forest Grove and all of Cornelius and Gaston. The facility produces Class C recycled water which is applied at storage ponds adjacent to the facility. Some recycled water is used to irrigate two acres of native plants at a nursery. During the dry season, the Forest Grove Wastewater Treatment Facility pumps all wastewater to the Rock Creek Advanced Wastewater Treatment Plant for higher level of treatment.

Forest Grove has a conventional filter water treatment plant that requires frequent backwashing of the filters. The backwash water is sent to a settling pond. In 2006, a "recycle" line was added to the settling pond so the water can be put back through the water treatment plant for distribution.

Two examples of opportunities to evaluate the use of non-potable water include Pacific University incorporating rain water harvesting into a new dormitory and the Forest Grove School District irrigating with non-potable water from Tualatin Valley Irrigation District. Clean Water Services is also proposing development of a natural treatment system (NTS) consisting of treatment wetlands in conjunction with surface and hyporheic discharge near the Forest Grove Wastewater Treatment Facility.

> *Benchmark*: Forest Grove will continue to forward customer and business inquiries on water reuse and recycling to CWS, as well as continuing to recycle backwash water, and will seek non-potable water use opportunities.

City of Beaverton

Water Use Measurement and Reporting (OAR 690-086-150 (2))

The City of Beaverton has a water use measurement and reporting program that complies with the measurement standards in OAR Chapter 690, Division 85.

Water is measured in numerous locations as it enters and is conveyed through Beaverton's distribution system. Primary water from the JWC is metered as it enters Beaverton's 36-inch transmission line, outside the city limits. Water is measured with magnetic flow meters, and flow data are transmitted to the city's telemetry/SCADA system. Flow meters at pressure reducing stations within Beaverton's distribution system provide additional data. Water entering the city's terminal storage reservoirs (15 MG and 5 MG) is metered and change in storage is measured and recorded by telemetry/SCADA. Water leaving the city's highest reservoir, Cooper Mountain (overflow at 794 ft) is also metered.

Injection and recovery volumes are measured at Beaverton's three ASR wells.

Both groundwater and surface water use is reported to OWRD annually. The city's water use records can be found on the OWRD webpage (http://www.wrd.state.or.us/OWRD/WR/water_use_report.shtml).

Conservation Highlights

- In conjunction with the RWPC, Beaverton offers a varied array of public information and education programs to its customers.
- Beaverton is currently spending in excess of $1 million annually in distribution system improvements and replacement of aging water lines.
- Beaverton relies heavily on ASR to supplement peak-season water supply and conserve surface water from primary sources (rivers and impoundment reservoirs) during environmentally stressful summer seasons. The city plans to expand the ASR program.
- Between 1992 and 2007, Beaverton's per-capita total water use has declined from 151 gpcd to 116 gpcd, a reduction of 23 percent.

Conservation Measures Required of All Suppliers

OAR 690-086-0150(4) requires all municipal water suppliers to implement a particular set of conservation measures. Following are descriptions of Beaverton's implementation to date and 5-year benchmarks for these measures.

Annual water audit. Beaverton conducts an annual audit and sends the results to the JWC. Hillsboro submits the combined audit report to WRD for the JWC member agencies. The audit includes estimates for fire hydrant use for firefighting (by Tualatin Valley Fire & Rescue) and other non-metered use for public works construction and maintenance.

> *Benchmark*: Beaverton will continue to conduct its annual water audit and to participate in the JWC annual water audit program.

Metering. The City of Beaverton is fully metered. Fire hydrant use is generally metered; un-metered hydrant use is estimated based on water truck "loads" of a known volume. A permit is required for all fire hydrant use. The city is investigating the feasibility of an AMR program.

> *Benchmark*: Beaverton will pilot an AMR program, and if feasible, will replace approximately 10 percent of existing meters by 2015.

Meter testing and maintenance. Beaverton has an aggressive meter replacement program. Residential meters are replaced when requested by customers or the city's Finance Department. In addition, the city currently endeavors to replace 700 residential meters annually, based on the age of the meters. Beaverton also tests all commercial meters annually and replaces them as necessary.

> *Benchmark*: Beaverton will continue its current meter testing and maintenance program. Beaverton will continue the aggressive meter replacement program with a goal of replacing 700 residential meters annually, and commercial meters as needed.

Rate structure. Beaverton has a two-component rate structure made up of a base (monthly) charge based on meter size and a charge based on the volume of water used in a month.

> *Benchmark:* Beaverton will conduct a rate study that will evaluate alternative rate structures intended to encourage water conservation. The results of the study and recommended actions will be presented to the City Council by January 1, 2015.

Leak detection. Beaverton has an active leak detection program for its distribution system and recently purchased new leak detection equipment. Beaverton performs periodic leak detection surveys on its distribution and transmission pipelines using leak noise correlation equipment. If a leak is found, Beaverton staff evaluates the severity and determines whether the appropriate action is to immediately repair the leak or to schedule a repair in the near future. Based on resources, staff performs leak detection on approximately 10 miles of distribution pipeline on an annual basis. As part of the JWC Transmission Line Inspection Project, Beaverton spent over $550,000 during FY 07-08 and 08-09 on 19 miles of large transmission line corrosion/cathodic protection inspection and excavation to ensure conveyance integrity.

> *Benchmark:* Beaverton annually spends in excess of $1,000,000 to repair, replace, and upgrade existing water distribution mains, including replacement of service lines,

valves, fire hydrants and customer meters. Beaverton expects to continue spending approximately $1,000,000 annually over the next five years towards these efforts.

Public Education. Beaverton educates water customers on efficient water use via a mailed copy of its annual Consumer Confidence Report, as well as brochures, city newsletters, city website, local outreach events and other media outlets. Beaverton runs local outreach programs, including but not limited to providing the "Where's Rosie" puppet show annually to all interested Beaverton School District elementary schools in its water service area. Additional local community conservation outreach events include, but are not limited to staffing city booths at numerous Saturday Farmers Markets, and "Flicks by the Fountain", "Neighborhood Summit" and "Holiday Open House" events. At each of these events, water conservation kits are distributed.

The City of Beaverton website is fully linked to that of the CCC.

Beaverton's water billing department distributes water conservation kits, brochures, pencils, stickers and bookmarks to customers. Beaverton manages local programs and provides staff to participate in the JWC EEC and RWPC outreach activities and events.

Benchmark: Beaverton will continue to participate in local, JWC EEC, and regional public education and outreach activities as identified by the city and those particular committees.

Additional Conservation Measures

OAR 690-086-0150 (6) requires municipal water suppliers serving a population greater than 7,500 to implement an additional set of conservation measures or to provide documentation showing that implementation of the measures is neither feasible nor appropriate. Following are descriptions of Beaverton's implementation to date and 5-year benchmarks for these measures.

System-wide leak repair. The City of Beaverton is currently spending over $1 million per year in distribution system replacements and improvements of aging water lines at or near the end of their useful life. The city has a dedicated annual budget program that provides a stream of funding solely for these types of projects. These capital projects serve to control and reduce unaccounted-for water and to ensure a more stable operation and maintenance program, less susceptible to catastrophic water line failures and spikes in needed revenue. The city's unaccounted-for water trend is generally dropping, and currently is less than 10 percent. It is expected to continue to slowly decline over the next five years.

Beaverton also has a policy to adjust the leak portion of a customer's bill, if the customer repairs the leak by the next billing cycle after being notified of the leak. The program is designed to encourage customers to identify and repair leaks in a timely manner.

Benchmark: Beaverton will continue with an ongoing leak detection and distribution system replacement program to help keep unaccounted-for water rates below 10 percent.

Technical and financial assistance. If feasible, Beaverton provides technical assistance to water customers as requested. Each year, Beaverton performs free water audits for two

water users within its largest water users group, which includes commercial, multi-family, and institutional customer classes.

> *Benchmark:* Beaverton has budgeted funds in fiscal year 2008-09 and will conduct a water audit for the Beaverton School District, which is one of the top ten water customers. The city will also continue to offer two free water audits per year for large water users.

Retrofits and replacement. Beaverton does not currently have a water/energy efficient rebate program because of limited staff.

> *Benchmark*: Beaverton will participate in a WaterSense rebate feasibility study in partnership with the City of Hillsboro (as previously described on page 3-21).

Rate structures and billing schedules. Beaverton's rate structure was described previously. Single-family residential customers are billed bi-monthly; other customers receive monthly bills.

> *Benchmark:* Beaverton will conduct a rate study that will evaluate alternative rate structures intended to encourage water conservation. The results of the study and recommended actions will be presented to the City Council by January 1, 2015. Beaverton will also evaluate the opportunity to develop a program of providing information/messages on water bills to encourage water conservation.

Water reuse and recycling. CWS's Durham Advanced Wastewater Treatment Facility serves most of Beaverton. Currently, there is no reuse program within the boundaries of Beaverton (See City of Tigard's water reuse and recycling description regarding use of wastewater from the Durham facility). For use of recycled water to be feasible for Beaverton, the source would need to be in close proximity to the place of use. This would require construction of a satellite treatment facility to provide Class A recycled water in Beaverton's collection system. Construction of a new treatment facility is currently not considered economically feasible.

> *Benchmark*: Beaverton will continue to forward customer and business inquiries on water reuse and recycling to CWS. Beaverton will also consider non-potable water use opportunities as they arise, such as for city irrigation.

Other identified conservation measures. Since 1999, Beaverton has been using Aquifer Storage and Recovery (ASR) to supplement peak season water supply. During the winter and spring, Beaverton injects treated drinking water from the JWC water treatment plant into natural underground basalt formations (aquifers), displacing native groundwater. Stored water in the aquifer is pumped out of the ASR wells during the summer when demand increases. The City of Beaverton's current ASR technology plays a vital role in meeting peak season water demand. During the summer months, treated water is recovered to help meet peak season demands (up to 17 mgd). Peak day customer demand currently exceeds the city's "maximum supply capacity" limitation of 14 mgd in the 20-mile long water transmission system.

Since 1999, ASR has helped the City of Beaverton delay the purchase of new source water and water facilities including raw water storage, water treatment, finished water storage,

and conveyance. Beaverton has reduced its diversion of limited summer streamflow and/or impounded surface water by substituting stored water recovered from ASR wells.

> *Benchmark*: Beaverton plans to expand its ASR program by adding approximately two new wells over the next 5-10 years.

TVWD

The following is a description of the current status of TVWD's conservation programming.

Water Use Measurement and Reporting

The TVWD has a water use measurement and reporting program that complies with the measurement standards in OAR Chapter 690, Division 85. Water is supplied into the TVWD system at four key locations: two from JWC (Cornelius Pass and 75th Ave) and two from Portland (Beaverton-Hillsdale Hwy and Florence Lane). TVWD has supply meters at each of these four locations. In addition, TVWD has a back-up connection from Portland (US-26 and SW Camelot Ct), which has a supply meter at Portland's Hoyt Park. TVWD's water use records can be found on the OWRD webpage. (http://www.wrd.state.or.us/OWRD/WR/water_use_report.shtml)

Conservation Highlights

TVWD has implemented an aggressive set of conservation programs. Highlights include the following:

- AMR meters are being installed in all new meter installations. Currently there are over 1,900 residential AMRs and over 90 commercial AMRs installed. There is a 3-year program to install AMRs for all commercial accounts.
- TVWD has a two-tiered inclining block rate, which is consistent with cost-of-service principles and was adopted to provide customer conservation incentives.
- TVWD has a wide variety of public education programs to inform its customers about water conservation and to encourage them to adopt water-saving behaviors and install water-saving equipment. Examples of these programs include intensive school programs, workshops for landscape professionals, front office displays and free conservation devices, and a renovated water-efficient demonstration garden, which was created to be an outdoor classroom.
- TVWD offers many categories of commercial and residential rebates for replacement of high-water use appliances and fixtures, and provides kits to help identify leaks. TVWD also hands out a variety of efficient fixtures and devices such as showerheads, shower timers, aerators, toilet leak tablets, toilet banks, watering gauges, and soil moisture probes.
- TVWD has developed a rainwater collection system that captures 6,500 square feet of surface run-off from the roof of TVWD's offices, and stores it in a 40,000 gallon storage tank. The rainwater is collected, filtered and disinfected by an ultraviolet disinfection system, and then used to supply water for flushing toilets and urinals throughout the

building. The system reduces the amount of potable water required for flushing by more than 60 percent.

- TVWD has taken steps to reduce water consumption in its own operations by reducing water levels in tanks prior to tank cleaning.
- TVWD has installed a new electronic controller for the irrigation system at TVWD's headquarters. The controller uses evapotranspiration information to efficiently water landscape plantings.
- In 2005, TVWD's Board adopted a goal to decrease total per-capita consumption by an average of 0.8 percent per year for 5 years. TVWD is in the fourth year of that 5-year program. Between 1998 and 2008, total per-capita use has decreased at a 2.5 percent annual rate, from 146 to 109 gpcd.
- January 2006, TVWD added a full time employee to implement the Business, Industry, Government (B.I.G) and Multi-Family Housing water conservation programs.
- The annual budget for water conservation, including staff, has been increased each year from $309,000 in FY 2003-2004 to $870,000 in FY 2008-2009. This represents an overall increase of more than 180 percent in the five year period.
- TVWD conservation staff are participants and leaders within professional water associations and consortiums that promote conservation education in both the Portland Metro Region, and in the Pacific Northwest (Oregon, Washington and Idaho).

Conservation Measures Required of All Suppliers

OAR 690-086-0150(4) requires all municipal water suppliers to implement a particular set of conservation measures. The following are descriptions of TVWD's implementation to date and 5-year benchmarks for these measures.

Annual water audit. TVWD performs an annual water audit to account for the total volume of water supplied to the system, consumed by customers through metered service connections, and used for distribution system flushing and construction purposes. The volume of water lost to distribution system flushing is estimated and recorded by TVWD staff. A few other authorized, unmetered water uses exist such as firefighting. Water audit summaries are submitted to the JWC

> *Benchmark*: TVWD will continue to conduct annual water audits and to submit annual water audits to the JWC. Water use data will be examined to determine trends or abrupt changes.

Metering. TVWD has a fully metered system, including all non-emergency sources of water—all permanent connections to the City of Portland water system, the JWC, and TVWD's back-up supply from groundwater wells. AMR meters are being installed in all new meter installations. Currently there are over 1,500 residential AMR meters and over 100 commercial AMR meters installed.

> *Benchmark*: AMR meters will be installed for all commercial accounts by 2013.

Benchmark: An evaluation of the feasibility of expanding the AMR program, including the possible water conservation benefits, will be completed by 2015.

Meter testing and maintenance. TVWD crews annually test and repair (or replace as necessary) all meters two-inches in diameter and larger. TVWD has been testing these large meters on-site since 1998. TVWD also replaces or repairs a number of smaller customer meters monthly in response to customer inquiries or deficiencies noted by staff.

Benchmark: TVWD will continue its current meter testing and maintenance program.

Rate structure. TVWD's water rate structure consists of a bi-monthly base rate, plus a two-tiered inclining block volume charge. The base rate increases with the size of the water meter and the tiered volume determination and charge are based on customer class. This water rate structure was developed through a comprehensive cost-of-service analysis to equitably assign costs to customers based on their demands. TVWD adopted this rate structure because it provides a conservation incentive.

Benchmark: TVWD will continue its two-tiered inclining block rate structure.

Leak detection. In recent years, TVWD has had an unaccounted-for water rate less than 10 percent. TVWD performs periodic leak detection surveys using leak noise correlation equipment. If a leak is detected in the distribution system, depending on the leak's severity, staff decide to repair the leak immediately, schedule a repair, or record and monitor the leak in future leak detection surveys. Since 1999, TVWD has invested more than $200,000 annually to repair water main and service leaks throughout the distribution system, and has budgeted $850,000 annually for the scheduled replacement of old water service lines.

TVWD educates customers about leak detection and repair downstream of customer meters through its website and print media. Customers with higher than normal meter readings are notified of possible leaks.

Benchmark: TVWD will continue to periodically perform leak detection surveys of portions of its system, and respond to identified leaks.

Benchmark: TVWD will continue to educate customers about customer-side leak detection and repair, and will continue to notify customers of higher than normal usage.

Public Education. TVWD promotes water conservation through direct mailing, community events, and a variety of programs and activities in schools. TVWD is active in conservation planning and implementation through and regional and statewide partnerships.

TVWD provides conservation information in its front lobby, with bi-monthly billing statements, and a bi-monthly Water Words newsletter.

TVWD has received national recognition for programs such as its annual calendar contest for youth. The Conservation Calendar is based on a water-related theme, and provides tips to use water wisely. These tips, and other elements of TVWD's public education program, clearly indicate that conserving water saves money for TVWD's customers.

TVWD launched a B.I.G. Newsletter in the fall of 2005. This quarterly letter is sent to non-residential customers with a focus on issues that would affect this sector.

TVWD updated its website in 2008 to create a more usable interface and to provide new information. TVWD's website provides information about the following topics:

- The importance of water conservation and why it is a major focus for TVWD
- Fixing water leaks
- Conserving water inside and outside of residential households and commercial enterprises
- Technical assistance available for commercial customers
- Rebates for water efficient devices
- Designing water-efficient landscapes

The website also provides links to other water conservation resources such as the EPA WaterSense program, the RWPC website, and many other useful sites including a list of water efficient toilet models, water barrel information, ET information, and more. TVWD created an email link to the conservation program so customers can correspond directly with TVWD conservation staff. TVWD has recently become a partner with EPA in promoting their WaterSense Program.

TVWD provides a Speaker's Bureau that presents TVWD policies and leads discussions with customer groups, businesses, and organizations. Water efficiency, water conservation, and sustainability are often the subject of these presentations.

TVWD participated in the American Water Works Association, Pacific Northwest Section (AWWA PNWS), Water Conservation Committee to develop a Conservation Certification Program in conjunction with Lane Community College. This program will offer training and credentials to existing conservation staff and new professionals wishing to join the industry.

In the summer of 2008, TVWD finished renovation of its water efficient demonstration garden, located on TVWD office property. The goal of the garden project was to provide hands on demonstration of water efficient principles and practices in landscape design, installation, and maintenance. Renovations included updated signage, new native and naturalized non-invasive plants, weather based irrigation technology, and high efficiency multi-stream nozzles and drip systems. In addition, a plaza was installed as an outdoor classroom for TVWD staff to hold year-round water conservation events targeting youth, landscape professionals, and residential and commercial customers.

TVWD's Youth Education Program sponsors presentations and activities at elementary schools. The school-age presentations are intended to instill a conservation ethic in the next generation of water users. TVWD's educational resources include presentations focusing on the natural water cycle, the path of drinking water from the source to the customer's home, and planting activities. TVWD also contracts with professional actors and puppeteers, for school presentations, such as the "Mad Science Program", "Rockin' Water Road Show" and "Where's Rosie?" puppet show. TVWD reaches approximately 5,700 students annually with these programs.

Benchmark: TVWD will work with local schools to develop new and creative programs that foster water stewardship.

Additional Conservation Measures

OAR 690-086-0150 (6) requires municipal water suppliers serving a population greater than 7,500 to implement additional conservation measures or to provide documentation showing that implementation of the measures is neither feasible nor appropriate. Following are descriptions of TVWD's implementation to date and 5-year benchmarks for these measures.

System-wide leak repair. TVWD's system unaccounted-for water rate is below 10 percent. Since 1999, TVWD has invested more than $200,000 annually to repair water main and service leaks throughout the distribution system. TVWD also budgets approximately $850,000 annually for water line replacement projects.

TVWD also has a policy to adjust the leak portion of a customer's bill, if the customer repairs the leak within 30 days of it being reported. The program is designed to encourage customers to identify and repair leaks in a timely manner.

Benchmark: TVWD will continue its current leak detection and repair and water line replacement program.

Technical and financial assistance. TVWD has developed several financial and technical assistance programs for water system customers. TVWD has partnered with the Energy Trust of Oregon to participate in adding a home water assessment to the current home energy assessment. This service is provided to TVWD residential customers at no charge.

TVWD staff offer and market a water-use audit program for commercial customers. TVWD provides financial assistance to customers with service line leaks by providing a "leak adjustment" to their billing when leaks are detected and repair is documented.

TVWD distributes two kits to homeowners to help them detect leaks and reduce water use. The "Welcome Kit" is offered to all new customers. The "Leak Kit" is distributed through the Field Customer Service Representatives, Customer Service and upon customer request by mail or delivery. These kits help customers identify leaks and other potential reasons for high water bills, such as inefficient fixtures.

The commercial or B.I.G. program includes the following elements:

- Technical assistance and water efficiency incentives for facility and property managers that service lavatories, landscape irrigation systems, production kitchens and cooling towers. In collaboration with commercial customers, conservation staff provides recommendations for improving both outdoor and indoor water conservation, and conducts on-site irrigation assessments at no charge. Staff underscore how conserving water saves money.
- A Weather-Based Irrigation Rebate that offers up to $500 to customers who install weather-based irrigation control devices for their landscapes
- A toilet/flush valve rebate of up to $100 per unit to replace inefficient fixtures

- Customers that participate in the B.I.G. toilet rebate program are provided with free low flow showerheads and faucet aerators
- Production kitchens that use older inefficient pre-rinse spray valves are provided with new efficient models free of charge when they participate in TVWD's free commercial water use assessment program
- Customers may propose capital improvement projects to improve water efficiency and may qualify for assistance with project costs
- A conservation technician speaks regularly to public groups interested in learning about water efficiency in commercial and multi-family settings

  Benchmark: TVWD will evaluate its home water assessment pilot program by 2012, and will determine if the program will be continued or expanded.

  Benchmark: TVWD will continue to promote its B.I.G. program and use it as a platform for influencing large water users to conserve.

Retrofits, replacements, and rebates. TVWD offers commercial and residential rebates for replacement of high-water use appliances and fixtures, and consults with residential and commercial customers to provide resources on product testing and technology.

The commercial program includes a landscape rebate that offers up to $500 to customers who install weather-based irrigation control devices for their landscapes and a toilet/flush valve rebate of up to $100 per unit to replace inefficient fixtures. Marketing of the current commercial rebate program to new participants currently is conducted and staffed by a TVWD Conservation Technician. This marketing is a primary goal of the Conservation Technician, who actively creates and maintains relationships with TVWD business, industry and government customers to conduct indoor and outdoor water assessments. The Conservation Technician also develops proposals to offer rebate funds that assist customers in finding water conservation solutions.

The residential program offers rebates for the purchase of water efficient washing machines, low water use toilets, water efficient dishwashers and a combination of landscape rebates such as lawn aeration, hose bib timers, rain sensors and pressure regulators. These rebates are for the actual cost up to $50. TVWD also offers up to $200 for residential weather-based irrigation controllers.

TVWD has used creative methods to encourage participation in their rebate programs. For example, TVWD has held three Toilet Roundups to promote its toilet rebate program. At this event customers bring their old toilet to TVWD on a weekend day and TVWD staff will recycle the old toilet. This event makes it convenient for the customer to replace an old water-wasting toilet and, therefore, has boosted rebate participation in all three events. Each event has produced an estimated savings of over 1 million gallons of water per year. In 2009, TVWD updated its toilet rebate program, making it tiered and including EPA WaterSense-labeled HET toilets. TVWD plans to continue this tiered rebate program until its next budgeting process, at which point TVWD will investigate the feasibility of providing rebates only for EPA WaterSense-labeled toilets.

In late 2010 or early 2011, TVWD will also evaluate its current fixture giveaway program, which includes showerheads and faucet aerators. TVWD has considered only supplying EPA WaterSense Labeled devices, but this is a moving target because the EPA WaterSense program is continually adding to its list of labeled products. TVWD staff will continue to monitor newly labeled products and services and will maintain flexibility to facilitate their incorporation into its program. TVWD is currently a Promotional Partner of the WaterSense program and urges its customers to look for the label in their purchasing decisions.

TVWD has tracked the number of customers participating in the rebate programs since their inception and based on the response has determined that these programs have been extremely successful. **Exhibit 3-3** summarizes the number of customers who have participated in each program.

Achieving a high level of participation in the commercial rebate program has been challenging. However, customers that have participated in the program are demonstrating significant water savings. For example, an apartment complex replaced 69 toilets, showerheads, and kitchen and bathroom aerators. One year following implementation, this property used 41percent less water than during the same period the previous year.

EXHIBIT 3-3
TVWD Rebate Program Cumulative Participation

Rebate Program (Inception Date)	Number of Rebates Through May 2008
Clothes Washers (May 2002)	6,801
Landscape (March 2004)	3,554
Toilet (November 2005)	690
Dishwasher (November 2005)	769
Weather-Based Irrigation Controller (June 2006)	31
B.I.G. Program (January 2006)	**Number of Rebates Through May 2008**
Toilet/Flush-Valve Rebates	416
Weather-Based Irrigation Rebates	9
Landscape Irrigation Assessments	19
Indoor Commercial Assessments	34

Benchmark: TVWD will develop and investigate measures to evaluate and report on rebate and outreach performance from actual customer meter data.

Benchmark: TVWD will use data from its current residential and commercial rebate program participants to market both programs and attract new participants. TVWD completed its first evaluation of the residential rebate program in 2008 using metered data and will conduct another scheduled residential rebate evaluation in late 2010. TVWD completed a few specific commercial rebate evaluations in 2008 and will complete additional evaluations in 2010. TVWD anticipates conducting future

evaluations of both programs every two years thereafter, in line with its budgeting process.

Benchmark: TVWD will investigate opportunities to promote EPA WaterSense labeled products.

Pilot Programs. TVWD actively looks for opportunities to test new methods and technologies. Various pilot programs have been explored and implemented with the focus on irrigation technology and ET.

Professional Groups. TVWD is very active in professional groups and dedicates much effort and leadership into the promotion of water conservation in the region. Staff belongs to the AWWA PNWS Conservation Committee, RWPC, Tualatin River Watershed Council and is a partner with the EPA WaterSense program. TVWD staff is active in the development of regional conferences and trainings to ensure technical sessions in water conservation are represented. TVWD staff also attends national conferences to learn about new water conservation technologies, marketing, and various other conservation studies, and to network with other industry professionals. Partnerships are one of the best tools in water conservation and these forums promote these relationships and future opportunities.

Customer Service. TVWD's mission is to provide quality customer service. Staff provides assistance to customers with high bills, general conservation questions, and water efficient fixture and device questions

TVWD also hosts various workshops, trainings and presentations. For example, topics include ET, irrigation, soils and seven steps to a water efficient landscape. All customer classes are reached as well as landscape professionals, plumbers, and other trade groups. Getting private businesses involved completes the circle to implementing long term and sustainable change in the landscape and plumbing market.

Benchmark: Continue current efforts to market the use of evapotranspiration to be used in landscape irrigation practices.

Rate structures and billing schedules. TVWD's rate structure is described above. TVWD currently bills customers on a bi-monthly basis. The meter is read, the data are processed and the bill arrives shortly after the reading. This billing schedule provides a balance between the higher administrative cost of more frequent reading and the benefit of providing a connection for the customer between the volume of water used and the cost of water that comes with a more frequent reading cycle.

Benchmark: TVWD will continue its two-tiered inclining block rate structure.

Water reuse and recycling. Wastewater throughout TVWD's service area is conveyed by the Cities of Tigard, Beaverton, and Hillsboro, and CWS wastewater collection systems to regional treatment facilities operated by CWS of Washington County. CWS is an industry leader in developing new and innovative methods for reuse of water conveyed to the treatment facilities. As a regional participant in major water resource projects and the largest water supplier in Washington County, TVWD will continue to support regional efforts to develop water reuse and non-potable water use opportunities.

TVWD has a sustainability program designed to minimize negative effects on the environment and produce positive benefits for society in a cost-effective manner. TVWD created a DVD that is available for other businesses that highlight many of TVWD's sustainability initiatives and actions.

TVWD has developed a rainwater collection system that captures 6,500 square feet of surface run-off from the roof of TVWD's offices and stores it in a 40,000-gallon storage tank. Rainwater is collected, filtered and disinfected by an ultraviolet disinfection system, and then used to supply water for flushing toilets and urinals throughout the building. The system reduces the amount of potable water required for flushing by more than 60 percent. In the field and office, TVWD is constantly looking for ways to be sustainable. For example, old bicycle tires full of sand are used to divert water when hydrants are flushed, and old hydrant parts are re-used for future repairs.

Finally, the B.I.G. program encourages business and industrial customers to recycle, reuse and reduce their water consumption. TVWD staff has ongoing relationships with 6 out of its 10 largest water consumption customers.

> *Benchmark*: Develop opportunities to work with B.I.G. customers that will encourage re-use, recycling, and water conservation and water efficiency.

City of Tigard

Following is a description of the current status of Tigard's conservation programming.

Water Use Measurement and Reporting

The City of Tigard has a water use measurement and reporting program that complies with the measurement standards in OAR Chapter 690, Division 85. The city has a meter at each well and records its water use. Purchased wholesale water entering the Tigard system is metered by the supplying entity or by Tigard. The city's water use records can be found on the OWRD webpage (http://www.wrd.state.or.us/OWRD/WR/water_use_report.shtml).

Conservation Highlights

The City of Tigard has implemented a variety of conservation measures and plans significant program enhancements over the next several years. Highlights include the following:

- Tigard provides a variety of water conservation education programs to its customers. The city also participates in and takes maximum advantage of regional and sub-regional conservation education opportunities.
- Tigard conducts an annual meter test for all meters 3-inches in diameter and greater. Water meters not recording within the manufacturer's specifications are repaired in field or replaced as needed.
- Tigard distributes both indoor and outdoor conservation kits to residential customers, and is considering offering indoor and outdoor audits to these customers as well.

- Since 2002, Tigard's Landscape Reimbursement Program has focused on reducing peak-season demand by providing rebates for outdoor water-efficiency measures. The city will also begin a high-efficiency toilet rebate program in early 2009 and is considering implementation of various other rebate programs over the next several years.
- Tigard reduces peak-season demand on limited and environmentally-sensitive water supplies by using ASR to help meet peak-season demands.
- Tigard's adopted budget includes, as an anticipated one percent per year reduction in per-capita consumption for the next 10 years. Actual total per-capita use figures for the past 5 years decreased by 18 percent from 125 to 103 gpcd (about 4 percent annually).

Conservation Measures Required of All Suppliers

OAR 690-086-0150(4) requires all municipal water suppliers to implement a particular set of conservation measures. The following paragraphs present descriptions of Tigard's implementation to date and 5-year benchmarks for these measures.

Annual water audit. The City of Tigard conducts an annual calendar-year water audit. The audit compares annual billed consumption to annual system demand. The city also uses the International Leak Index to track system leakage.

> *Benchmark*: Tigard will continue to conduct annual water audits and to track system leakage.

Metering. The City of Tigard is fully metered.

> *Benchmark*: Tigard will continue to meter all new connections.

Meter testing and maintenance. Tigard's water meter maintenance and replacement program is focused on large meters (3-inch or larger diameters), which are associated with high water use. This approach yields the greatest conservation cost/benefit ratio. The city conducts annual in-field testing and repair for these meters (approximately 42 per year). These tests are conducted by an outside contractor using certified personnel and testing equipment. All data are tracked using a computer management maintenance system. Water meters not recording within the manufacturer's specifications are repaired in the field or are replaced as needed.

Smaller meters are inspected during meter reading every two months, and are replaced if determined to be inoperable. The city annually budgets for replacement of a number of smaller meters identified by manufacturer or age as likely to need replacement.

> *Benchmark*: Tigard will continue its current meter testing and maintenance program. Tigard will seek to increase the funding to replace inaccurate or inoperable meters.

Portland General Electric (PGE) is retrofitting all of its electric meters with "smart" meters with wireless flex-net connections. Other utilities may be able to install meters that are compatible with PGE's system. (All of the meters installed by the city since 2000 are compatible and easily adaptable to the PGE system.) The city is negotiating with PGE regarding partnering with the utility company in this process, which would allow the city to provide real-time monitoring by customers and the city of water use, time of use, error and

malfunction of meters, and tampering. This would also allow the city to move to monthly billing. If negotiations are successful, the city will develop a pilot program to study the concept and resolve identified issues, such as ensuring separate metering access. After the pilot program is complete, the city will be able to formulate an efficient and effective plan including funding, scope, and schedule.

Rate structure. Tigard's rate structure is based on the quantity of water consumed through metered connections.

> *Benchmark*: During the next fiscal year, Tigard will conduct a rate study that will evaluate rate structures intended to encourage water conservation. The results of the study and recommended actions will be presented to the City Council.

Leak detection. Tigard monitors water audit results on the basis of a five-year running average. City policy is to begin leak detection measures if the average exceeds 10 percent. Based on the most recent Water Audit Report (February 2008), the current 5-year average is 4.5 percent. Visual leaks reported by the general public or public works personnel are investigated. Minor and major leaks are repaired immediately.

> *Benchmark*: Tigard will continue the current leak detection program as described.

Public education. Tigard's conservation program includes a significant public education element. The youth education program is composed of a wide variety of activities, including in-class presentations, videos, interactive games, performances, funding for the Clean Water Festival and an annual water conservation poster contest, which is used in developing a conservation calendar.

In 2006-2007, over 1,600 students were reached through a combination of 40 assemblies and classroom presentations. The conservation program is budgeted to sponsor one free show per elementary school in the water service area. There are two shows offered for this school year, one geared to first and second graders, and one geared to fourth and fifth graders. Both of these are developed and coordinated under the auspices of the RWPC.

The conservation poster contest was introduced to the schools in 2001 with the first calendar published for the year 2002. The calendar is designed in-house by the Tigard conservation coordinator using the 14 winners of the poster contest (12 months plus cover and back). In addition to the art work, the calendar is filled with conservation tips and facts. In 2001, 75 entries were received. The popularity of this event has increased, and 525 entries were received for the 2008 calendar. Calendars are available at the Library, City Hall, and the Public Works Building, and can be requested on Tigard's website. They are also handed out at events and during presentations.

The conservation coordinator participates every summer in the Tigard Balloon Festival. The coordinator provides a display of conservation information and/or a related activity, as well as program promotions. This is one of the best opportunities to talk with Tigard residents about conservation issues. The conservation program provides staff and materials, as needed, for other events as well.

Tigard's website contains seasonal conservation articles, indoor/outdoor conservation tips, a description of educational tools available to schools/teachers, instructions on how to water one inch per week, a FAQ section, a downloadable application for the reimbursement

program, and an information request form where people can request materials such as kits, calendars or information regarding water conservation as well as water quality.

Water conservation displays are set up at the Tigard Library and Public Works Building. These seasonal displays provide informational brochures depending on the time of the year. During peak water use times, brochures on the reimbursement program and outdoor water conservation tips are available. During the wetter months, the conservation calendar and indoor conservation information are available.

The conservation program has produced a utility bill insert to teach customers the importance of water conservation throughout the summer.

The city has implemented a voluntary "one inch per week" watering schedule during peak summer months. This is done though advertising on the city's website, articles in the monthly newsletter Cityscape and customer contact at public events such as the Balloon Festival and Yard, Garden and Patio show. The conservation program supplies rain gauges to measure the amount of rain and estimate water sprinkler output.

> *Benchmark*: Tigard will continue to use a variety of methods to provide water conservation information to the public. The city will continue sponsoring existing contests and will explore opportunities to conduct additional customer contests, both among customers and in schools, to encourage creative water conservation.

Additional Conservation Measures

OAR 690-086-0150 (6) requires municipal water suppliers serving a population greater than 7,500 to implement an additional set of conservation measures or to provide documentation showing that implementation of the measures is neither feasible nor appropriate. The following present descriptions of Tigard's implementation to date and 5-year benchmarks for these measures.

System-wide leak repair. Despite the fact that its system unaccounted-for water rate is under 10 percent, Tigard currently is conducting various programs to reduce unaccounted-for water within the distribution system. Several leaks have been identified and corrected through this program, which has been effective in reducing system water losses. These programs include small pipe replacement, blow-off assembly replacement, and water audit tracking of progress within the various programs.

Tigard also has a policy to adjust the leak portion of a customer's bill, if the customer repairs the leak within 10 days after being notified of the leak. The program is designed to encourage customers to identify and repair leaks in a timely manner.

> *Benchmark*: Tigard will continue the current system-wide leak repair program to maintain less than 10 percent unaccounted-for water. The city will implement new cost-effective programs to reduce unaccounted-for water as they are identified.

Technical and financial assistance. Technical assistance is provided to all customers and rate classifications that encourages and assists residential, commercial and industrial customers in implementing water conservation measures. Conservation kits for both indoor and outdoor water conservation are offered to residential customers.

The kits are available year round and are free to the residents of the Tigard water service area. They are permanently advertised on the library display board, on the information board of the Public Works Building and on the Water Division's website. Occasionally an article is written for Tigard's newsletter, Cityscape, reminding residents to take advantage of this opportunity, especially during the summer. In 2007 an article was written in the Tigard Times, which elicited much public feedback.

The indoor kits contain toilet fill cycle diverter, an Earth Massage ™ Showerhead, a shower timer, a bathroom faucet aerator, a kitchen faucet aerator with swivel, Teflon tape, and leak detection dye tablets.

Outdoor conservation kits include a hose nozzle, two watering gauges, wildflower seeds, and brochures on selecting a landscape and/or irrigation contractor, maintaining a healthy lawn and more.

> *Benchmark*: Tigard will continue to provide technical assistance to residential and multi-residential customers, which account for the majority of the city's water use. During the next five years, the city also will investigate opportunities to provide technical assistance to commercial and industrial customers, and offering residential irrigation audits to be conducted by the Conservation Coordinator.

Retrofits and replacement. The Landscape Reimbursement Program started in the spring of 2002. The main purpose of the program is to reduce peak summer demand and improve outdoor watering efficiency. A new brochure is printed each fiscal year to reflect any changes and to update when applications are due. Qualifying products and services include rain sensors and switches, drip irrigation, hose timers, and lawn aeration. Each category qualifies for a $25 water bill credit, with a maximum credit of $50. **Exhibit 3-4** illustrates the increasing popularity of the program and the number of reimbursements issued per year.

EXHIBIT 3-4
Summary of Applications and Reimbursements for the Landscape Reimbursement Program

	FY 05/06	FY 06/07	FY 07/08
Total Applications[1]	**31**	**101**	**413**
Type of Purchase			
Core Aeration	19	81	391
Drip Irrigation	17	11	23
Hose Timers	6	20	33
Rain Sensors	12	5	5
Low Water Use Plants	9	77	
Upgrade Irrigation Controller		8	

[1] Each application could request reimbursement for up to two qualifying products.

Tigard has recently implemented a reimbursement program for residential customers who replace existing toilets with high efficiency toilets. The reimbursement provides a $75 credit on the customer's water bill for each toilet replaced, up to a total of $150 (two toilets).

> *Benchmark*: Tigard will continue to offer the above-described reimbursements. Tigard will evaluate the current program to determine its effectiveness. During the next five years, Tigard will retrofit the remaining public facilities, such as public park restrooms, and will investigate a program to retrofit multi-family buildings. These programs could include both indoor and outdoor fixtures. During the next five years, Tigard also will explore the effectiveness of a program to offer reimbursements to restaurants that install water efficient pre-rinse spray valves.

Rate structures and billing schedules. Tigard has adopted a rate structure that encourages water conservation by setting rates per water customer classification and metered water use.

> *Benchmark*: During the next fiscal year, Tigard will conduct a rate study that will evaluate rate structures intended to encourage water conservation. The results of the study and recommended actions will be presented to the City Council. Tigard will also evaluate the opportunity to develop a program of providing information/messages on water bills to encourage water conservation.

Water reuse and recycling. Tigard's ability to reuse treated water is subject to the authority of Clean Water Services, which strongly supports reuse and is currently the largest provider of reuse water in Oregon. The Durham Advanced Wastewater Treatment Plant in Tigard produces Level IV treated wastewater providing 0.5 mgd of irrigation water to 215 acres of turf located in Tigard, Durham and King City. The facilities served include playing fields at Tigard High School and Durham Elementary School, Tigard's Cook Park, Summerfield Golf Course, King City Golf Course, and Tualatin Country Club's golf course.

Tigard has investigated using reclaimed water for other uses, but Clean Water Services has been unable to provide this reclaimed water because of its need to meet instream water right flows during the peak irrigation season. Clean Water Services uses most of its highly treated wastewater to add critical flow in the Tualatin River during late summer and fall, sometimes accounting for as much as 40% of the river's flow needed for water quality and wildlife habitat. As a result, any expansion of reuse would need to consider the impact on instream flow for the Tualatin River. A preferred strategy would be to provide reuse water through a water rights exchange, such as with golf courses, to mitigate irrigation withdrawals from the river or tributaries.

The City of Tigard has been exploring additional reuse and non-potable water supply opportunities. In response to public interest, Tigard evaluated use of rainwater catchments and found that while useful for stormwater runoff mitigation and habitat enhancement, rainwater catchments are unlikely to reduce water demand during the peak season of water use. In addition, Clean Water Services and the City of Tigard are currently engaged in a study, partially funded by OWRD, to evaluate possibilities for additional reuse within Tigard city limits. The study is not yet complete.

> *Benchmark*: Tigard will continue to forward customer and business inquiries on water reuse and recycling to Clean Water Services. The city will provide the public with information about rainwater catchment systems.

Other identified conservation measures. Since 2001, Tigard has used ASR (Limited License #005) to supplement water supply by using winter excess water for underground storage. This underground stored water supply is recovered during the summer water use period to lessen the peak demands on available regional water supply.

> *Benchmark*: Tigard will continue use of ASR to supplement peak season water supply.

SECTION 4

JWC Curtailment Plans

Introduction

Curtailment planning is the development of proactive measures to reduce demand during water supply shortages. Shortages may be due to prolonged drought, or system failure resulting from unanticipated events including catastrophic events (e.g. flooding, landslides, earthquakes, and contamination), mechanical or electrical equipment failure, or events not under control of the JWC (e.g. localized or area-wide power outages and intentional malevolent acts.)

The JWC currently has a curtailment plan that was developed in 2001. JWC, however, recognizes that this curtailment plan needs to be modified to meet OWRD's current rules. Further, given the unique nature of the JWC and its member agency relationships, each member should also have its own individual curtailment plan since the JWC does not have direct authority to regulate member agencies. The objective of this curtailment plan is to create a process by which JWC will do the following:

- Present member agencies with information about the status of storage and supply
- Provide a forum for negotiation of alternative supply sources between JWC members
- Coordinate unified public messaging related to curtailment and conservation measures and requirements

Ultimately, on-the-ground curtailment triggers will be delegated to and implemented by the individual member agencies.

Each JWC agency has provided its individual curtailment plan as presented below. The individual plans are based on their specific water system characteristics, such as varying customer category objectives and alternate supply options. Each of these plans was also developed to meet OWRD's requirements for curtailment event triggers (OAR 690-086-0160 (3)) and curtailment stages (OAR 690-086-0160 (2)).

History of System Curtailment Episodes

690-086-0160 (1)

Summary of 2001 Drought

The JWC experienced its first water shortage in the summer of 2001. As previously described, JWC is generally regulated off its natural flow rights on the Tualatin River beginning in late May to early June until mid-October in an average year (described in more detail in Section 2, Water Rights). JWC relies primarily on stored water releases from Scoggins Dam (Hagg Lake) and Barney Reservoir during this period.

For the first time since 1977, Scoggins Dam (Hagg Lake) did not fill in 2001, but reached only 54 percent of the storage capacity. Several JWC member agencies (Hillsboro, Beaverton, and Forest Grove) hold contracts with the Bureau of Reclamation (BOR) for the use of stored water in Scoggins Dam (Hagg Lake) that specify curtailment measures. All of the BOR contracts state that 2,500 acre feet of water will be reserved for natural or minimum flow during water shortage events. All BOR contracts specify that:

> The quantity of water to be furnished for irrigation and water quality control shall first be reduced as necessary but not by greater than 15 percent. Any further reduction in the project water supply shall be shared among the remaining entities receiving a water supply from the project in the proportion that the entity's water entitlement under the BOR contract bears to the total quantity of the project water under contract.

Because of the conditions of the contracts, the cities of Hillsboro, Beaverton, and Forest Grove and the Lake Oswego Corporation received only about 76 percent of their normal water allocations from Scoggins Dam (Hagg Lake) in 2001. Clean Water Services and Tualatin Valley Irrigation District received only 27 percent and 47 percent, respectively, of their normal water allocations. Discharge changes at Scoggins Dam were made twice a day, seven days a week to closely match the timing of water orders, avoid waste, and maintain natural flow in the Tualatin River.

In the same year, Barney Reservoir only reached 55 percent of its storage capacity. The Barney Reservoir Joint Ownership Commission (Hillsboro, Forest Grove, Beaverton, TVWD, and CWS) decided to hold 4,000 acre-feet of Barney Reservoir water in reserve in case dry conditions continued into 2002. After accounting for dead pool storage and releases for fish flows to the Trask River (15 percent of the available storage), the Barney Reservoir member agencies were allotted only 54 percent of their normal full pool allocations.

JWC Response to 2001 Drought

Since JWC provides the primary water supply to Hillsboro, Forest Grove, and Beaverton, these communities faced a moderate to severe shortage in late spring and early summer of 2001. Tualatin Valley Water District (TVWD) and Tigard were able to meet their needs through their alternative water supply sources. Forest Grove also relied more heavily on their own water treatment plant to split their demands through the JWC and their own alternative water supply. TVWD purchased additional water from the Portland Water Bureau during the storage release season. This decision allowed Hillsboro, Forest Grove, and Beaverton to rely on the remaining storage capacity available to meet their reduced water demands.

The JWC chose to present a unified message to all Washington County in order to avoid customer confusion and to promote cooperative efforts for curtailment and voluntary conservation messaging. At the beginning of the summer, it was unclear how severe the shortage would become. JWC member agencies wanted to make their customers aware of the potential crisis without causing undue alarm. The JWC partners quickly convened a team to create consistent and concise message in a variety of formats.

The marketing campaign included billboards, radio traffic spots that passed on conservation tips, discount coupons for a local car wash that recycles water (Kaady Car Wash),

newspaper articles, weekly newspaper ads with "Water Wise Tips of the Week," and posters and brochures at agency reception centers. JWC also promoted voluntary conservation at various community events throughout the county, such as Tuesday Markets, Tualatin Watershed Festival, Washington County Fair and Taste of Beaverton.

Because of the effectiveness of the JWC's curtailment marketing campaign and customers' implementation of voluntary conservation measures, severe water use curtailment measures and mandatory curtailment were never required. This effort helped decrease demand for JWC source water by 7.5 percent and, most importantly, none of the JWC members ran out of water. JWC received an award for this successful joint campaign from the American Water Works Association.

Short-term Supply Deficiencies

The JWC has not experienced short-term supply deficiencies, even when power disruption or facility breakdowns have occurred. These deficiencies have been avoided primarily due to the large storage capacity of the system's reservoirs.

Curtailment Event Triggers

690-086-0160 (3)

Curtailment Event Triggers. Events causing the JWC Curtailment Plan to be activated would include but not be limited to the following:

Stage 1: Short-Term Supply Disruption

- Mechanical or electrical malfunction of critical pumping facilities at the JWC's intake or water treatment plant.
- Interruption of local utility electrical service for a period of time.

Stage 2: Pending Drought Conditions

Abnormal weather conditions during the storage season, or other reasons, make it unlikely that Barney Reservoir and Scoggins Dam (Hagg Lake) will fill to their full capacities preceding the peak summer supply season.

Stage 3: Drought Conditions During Release Season

- Barney Reservoir and Scoggins Dam (Hagg Lake) did not fill to their full capacities prior to the release season.
- Existing storage will not meet peak season demand.
- Declaration of a drought for Washington County by the governor pursuant to ORS 536.720.

Stage 4: Extreme Supply Disruption

- Catastrophic natural disaster that damages individual critical facilities and/or lifelines or extensive portions of the JWC's transmission system.

- Terrorist act perpetrated on any of the JWC's critical facilities, storage reservoirs, or source water.

During non-peak demand periods, curtailment is unlikely unless a catastrophic natural disaster impacts multiple elements of the JWC's source of supply. Absent a trigger of this magnitude, the JWC is well-positioned to meet its non-peak season customer demands for the following reasons:

- Fern Hill Reservoir 1 was seismically upgraded with 20 million gallons of storage available.
- The JWC seismically hardened its Fern Hill Reservoir 2 during construction providing an additional 20 million gallons of storage (for a total of approximately 40 million gallons of storage).
- The existing JWC water treatment plant will be seismically upgraded during the next phase of treatment plant expansion.
- The near-term treatment plant expansion will be designed and constructed to meet the most stringent earthquake design codes.
- Each JWC member agency is required to have 3 days of average day demand in finished water storage in the JWC and their distribution system. Enacting curtailment measures could extend this supply.
- If the JWC is unable to use water from the Tualatin River, the JWC member agencies can use intersystem connections with the Cities of Portland and Lake Oswego. The Cities of Hillsboro and Forest Grove also maintain their own water treatment plants and facilities in the upper Tualatin basin that could supply a small portion of their demands. Beaverton, Tigard, and TVWD maintain emergency groundwater supplies. Further, Beaverton and Tigard can use water stored as part of their aquifer storage and recovery programs.
- Existing firm pumping capacity of JWC's intake and water treatment plant exceed its annual average day demands.
- The Regional Water Provider's Consortium is currently working on a regional interconnections feasibility study. Construction of new interconnections could provide JWC access to additional back-up supplies during emergencies.

Curtailment Stages

690-086-0160 (2)

The JWC will provide water supply status information, a forum for negotiating alternative sources of supply between JWC members and other regional water providers, and coordinated public messaging and outreach, as further described below. In addition, each JWC agency will be required to initiate and implement the progressive stages of their individual curtailment plans based on status of supply, projected demands, and alternative sources of available supply.

The JWC has had an emergency response plan (ERP) since February 2003. The ERP clarifies the different roles of the incident command system that must be coordinated during emergency response and recovery. The ERP provides checklists of response activities for a wide variety of incidents, as well as information on average day and peak day demands of each JWC partner agency and capacities of emergency back-up supplies.

The 2008 ERP update greatly expanded the staff contact list for all the partner agencies, and organized them by area of expertise. It is within a highly usable stand-alone packet that contains the most important and useful information needed when an emergency first strikes. Its small size makes it ideal for both ease of use and distribution to operations, management, and administration personnel.

JWC has reviewed and approved the draft JWC Curtailment Plan contained in this WMCP. The JWC Curtailment Plan will be officially adopted after the WMCP is approved by OWRD.

The following describes the on-going notification activities, actions before a potential water shortage, and actions during a drought or other water shortage.

Ongoing Notifications. The JWC notifies its member agencies of the status of storage in Barney Reservoir and Scoggins Dam (Hagg Lake) periodically throughout the storage season. JWC provides its member agencies storage curves for both reservoirs at the semi-monthly JWC Operations Committee meetings and the quarterly JWC Board meetings.

Before each release season, JWC provides the storage allocations to each member agency that owns storage in Barney Reservoir, has a contract with the Bureau of Reclamation in Scoggins Dam (Hagg Lake), or has a lease agreement with another JWC member agency. Each JWC member agency also provides their projected peak season demand to the JWC.

During the release season, each JWC agency is required to forecast the amount of water that they will need within the next 12- to 24-hour period. Each agency requests that JWC release water from their allotted storage. JWC provides Weekly Release Reports to the member agencies that include the previous week's daily releases, the allotments charged to each member agency, status of remaining storage, and efficiency of capture of stored water. The frequent distribution of the release reports has made them a valuable resource for storage and release tracking and has helped increase the efficiency of stored water releases in relation to customer demands.

Stage 1: Short-Term Supply Disruption

During a short-term supply disruption, the JWC will take the following actions.

- The JWC will notify the member agencies of the expected duration of the event and available finished water in storage.
- The JWC will request projected water demands from each member agency.
- The JWC may request member agencies to implement their individual curtailment plan at a stage that will reduce demand if finished water in storage will not meet the duration of the event.

Stage 2: Pending Drought Conditions

If the JWC determines that the storage reservoirs may not fill before the release season, the JWC will take the following actions.

- The General Manager will inform the Operations Committee and the Management Committee no later than March 1 of the potential water shortage.
- The JWC Events and Education Committee (EEC) will convene to prepare conservation and curtailment messages shortly after notification of the potential water supply shortage.
- The JWC will contact the Bureau of Reclamation to determine the levels of water supply and confirm the reduction schedules for each JWC member agency with contracted water in Scoggins Dam (Hagg Lake).
- The JWC will issue notices of the current storage levels and potential shortages in each member agency's allotment twice every month until the release season begins.
- The JWC Management Committee and/or Executive Committee will convene an emergency meeting to discuss and negotiate alternative water supply sources between member agencies.
- The JWC will issue notifications to each JWC member agency to prepare for the appropriate curtailment scenarios authorized by their individual plans based on the percentage of water available from the JWC to each member agency.
- The JWC EEC will provide a summary and schedule of the proposed cooperative public outreach campaign and schedule to the Operations and Management Committees for review and approval. JWC maintains an emergency communications budget, but each agency may be requested to provide additional funds for the anticipated public outreach campaign.
- Shortly before the release season is anticipated to begin, the JWC EEC will work with local newspapers to issue articles describing the potential water supply shortage and encouraging voluntary conservation measures.
- Shortly before the release season is anticipated to begin, the JWC EEC will post the water supply shortage notice and press release on the JWC website and each JWC member agency's websites.

Stage 3: Drought Conditions During the Release Season

If the storage reservoirs do not fill before the release season or JWC determines that remaining storage will not meet peak season demand, or the Governor declares a drought for Washington County, JWC will take the following actions.

- JWC will provide Weekly Release Reports to the member agencies including the previous week's daily releases, allotments charged to each member agency, status of remaining storage, and efficiency of capture of stored water.

- JWC will inform each member agency of their percentage of supply available from the JWC and request implementation of their individual curtailment scenarios appropriate to their agency and system supply percentages.
- JWC EEC will initiate the full cooperative public outreach campaign at the beginning of the release season including, but not limited to billboards, radio traffic spots, signage, local business partnerships, and weekly "Water Wise Tips" advertisements in local newspapers.

Stage 4: Extreme Supply Disruption

After an extreme event such as a severe natural disaster (earthquake, flooding, landslides, etc.) or terrorist act, JWC will take the following actions.

- JWC will initiate the JWC DOC (Department Operations Center) and Hillsboro EOC (Emergency Operations Center) within the Incident Command System.
- JWC will notify the member agencies of the status of supply.
- JWC will complete a damage assessment as soon as possible and provide the critical facility damage information to member agencies and Hillsboro EOC. Resources will be requested through the Hillsboro EOC.

JWC member agencies are participating with the Regional Water Providers Consortium in the development of an Emergency Drinking Water Distribution Plan that will incorporate several elements of supply options for our customers after an extreme event. JWC recently purchased an Emergency Water Distribution System that can be used in such an event and is coordinating with the other six systems that were purchased in the region with Urban Areas Security Initiative grant funding. Other supply options include encouraging the public to maintain 72 hours of emergency water supply in their homes, bottled water agreements, participating in and implementing the Oregon Water/Wastewater Agency Response Network mutual aid agreements, mobilizing the regional Emergency Water Distribution System, and seeking federal aid from the Federal Emergency Management Agency and the National Guard.

Authority

Actions under Stages 2 through 4 of this plan may be initiated only after a declaration of emergency by the General Manager of the JWC.

Plan provisions will remain in effect until the emergency is declared ended by the General Manager. The General Manager is responsible for execution of the plan provisions once an emergency has been declared.

JWC Member Agencies

Each JWC member agency is required to have a curtailment plan prepared that meets the state's requirements under OAR 690-086-0160. The JWC expects each agency to implement

the appropriate curtailment stages to reduce their demand to the allotments available during the drought or emergency scenario.

City of Hillsboro Curtailment Plan

This section satisfies the requirements of OAR 690-086-0160

Introduction

The City of Hillsboro's water source is essentially the same as the JWC's water source so the city's curtailment planning will be intrinsically linked to JWC curtailment. While the JWC curtailment plan creates processes for coordination, negotiation and public education, the city's curtailment plan establishes measures to reduce on-the-ground water demand.

Hillsboro is well positioned to supply non-peak water demands absent a major disaster. Thus, this curtailment plan will focus on supply constraints during the peak season and during an emergency event. Triggers have been identified (such as equipment malfunctions, infrastructure damage and supply-limiting events) for five different curtailment stages. Next, specific actions to reduce demands, voluntary and mandatory, are described for each curtailment stage.

The City of Hillsboro operates two separate retail systems: City of Hillsboro service area; and the Upper System service area. Hillsboro also serves three wholesale customers: LA Water Cooperative; and the Cities of Cornelius and Gaston. The retail systems and wholesale customers are served by two different surface supply treatment facilities, but are interconnected for emergency and back-up supply alternatives. The Upper System retail system, the LA Water Cooperative, and the City of Gaston are served primarily from the Cherry Grove slow sand filter plant in the upper Tualatin River. The JWC water treatment plant serves as the sole source of supply for the City of Hillsboro retail system and the City of Cornelius. The JWC can also serve the LA Water Cooperative and the City of Gaston for emergency purposes and during high turbidity events that may impact the slow sand filter plant.

Because these two systems have separate treatment processes and points of diversions, one of the supply systems may be impacted by curtailment conditions while the other system does not require curtailment to satisfy existing water demands. The city may enact curtailment actions for the systems separately or in combination, depending on the nature of the event and the capacity of supplies. Wholesale customers are required to adhere to the city's curtailment actions as stipulated through their wholesale contracts.

History of System Curtailment Episodes

OAR 690-086-0160 (1)

Within the last decade, the City of Hillsboro has experienced a water shortage resulting from a constrained source of supply from the drought conditions that occurred in 2001.

2001 Drought Summary: The JWC experienced its first water shortage in the summer of 2001. As previously described, JWC is generally regulated off its natural flow rights on the

Tualatin River beginning in late May to early June until mid-October in an average year (described in more detail in Section 2, Water Rights). JWC relies primarily on stored water releases from Scoggins Dam (Hagg Lake) and Barney Reservoir during this period.

For the first time since 1977, Scoggins Dam (Hagg Lake) did not fill in 2001, but reached only 54 percent of the storage capacity. Several JWC member agencies (Hillsboro, Beaverton, and Forest Grove) hold contracts with the Bureau of Reclamation (BOR) for the use of stored water in Scoggins Dam (Hagg Lake) that specify curtailment measures. All of the BOR contracts state that 2,500 acre feet of water will be reserved for natural or minimum flow during water shortage events. All BOR contracts specify that:

> The quantity of water to be furnished for irrigation and water quality control shall first be reduced as necessary but not by greater than 15 percent. Any further reduction in the project water supply shall be shared among the remaining entities receiving a water supply from the project in the proportion that the entity's water entitlement under the BOR contract bears to the total quantity of the project water under contract.

Because of the conditions of the contracts, the cities of Hillsboro, Beaverton, and Forest Grove and the Lake Oswego Corporation received only about 76 percent of their normal water allocations from Scoggins Dam (Hagg Lake) in 2001. Clean Water Services and Tualatin Valley Irrigation District received only 27 percent and 47 percent, respectively, of their normal water allocations. Discharge changes at Scoggins Dam were made twice a day, seven days a week to closely match the timing of water orders, avoid waste, and maintain natural flow in the Tualatin River.

In the same year, Barney Reservoir filled to only 55 percent of its total storage capacity. The Barney Reservoir Joint Ownership Commission (Hillsboro, Forest Grove, Beaverton, and TVWD) decided to hold 4,000 acre feet of Barney Reservoir water in reserve in case dry conditions continued into 2002. After accounting for dead pool storage and releases for fish flows to the Trask River (15 percent of the available storage), the Barney Reservoir member agencies were allotted only 54 percent of their normal full-pool allocations.

Because of the effectiveness of the JWC's curtailment marketing campaign and customers' implementation of voluntary conservation measures, severe water use curtailment measures and mandatory curtailment were never required. This effort helped decrease demand for JWC source water by 7.5 percent and, most importantly, none of the JWC members ran out of water. JWC received an award for this successful joint campaign from the American Water Works Association. The JWC WMCP Chapter 4 Summary contains additional information on the JWC's curtailment marketing campaign.

Curtailment Event Triggers

OAR 690-086-0160 (3)

During non-peak demand periods, curtailment triggers are unlikely to be met unless a catastrophic natural disaster impacts multiple elements of the city's source of supply. Absent a trigger of this magnitude, the city is well-positioned to meet its non-peak season customer demands for the following reasons:

- The JWC's Fern Hill Reservoir 1, with 20 million gallons of storage available, was seismically upgraded in 2006.
- An additional 20 million gallons of storage (for a total of 40 million gallons of storage) was provided with the construction of JWC Fern Hill Reservoir 2 in 2006. The construction included seismic hardening.
- Hillsboro is required to have 3 days of average day demand (ADD) in finished water storage in the JWC and local distribution system. Enacting curtailment measures could extend this supply.
- If the JWC is unable to use water from the Tualatin River, Hillsboro maintains its own water treatment plant and facilities in the upper Tualatin basin that could supply a small portion of Hillsboro's Upper System and wholesale customer water demand.

During the peak summer demand period from June through September when the system is operating at or near its maximum capacity, interruption of supply due to natural disaster, mechanical failure, terrorist act or loss of source could present significant challenges to the city. Therefore, the following triggers and related curtailment stages in this curtailment plan are based primarily on events occurring during this time period. In addition, less critical impacts to the water supply such as forecasted drought, and minor mechanical or electrical failures are addressed in Stages 1, 2 and 3.

Curtailment Stages

OAR 690-086-0160 (2)

This curtailment plan for City of Hillsboro is designed to be initiated and implemented in progressive stages.

The city's curtailment plan has five distinct stages, as shown in **Exhibit 4-1**, each of which is triggered by one or more of the listed events:

EXHIBIT 4-1
City of Hillsboro Water Use Curtailment Plan Stages 1 through 5

Curtailment Stages	Initiating Conditions
Stage 1 Temporary Water Shortage Alert (Short Term Voluntary)	Interruption of local utility electrical service affecting water treatment and distribution; Minor mechanical or electrical malfunction in pumping facilities or treatment plant; or Minor damage to raw or treated water transmission mains (e.g., leaking joint requiring repair).
Stage 2 Long-Term Water Shortage Alert (Preparing for Long Term Voluntary)	Forecasts of below-normal levels of stored water in Barney Reservoir and Scoggins Dam (Hagg Lake) may fall below projected peak season demand. Forecasts of drought conditions for the peak season.

EXHIBIT 4-1
City of Hillsboro Water Use Curtailment Plan Stages 1 through 5

Curtailment Stages	Initiating Conditions
Stage 3 Serious Water Shortage (Long Term Voluntary)	Forecasts of below-normal levels of stored water in Barney Reservoir and Scoggins Dam (Hagg Lake) (storage supply at or below 90 percent of projected peak season demand); or Mechanical or electrical malfunction or other incident requiring more extensive repairs of pumping facilities, treatment plant or water transmission mains.
Stage 4 Severe Water Shortage (Long Term Mandatory)	Declaration of drought by Governor pursuant to ORS 536.720; Forecasts of below-normal levels of stored water in Barney Reservoir and Scoggins Dam (Hagg Lake) (storage supply at or below 80 percent of projected peak season demand); Any event causing the Hillsboro slow sand filter plant to be out of service for an extended period beyond the storage at the plant (7 to 15 days); or Multiple failures in the pumping facilities, treatment plant or transmission mains.
Stage 5 Critical Water Shortage (Short Term Critical Mandatory Restrictions)	Extensive damage to transmission, pumping or treatment processes caused by natural disaster; Forecasts of below-normal levels of stored water in Barney Reservoir and Scoggins Dam (Hagg Lake) (storage supply at or below 70 percent of projected peak season demand); or Intentional acts, fire, contamination of source or any other event resulting in an immediate, sustained deprivation of water supply.

Authority

The Utilities Commission will be responsible for the actions and implementation of Stages 1, 2 and 3 with frequent updates to the City Manager and City Council. Before implementing Stages 4 or 5, the Utilities Commission will notify and make a recommendation to the Mayor and/or City Council regarding the appropriate curtailment action. Actions under Stages 4 and 5 of this plan may be initiated only after a declaration of emergency by the Mayor, City Council, or appropriate successor as outlined in the city's Emergency Response Plan.

Plan provisions will remain in effect until the emergency is declared ended by the initiating party, provided that the Mayor or City Council may rescind an emergency declaration issued by staff or another party upon a finding by the Utilities Commission that demonstrates the emergency no longer exists, or that the original declaration was made in error.

Curtailment measures may be applied to the entire system, or only to water use sectors, and/or in geographic areas, which are directly impacted as determined by the Utilities Commission and the City Manager. Specifically, different restriction levels may be placed

upon the Upper System depending on the nature, severity, and location of the initiating conditions.

The City Manager and Utilities Commission are responsible for execution of the plan provisions once an emergency has been declared.

Curtailment Plan Implementation and Enforcement

OAR 690-086-0160 (4)

In implementing this curtailment plan, the Utilities Commission will work closely with the JWC and other member agencies to assure consistent approaches to dealing with water shortages by coordinating stage designations, public notices, press releases, and other outreach activities.

Stage 1: Temporary Water Shortage Alert

After notifying the City Manager, the Utilities Commission will activate a Temporary Water Shortage Alert to inform customers of the need for voluntary, temporary reductions in consumption. This will occur when the Stage 1 triggers are met as described in Exhibit 4-1.

Stage 1 Temporary Water Shortage Alert requests for short-term voluntary reductions will be made if the Utilities Commission determines that finished water storage at the JWC or in the distribution system may not meet projected demands due to the events described in Exhibit 4-1 Stage 1.

Stage 1 public information program elements would include:

1. The Utilities Commission shall issue a general request for voluntary reductions in water use by all water users. The request will include a summary of the current water situation, the reasons for the requested reductions, and a warning that mandatory cutbacks will be required if voluntary measures do not sufficiently reduce water usage.
2. Contacting local media outlets, in coordination with the JWC, to inform customers about temporary interruptions to normal service delivery.
3. Post pre-prepared public service announcement on city's webpage. Include prepared information regarding conservation tips.
4. Provide notice on water bills or through utility bill inserts, if the timing is feasible.
5. Encourage, through public service announcements, voluntary reductions on outdoor irrigation and limit irrigation times to between the hours of 8:00 p.m. and 10:00 a.m.
6. Encourage customers to refrain from washing cars except at commercial establishments that recycle or reuse water in their cleaning process. Consider offering free or discounted single-wash coupons to encourage compliance.
7. Contact wholesale customers notifying them of the existence or potential for water shortages.

8. Provide notification, assistance, and conservation curtailment materials to wholesale customers.

Stage 2: Long-Term Water Shortage Alert

A Stage 2 Long-Term Water Shortage Alert will be issued for potential long-term voluntary reduction preparations if it is projected by the JWC and Barney Joint Ownership Commission that peak season storage supplies may not reach projected peak season demand. The actions under this stage will include the previous actions listed above in Stage 1, but will also include the following actions requesting customers to voluntarily restrict their non-essential uses.

Stage 2 public information program elements would include:

1. Utilities Commission will implement Stage 1 program elements as appropriate.
2. Begin preparations for an aggressive conservation campaign to begin before the peak season (April – May).
3. Provide notice and press releases to local media outlets to inform customers about potential water shortages for peak season demands.
4. Develop and provide billboard conservation advertisements.
5. Provide weekly updates on website and/or local newspapers of storage levels in Barney and Scoggins Dam (Hagg Lake).
6. Tailor all conservation messaging at outreach events to the drought conditions and attend additional events such as neighborhood or home owner's associations, farmer's markets, etc.
7. Consider purchasing additional radio or television advertisements with partners such as the JWC or RWPC.
8. Meet with industrial customers to review the water supply situation.

Staff will closely monitor the citizen response to Stage 2 throughout the peak season and will implement Stage 3 if response is not adequate to sustain storage supplies through the entire peak season. These measures proved sufficient during the 2001 curtailment campaign.

Stage 3: Serious Water Shortage

After notifying the City Manager, the Utilities Commission will activate a Stage 3 alert to impose a suite of mandatory prohibitions on non-essential water use when any of the initiating conditions are met. The goal of a Stage 3 alert is to achieve reductions of 10 percent of peak season demand. Under Stage 3, the city would introduce the following mandatory water reduction measures:

1. Restricting outdoor irrigation to only 3-days days per every 7-day period (including use of specific schedules imposed by the City Manager) and only between the hours of 8:00 p.m. and 10:00 a.m. This restriction and prohibition applies to all outdoor irrigation unless:

a. Grass, turf or landscaping is less than 1-year old;

b. Grass or turf is part of a commercial sod farm;

c. Grass or turf areas are within a high use athletic field used for organized play;

d. Grass or turf areas are used for golf tees or greens; or

e. Grass or turf areas are part of a park or recreation area deemed by the City Council to be of particular significance and value to the community.

Notwithstanding the exceptions to the outdoor irrigation restrictions and prohibitions noted above, all outdoor watering schedules shall be limited to only that necessary to maintain plant health and shall not water unnecessarily.

2. Mandatory restrictions on all water waste:

   a. No washing of paved surfaces;

   b. No fountains except those using re-circulated water;

   c. No water running onto streets, sidewalks, or into gutters;

   d. No washing of vehicles other than in establishments that recycle water; and

   e. No washing of roofs, decks or home siding unless such uses are solely to abate a potential fire hazard.

3. The Utilities Commission will work closely with Utility Billing to identify and notify customers of unfixed leaks in their systems. Financial incentives will be available to customers that fix their leaks in a short time frame. The Utilities Commission will consider additional restrictions on notified customers with unfixed leaks.

4. Hillsboro will begin negotiations with JWC partners for activating alternative water supplies.

5. In addition, city staff will work with large, local industrial and commercial water users to minimize their non-essential water use.

Stage 4: Severe Water Shortage

Conditions causing Stage 4 curtailment measures are severe enough in terms of extent and duration that significant reductions in water use must be achieved as quickly as possible in order to ensure public health safety and welfare. Stage 4 builds on measures enacted through the previous stages. In a Stage 4 curtailment, all outside watering is prohibited and any exceptions noted above for outdoor water uses are rescinded unless such uses are solely to abate public health or fire hazards. Stage 4 measures attempt to achieve reductions in residential and commercial demands of up to 20 percent of peak season demand. In the case of temporary water loss due to major damage to critical supply system facilities or major damage to local electrical utility systems, it may be necessary to go directly to Stage 5.

Under Stage 4 it will be expressly prohibited to:

1. Water, sprinkle or irrigate lawns, grass, landscaping or turf.
2. Wash, wet down, or sweep sidewalks walkways, driveways, parking lots, open ground or other hard-surfaced areas with water.
3. Wash vehicles, unless the Utilities Commission finds that the public health, safety, and welfare is contingent upon frequent vehicle cleaning such as cleaning of solid waste transfer vehicles, vehicles that transfer food and other perishables, or as otherwise required by law. Exceptions will be required to wash vehicles at establishments that recycle water.
4. Flush water mains, except for water quality concerns or emergency purposes.
5. The Utilities Commission may also consider reducing pressure at PRV stations for prolonged severe water shortage event.

The Utilities Commission will consider exemptions on a case-by-case basis for businesses that rely on irrigation for their essential operations such as nurseries and if the businesses are willing to implement requested conservations measures.

Additional restrictions and exemptions may be passed, as necessary, if the above measures to not adequately reduce demands.

If the Stage 4 alert is triggered by an extended disruption at the Hillsboro slow sand filter plant or a specific geographical area with the distribution system, the city would provide bottled water or request deployment of the JWC Emergency Water Distribution System to the limited number of customers who would lose water service.

Stage 5: Critical Water Shortage

Stage 5 responds to events causing an immediate and sustained loss of the source of supply or major damage to critical treatment, transmission and pumping systems. Examples include failure of a main transmission line, failure of the intake or water treatment plant, a contamination event in Barney Reservoir or Scoggins Dam (Hagg Lake), natural disaster such as an earthquake, or a malevolent attack on the system that introduces a contaminant at some point in the system.

Under the Critical Water Shortage stage, all water use may be prohibited, except that which is necessary for human consumption, fire suppression, and sanitation needs. If the emergency causes or is expected to cause a shortage of water for an extended period of time, implementing the curtailment measures of Stage 4 may be more appropriate than Stage 5 for business continuity purposes and recovery operations.

If the event causes immediate sustained loss of supply, major damage, or renders water in the system unsafe to drink (as described above), the Hillsboro Emergency Operations Center (EOC) will be activated within the Incident Command System. The Incident Commander will assume command and control of the city's response to the event. As the cause and severity of the event dictates, the Incident Commander will direct the following actions to occur:

1. Implement the appropriate response protocols of the city's Emergency Response Plan for the Hillsboro Water System.
2. Contact the Oregon Drinking Water Program, Department of Human Services, and request their assistance in response actions.
3. Notify the local news media, to solicit their assistance in notifying customers.
4. Contact County, State and Federal law enforcement officials as appropriate.
5. Contact the County Public Health Officer and local hospitals as appropriate for the nature of the event.
6. Contact the JWC staff and request deployment of the Emergency Water Distribution System.
7. Consider contacting another Oregon Water/Wastewater Agency Response Network agency requesting additional equipment and staff for emergency response operations.

The city will continue to investigate and develop specific back-up plans for a Stage 5 emergency. These plans may include purchasing water from another JWC partner agency or the Portland Water Bureau, directing residents to a pre-designated water distribution location, and supplying bottled water.

City of Forest Grove Curtailment Plan

This section satisfies the requirements of OAR 690-086-0160

Introduction

The City of Forest Grove depends on the JWC's water source for approximately 50 percent of its water supply, so Forest Grove's curtailment planning will consider JWC curtailment as well as measures based on the city's own water supplies. As stated in the JWC's curtailment plan, the JWC does not have direct authority to regulate its member agencies. Thus, while the JWC curtailment plan creates processes for coordination, negotiation and public education, Forest Grove's curtailment plan establishes measures to reduce on-the-ground water demand.

The curtailment plan presented in this section expands on the City of Forest Grove's current city code, and is revised to comply with Division 86 requirements. In addition to the following measures, the city shall retain ordinance provisions regarding the adoption of enforcement.

History of System Curtailment Episodes

690-086-0160 (1)

During the last 10 years, the City of Forest Grove has not experienced supply deficiencies. When the city has had transmission line or power failures, it has been able to use capacity from the JWC system so that its customers have had sufficient water supply and curtailment has been unnecessary.

Curtailment Event Triggers and Stages 690-086-0160 (2) and (3)

The City of Forest Grove's Curtailment Plan, presented here, has four stages that increase in level of severity:

Stage 1 – Water Shortage Alert

Stage 2 – Serious Water Shortage

Stage 3 – Critical Water Shortage

Stage 4 – Emergency Water Shortage

The City of Forest Grove's curtailment plan stages will be triggered by one or more of the criteria presented in **Exhibit 4-2**.

EXHIBIT 4-2
City of Forest Grove Curtailment Stages

Curtailment Stages	Initiating Conditions
Stage 1 Water Shortage Alert	Mechanical or electrical malfunction at city's or JWC's intake or water treatment plant anticipated to be of short duration; Interruption of local utility electrical service anticipated to be of short duration; General recognition of drought conditions in Western Oregon; or Abnormal weather conditions during the storage season, or other reasons, that make it unlikely that Barney Reservoir and Scoggins Dam (Hagg Lake) will fill to their full capacities preceding the peak summer supply season;
Stage 2 Serious Water Shortage	Notice of potential water shortage from the JWC as part of its Stage 2 curtailment; Forecast for continuation of drought conditions and water supply at or below 90 percent of demands for three or more consecutive days; or Mechanical or electrical malfunction or other incident requiring a longer duration and more extensive repairs of pumping facilities, treatment plant or water transmission mains.
Stage 3 Critical Water Shortage	Curtailment request from the JWC as part of its Stage 3 curtailment; Declaration of drought for Washington County by Governor; Water supply at or below 80 percent of projected demands for three or more consecutive days; or Mechanical or electrical malfunction or other incident requiring a longer duration and more extensive repairs of pumping facilities, treatment plant or water transmission mains.
Stage 4 Emergency Water Shortage	Water supply notification from the JWC as part of its Stage 4 curtailment; Water supply at or below 70 percent of demands for three or more consecutive days; Intentional acts or fire, contamination of source or any other event resulting in an immediate, sustained deprivation of water supply; or Extensive damage to transmission, pumping or treatment processes caused by natural disaster.

Authority

Actions under Stages 2 through 4 of this plan may be initiated only after a declaration of emergency by the City Manager. Plan provisions will remain in effect until the emergency is declared ended by the initiating party, provided that the City Council may rescind an emergency declaration issued by the City Manager upon a finding that the emergency no longer exists, or that the original declaration was made in error.

Actions may be applied to the entire system or only to those water use sectors or in those geographic areas that are directly impacted by a water supply shortage.

The City Manager is responsible for execution of the plan provisions once an emergency has been declared.

Curtailment Plan Implementation and Enforcement

690-086-0160 (4)

In implementing this curtailment plan, the city will work closely with the JWC and other member agencies to assure consistent approaches to dealing with water shortages by coordinating stage designations, public notices, press releases, and other outreach activities.

Stage 1: Water Shortage Alert

Under Stage 1, the City Manager will issue a notice requesting voluntary reductions in water use by all customers upon determining in coordination with city staff that voluntary curtailment is needed based on the circumstances. The notice will include a summary of the current water situation, the reasons for the requested conservation measures, and a warning that mandatory restrictions will be implemented if voluntary measures do not sufficiently reduce water usage. Forest Grove will coordinate with the JWC to contact local media to inform customers about temporary interruptions to normal service delivery.

When Stage 1 is triggered, the city will ask customers to voluntarily comply with the following:

1. Minimize landscape watering between 10:00 a.m. and 6:00 p.m., the period of highest water loss due to evaporation.
2. Water landscapes on alternate days (even numbered addresses water on even numbered days and odd numbered addresses water on odd numbered days.)
3. Implement other conservation measures, such as those described on the Regional Water Providers Consortium website, which can be accessed from the city's website.

The goal under Stage 1 is to reduce demand by approximately 5 percent.

Stage 2: Serious Water Shortage

Stage 2 is similar to Stage 1, except that the voluntary measures regarding outdoor water use will be made mandatory by the City Manager, and additional non-essential water use will be prohibited. The need for Stage 2 curtailment can be triggered by several initiating conditions. One condition is a forecast for continuation of drought conditions and water supply at or below 90 percent of demands for three or more consecutive days; e.g. if, over three or more consecutive days, the city's water demand is 1 million gallons per day but the City of Forest Grove's supply from all sources is only 900,000 gallons per day.

The goal under Stage 2 is to reduce demand by approximately 10 percent.

Under Stage 2, the city will implement the following mandatory water reduction measures:

1. Restricting outdoor irrigation to the odd/even schedule described in Stage 1, and to only the hours between 6:00 p.m. and 10:00 a.m. This restriction applies to all outdoor irrigation unless:
    a. Grass, turf or landscaping is less than 1-year old;
    b. Grass or turf is part of a commercial sod farm;
    c. Grass or turf areas are within a high use athletic field used for organized play;
    d. Grass or turf areas are used for golf tees or greens; or
    e. Grass or turf areas are part of a park or recreation area deemed by the City Manager to be of particular significance and value to the community.
2. Prohibiting washing motor vehicles, boat trailer, or other vehicles, except at a commercial washing facility that practices wash water recycling. An exception to this restriction will allow washing of vehicles that must be cleaned to maintain public health and welfare such as food carriers and solid waste transfer vehicles.
3. Prohibiting the following non-essential uses of water:
    a. Washing of paved or hard-surfaced areas such as sidewalks, driveways and parking lots;
    b. Fountains or ponds except those using re-circulated water;
    c. Water running onto streets, sidewalks, or into gutters;
    d. Washing of roofs, gutters, decks or home siding unless such uses are needed for painting, construction or to abate a potential fire hazard.
    e. Irrigating golf courses except tees and greens.

Stage 3: Critical Water Shortage

Conditions causing Stage 3 curtailment measures are severe enough in terms of extent and duration that significant reductions in water use must be achieved as quickly as possible in order to ensure public health safety and welfare. Stage 3 builds on measures enacted through the previous stages. The goal under stage 3 is to reduce demand by approximately 20 percent.

In a Stage 3 curtailment, all outside watering is prohibited and any exceptions noted above for outdoor water uses are rescinded unless such uses are solely to abate public health or fire hazards.

Under Stage 3, in addition to the prohibitions in Stage 2, it will be expressly prohibited to:

1. Irrigate lawns, grass, landscaping or turf
2. Flush water mains, except for water quality concerns or emergency purposes.
3. Filling or otherwise putting water into any swimming pool or hot tub, unless it:
    a. Is used for a neighborhood fire control supply;

b. Has a recycling water system;

c. Has a evaporative cover; or

d. Is required by a medical doctor's prescription.

As part of Stage 3, the city will issue public service announcements, in coordination with the JWC, to notify customers of the severity of the conditions.

Stage 4: Emergency Water Shortage

Stage 4 responds to events causing an immediate and sustained loss of water supply or major damage to critical treatment, transmission and pumping systems. Under the Critical Water Shortage stage, all water use may be prohibited, except that necessary for human consumption, fire suppression, and sanitation needs. The goal under Stage 4 is to ensure potable water supply for public health, safety and welfare.

If the event renders water in the system unsafe to drink (e.g., chemical spill or intentional act against the system), the City Manager will direct staff to notify customers as quickly as possible. In addition, the City Manager will implement the following:

1. Contact the Oregon Drinking Water Program, Department of Human Services, and request their assistance in response actions.
2. Notify the local news media, if appropriate, to solicit their assistance in notifying customers.
3. Contact city, county, state and federal law enforcement officials as appropriate.
4. Contact the county public health officer and local hospitals, as appropriate for the nature of the event.
5. Contact the JWC staff and request deployment of the Emergency Water Distribution System.
6. Contact another Oregon Water/Wastewater Agency Response Network agency requesting additional equipment and staff for emergency response operations.

The city will continue to investigate and develop specific back-up plans for a Stage 4 emergency. These plans may include purchasing water from another JWC partner agency, directing residents to a pre-designated water distribution location, and supplying bottled water.

City of Beaverton Curtailment Plan

This section satisfies the requirements of OAR 690-086-0160

Introduction

The City of Beaverton water supply relies mostly on the shared sources managed by the JWC and as such, the City's curtailment plan shares some features with other JWC members. Beaverton's water treatment plant also is managed by the JWC. Beaverton's other water sources are native groundwater and its ASR program and emergency mutual aid interties with Tualatin Valley Water District, Tigard and Portland. The JWC curtailment plan includes coordination, negotiation and public education; the City's curtailment plan establishes measures to reduce on-the-ground water demand.

Beaverton is well positioned to supply non-peak water demands absent a major disaster. As described in Section 2 of this plan, Beaverton has 23 interconnections with the JWC, its member agencies and the PWB. As a result, Beaverton has opportunities to obtain emergency water supplies and to avoid curtailment for most events that could affect the City's water supply on a short-term basis or during low-demand time periods. Thus, this curtailment plan will focus on supply constraints during the peak season and during an emergency event. Triggers have been identified (such as equipment malfunctions, infrastructure damage and supply-limiting events) for five different curtailment stages. Next, specific actions to reduce demands are described for each curtailment stage.

The curtailment plan presented in this section expands on Beaverton's city code and its Emergency Operations Plan (as amended from time to time) as revised to comply with Division 86 requirements.

History of System Curtailment Episodes

OAR 690-086-0160 (1)

Within the last decade, the City of Beaverton has experienced a water shortage resulting from a constrained source of supply from the drought conditions that occurred in 2001.

The JWC experienced its first water shortage in the summer of 2001. As previously described, JWC is generally regulated off its natural flow rights on the Tualatin River beginning in late May to early June until mid-October in an average year (described in more detail in Section 2, Water Rights). JWC relies primarily on stored water releases from Scoggins Dam (Hagg Lake) and Barney Reservoir during this period.

For the first time since 1977, Scoggins Dam (Hagg Lake) did not fill in 2001, but reached only 54 percent of the storage capacity. Several JWC member agencies (Hillsboro, Beaverton, and Forest Grove) hold contracts with the Bureau of Reclamation (BOR) for the use of stored water in Scoggins Dam (Hagg Lake) that specify curtailment measures. All of the BOR

contracts state that 2,500 acre feet of water will be reserved for natural or minimum flow during water shortage events. All BOR contracts specify that:

> The quantity of water to be furnished for irrigation and water quality control shall first be reduced as necessary but not by greater than 15 percent. Any further reduction in the project water supply shall be shared among the remaining entities receiving a water supply from the project in the proportion that the entity's water entitlement under the BOR contract bears to the total quantity of the project water under contract.

Because of the conditions of the contracts, the cities of Hillsboro, Beaverton, and Forest Grove and the Lake Oswego Corporation received only about 76 percent of their normal water allocations from Scoggins Dam (Hagg Lake) in 2001. Clean Water Services and Tualatin Valley Irrigation District received only 27 percent and 47 percent, respectively, of their normal water allocations. Discharge changes at Scoggins Dam were made twice a day, seven days a week to closely match the timing of water orders, avoid waste, and maintain natural flow in the Tualatin River.

In the same year, Barney Reservoir filled to only 55 percent of its total storage capacity. The Barney Reservoir Joint Ownership Commission (Hillsboro, Forest Grove, Beaverton, and TVWD) decided to hold 4,000 acre feet of Barney Reservoir water in reserve in case dry conditions continued into 2002. After accounting for dead pool storage and releases for fish flows to the Trask River (15 percent of the available storage), the Barney Reservoir member agencies were allotted only 54 percent of their normal full-pool allocations.

Because of the effectiveness of the JWC's curtailment marketing campaign and customers' implementation of voluntary conservation measures, severe water use curtailment measures and mandatory curtailment were never required. This effort helped decrease demand for JWC source water by 7.5 percent and, most importantly, none of the JWC members ran out of water. JWC received an award for this successful joint campaign from the American Water Works Association. The JWC WMCP Chapter 4 Summary contains additional information on the JWC's curtailment marketing campaign.

Curtailment Event Triggers

OAR 690-086-0160 (3)

During non-peak demand periods, curtailment triggers are unlikely to be met unless a catastrophic natural disaster impacts multiple elements of Beaverton's source of supply. Absent a trigger of this magnitude, Beaverton is well-positioned to meet its non-peak season customer demands for the following reasons:

- The JWC's Fern Hill Reservoir 1, with 20 million gallons of storage available, was seismically upgraded in 2006.
- An additional 20 million gallons of storage (for a total of 40 million gallons of storage) were provided with the construction of JWC Fern Hill Reservoir 2 in 2006. The construction included seismic hardening.

During the peak summer demand period from June through September when the system is operating at or near its maximum capacity, interruption of supply due to natural disaster, mechanical failure, terrorist act or loss of source could present significant challenges to Beaverton. Therefore, the following triggers and related curtailment stages in this curtailment plan are based primarily on events occurring during this time period. In addition, less critical impacts to the water supply such as forecasted drought, and minor mechanical or electrical failures are addressed in Stages 1, 2 and 3.

Curtailment Stages

OAR 690-086-0160 (2)

This curtailment plan for City of Beaverton is designed to be initiated and implemented in progressive stages.

As shown in **Exhibit 4-3**, Beaverton's curtailment plan has five distinct stages, each of which is triggered by one or more of the listed events.

EXHIBIT 4-3
City of Beaverton Water Use Curtailment Plan Stages 1 through 5

Curtailment Stages	Initiating Conditions
Stage 1 Temporary Water Shortage Alert (Short Term Voluntary)	Interruption of local utility electrical service affecting water treatment and distribution; Minor mechanical or electrical malfunction in pumping facilities or treatment plant; or Minor damage to raw or treated water transmission mains (e.g., leaking joint requiring repair).
Stage 2 Long-Term Water Shortage Alert (Preparing for Long Term Voluntary)	JWC forecasts below-normal levels of stored water in Barney Reservoir and Scoggins Dam (Hagg Lake) that may fall below City's projected peak season demand. JWC-issued forecasts of drought conditions for the peak season.
Stage 3 Serious Water Shortage (Long Term Voluntary)	JWC forecasts below-normal levels of stored water in Barney Reservoir and Scoggins Dam (Hagg Lake) (storage supply at or below 90 percent of City's projected peak season demand); or Mechanical or electrical malfunction or other incident requiring more extensive repairs of pumping facilities, treatment plant or water transmission mains than in Stage 1.
Stage 4 Severe Water Shortage (Long Term Mandatory)	Declaration of drought by Governor pursuant to ORS 536.720; JWC forecasts below-normal levels of stored water in Barney Reservoir and Scoggins Dam (Hagg Lake) (storage supply at or below 80 percent of City's projected peak season demand); or Multiple failures in the pumping facilities, treatment plant or transmission mains.

EXHIBIT 4-3
City of Beaverton Water Use Curtailment Plan Stages 1 through 5

Curtailment Stages	Initiating Conditions
Stage 5 Critical Water Shortage (Short Term Critical Mandatory Restrictions)	Extensive damage to transmission, pumping or treatment processes caused by natural disaster, JWC forecasts of below-normal levels of stored water in Barney Reservoir and Scoggins Dam (Hagg Lake) (storage supply at or below 70 percent of City's projected peak season demand); or Intentional acts, fire, contamination of source or any other event resulting in an immediate, sustained deprivation of water supply.

Authority

Actions under Stages 2 through 5 of this plan may be initiated only after a declaration of emergency by the City Council. Plan provisions will remain in effect until the emergency is declared ended by the City Council.

Curtailment measures may be applied to the entire system, or only to water use sectors, and/or in geographic areas, which are directly impacted as determined by the Public Works Director.

The Mayor is responsible for execution of the plan provisions once an emergency has been declared.

Curtailment Plan Implementation and Enforcement

OAR 690-086-0160 (4)

In implementing this curtailment plan, the Mayor will work closely with the Joint Water Commission and other member agencies to assure consistent approaches to dealing with water shortages by coordinating stage designations, public notices, press releases, and other outreach activities.

Stage 1: Temporary Water Shortage Alert

A Temporary Water Shortage Alert will be activated to inform customers of the need for voluntary, temporary reductions in consumption. This will occur when the Stage 1 triggers are met as described in Exhibit 4-3.

Stage 1 Temporary Water Shortage Alert requests for short-term voluntary reductions will be made if the Mayor determines that finished water storage at the JWC or in the distribution system may not meet projected demands because of the events described in Exhibit 4-3 Stage 1.

Stage 1 public information program elements would include the following:

1. The Mayor shall issue a general request for voluntary reductions in water use by all water users. The request will include a summary of the current water situation, the reasons for the requested reductions, and a warning that mandatory cutbacks will be required if voluntary measures do not sufficiently reduce water usage.
2. Contacting local media outlets, in coordination with the JWC, to inform customers about temporary interruptions to normal service delivery.
3. Post pre-prepared public service announcement on City's webpage. Include prepared information regarding conservation tips.
4. Provide notice on water bills or through utility bill inserts, if the timing is feasible.
5. Encourage, through public service announcements, voluntary reductions on outdoor irrigation and limit irrigation times to between the hours of 8:00 p.m. and 10:00 a.m.
6. Encourage customers to refrain from washing cars except at commercial establishments that recycle or reuse water in their cleaning process. Consider offering free or discounted single-wash coupons to encourage compliance.
7. Contact wholesale customers notifying them of the existence or potential for water shortages.
8. Provide notification, assistance, and conservation curtailment materials to wholesale customers.

Stage 2: Long-Term Water Shortage Alert

A Stage 2 Long-Term Water Shortage Alert will be issued for potential long-term voluntary reduction preparations if it is projected by the JWC and Barney Joint Ownership Commission that peak season storage supplies may not reach the City's projected peak season demand. The actions under this stage will include the previous actions listed above in Stage 1, but will also include the following actions requesting customers to voluntarily restrict their non-essential uses.

Stage 2 public information program elements would include the following:

1. Stage 1 program elements.
2. Begin preparations for an aggressive conservation campaign to begin before the peak season (April – May).
3. Provide notice and press releases to local media outlets to inform customers about potential water shortages for peak season demand.
4. Develop and provide billboard conservation advertisements.
5. Provide weekly updates on website and/or local newspapers of storage levels in Barney and Scoggins Dam (Hagg Lake).
6. Tailor all conservation messaging at outreach events to the drought conditions and attend additional events such as neighborhood or home owner's associations, farmer's markets, etc.

7. Consider purchasing additional radio or television advertisements with partners such as the JWC or RWPC.

8. Meet with industrial customers to review the water supply situation

City staff will closely monitor the citizen response to Stage 2 throughout the peak season and recommend that the Mayor implement Stage 3 if response is not adequate to sustain storage supplies through the entire peak season. These measures proved sufficient during the 2001 curtailment campaign.

Stage 3: Serious Water Shortage

A Stage 3 alert will be activated to impose a suite of mandatory prohibitions on non-essential water use when any of the initiating conditions are met. The goal of a Stage 3 alert is to achieve reductions of 10 percent of peak season demand. Under Stage 3, the City would introduce the following mandatory water reduction measures:

1. Restricting outdoor irrigation to only 3 days per every 7-day period (including use of specific schedules imposed by the Mayor) and only between the hours of 8:00 p.m. and 10:00 a.m. This restriction and prohibition applies to all outdoor irrigation unless:

    a. Grass, turf or landscaping is less than 1-year old;

    b. Grass or turf is part of a commercial sod farm;

    c. Grass or turf areas are within a high use athletic field used for organized play;

    d. Grass or turf areas are used for golf tees or greens; or

    e. Grass or turf areas are part of a park or recreation area deemed by the City Council to be of particular significance and value to the community.

Notwithstanding the exceptions to the outdoor irrigation restrictions and prohibitions noted above, all outdoor watering schedules shall be limited to only that necessary to maintain plant health.

2. Mandatory restrictions on all water waste:

    a. No washing of paved surfaces;

    b. No fountains except those using re-circulated water;

    c. No water running onto streets, sidewalks, or into gutters;

    d. No washing of vehicles other than in establishments that recycle water; and

    e. No washing of roofs, decks or home siding unless such uses are solely to abate a potential fire hazard.

3. Identify and notify customers of unfixed leaks in their systems. Financial incentives will be available to customers that fix their leaks in a short time frame. Additional restrictions on notified customers with unfixed leaks will be considered.

4. Beaverton will begin negotiations with its water supply partners for activating alternative water supplies.

5. In addition, city staff will work with large, local industrial and commercial water users to minimize their non-essential water use.

Stage 4: Severe Water Shortage

Conditions causing Stage 4 curtailment measures are severe enough in terms of extent and duration that significant reductions in water use must be achieved as quickly as possible in order to ensure public health safety and welfare. Stage 4 builds on measures enacted through the previous stages. In a Stage 4 curtailment, all outside watering is prohibited and any exceptions noted above for outdoor water uses are rescinded unless such uses are solely to abate public health or fire hazards. Stage 4 measures attempt to achieve reductions in residential and commercial demands of up to 20 percent of peak season demand. In the case of temporary water loss due to major damage to critical supply system facilities or major damage to local electrical utility systems, it may be necessary to go directly to Stage 5.

Under Stage 4 it will be expressly prohibited to:

1. Water, sprinkle or irrigate lawns, grass, landscaping or turf.
2. Wash, wet down, or sweep sidewalks walkways, driveways, parking lots, open ground or other hard-surfaced areas with water.
3. Wash vehicles, unless the Mayor finds that the public health, safety, and welfare is contingent upon frequent vehicle cleaning such as cleaning of solid waste transfer vehicles, vehicles that transfer food and other perishables, or as otherwise required by law. Exceptions will be required to wash vehicles at establishments that recycle water.
4. Flush water mains, except for water quality concerns or emergency purposes.

The Mayor will consider exemptions on a case-by-case basis for businesses that rely on irrigation for their essential operations such as nurseries and if the businesses are willing to implement requested conservations measures.

Additional restrictions and exemptions may be passed as necessary, if the above measures to not adequately reduce demands.

Stage 5: Critical Water Shortage

Stage 5 responds to events causing an immediate and sustained loss of the source of supply or major damage to critical treatment, transmission and pumping systems. Examples include failure of a main transmission line, failure of the intake or water treatment plant, a contamination event in Barney Reservoir or Scoggins Dam (Hagg Lake), natural disaster such as an earthquake, or a malevolent attack on the system that introduces a contaminant at some point in the system.

Under the Critical Water Shortage stage, all water use may be prohibited, except that which is necessary for human consumption, fire suppression, and sanitation needs.

The City Council may also activate the City's Emergency Operations Center (EOC) in order to mobilize sufficient resources to respond to the event(s) causing the need for a Stage 5 action.

If the event renders water in the system unsafe to drink (e.g., chemical spill or intentional act against the system), the EOC will be activated and the Incident Commander will assume command and control of the City's response to the event. As the cause and severity of the event dictates, the Incident Commander will:

1. Implement the appropriate response protocols of the City's Emergency Response Plan for the Beaverton Water System.
2. Contact the Oregon Drinking Water Program, Department of Human Services, and request their assistance in response actions.
3. Notify the local news media, to solicit their assistance in notifying customers.
4. Contact County, State and Federal law enforcement officials as appropriate.
5. Contact the County Public Health Officer and local hospitals as appropriate for the nature of the event.
6. Contact the Joint Water Commission staff and request deployment of the Emergency Water Distribution System.
7. Consider contacting another Oregon Water/Wastewater Agency Response Network agency requesting additional equipment and staff for emergency response operations.

The City will continue to investigate and develop specific back-up plans for a Stage 5 emergency. These plans may include purchasing water from another JWC partner agency, directing residents to a pre-designated water distribution location, and supplying bottled water.

TVWD Water Supply Shortage Plan

The following text is replicated from TVWD's 2007 *Water Management and Conservation Plan*. References to appendices not included with this plan have been omitted.

Tualatin Valley Water District (TVWD) receives its water supplies from the City of Portland's Water Bureau (Portland) and the JWC (JWC). The actions of our water providers, along with the condition of local water supplies, have an effect on TVWD's ability to deliver quality water supplies to its customers. The philosophy of our water providers is to "share the shortage," meaning that they will curtail all their wholesale customers by the same percent should it become necessary to decrease water use.

Introduction

TVWD developed this water supply shortage plan to guide the Board of Commissioners and TVWD staff in the event of a water shortage. TVWD may undertake a variety of curtailment actions, depending on the time of year and the expected duration of any water supply shortage.

- Throughout any such shortage, TVWD will continue to pursue the following objectives:
- Maintain adequate volume of high-quality water supplies for all TVWD customers.
- Provide clear customer communications and rapid customer service. Be consistent with public expectations based on information shared to date.
- Promote water use efficiency.
- Control costs that come with curtailed water use, such as losses in revenue, or higher-cost water supplies (e.g., the purchase of peaking water from Portland or the lease of extra water from the JWC).
- Have an equitable impact on all users—public and private, urban and suburban, business and residential. Prioritize actions to have the least permanent negative impact.

System Capacity

As of 2005, TVWD supplied an average of 23 million gallons of water to our customers every day, between eight and nine billion gallons of water per year. When summer arrives and the temperature rises, water consumption rises, too. During 2004, our peak day of water usage was July 30, with 53 million gallons of water supplied.

Within the TVWD system, eight pumping stations transmit water to customers at higher elevations. The District has 24 covered reservoirs with a combined storage capacity of more than 53 million gallons. The District also maintains 726 miles of transmission pipes; these pipes distribute water from two sources.

First, the Washington County Gravity Supply Line from the City of Portland is a 60-inch main serving the District from Portland's Powell Butte Reservoir. The District owns the right to receive up to 42.3 million gallons per day (MGD) through this gravity line. Portland officials describe summer demand in three possible categories: a warm-dry scenario, a median or "most likely" scenario, and a cool-wet scenario.

Portland's Water Supply depends on Bull Run stream flow during the summer draw down period, and usable storage in Bull Run Reservoirs 1 and 2. Portland defines "usable storage" in the Bull Run Reservoirs as the amount available above the 970 feet elevation for Reservoir #1 and the amount available above 840 feet elevation for Reservoir #2. Portland's ongoing surface water concerns include length of time to draw down the reservoirs, ability to refill the reservoirs, and turbidity events that take the reservoirs off-line.

Portland has the ability to augment these supplies with the first increment of Bull Run Lake[10] and/or groundwater from the Columbia South Shore Well Field (up to 12.4 billion gallons over a 151-day period). The Columbia South Shore Well Field is the second largest water source in the State of Oregon, with about half the capacity of Portland's Bull Run source. It is capable of producing close to 100 million gallons of water a day. During the summer of 2004, the well field provided an average of 36 million gallons a day for 29 days. The total 151-day yield of the Columbia South Shore Well Field assumes that:

- from well field start-up to 30 days of pumping, 100 percent of the initial well capacities are available;
- between 30 and 90 days of pumping, 90 percent of the initial well capacities are available;
- between 90 and 151 days of pumping, 80 percent of the initial well capacities are available.

Portland's ongoing groundwater concerns include a contamination plume and available volume. Once groundwater sources are depleted beyond their ability to meet the demand of all customers, Portland will need to activate its own curtailment plan, which applies to TVWD.

Secondly, TVWD has another 10 MGD available from the JWC (JWC), for a total amount from the two sources that is adequate to supply the District's average and peak daily flow. TVWD is an owner with other agencies of the JWC, which uses water originating from Barney Reservoir, Hagg Lake, and the Tualatin River. As an owner of the JWC, the District owns 10 MGD from the 60 MGD treatment plant. Other JWC owners—the cities of Hillsboro, Beaverton, Tigard and Forest Grove—also use this source and have leased some of their capacity to TVWD in the past. However, these communities are also growing rapidly and plan to use more of their own water allocation in the future.

The JWC withdraws water supplies from the Tualatin River and runs the water through a treatment plant. Chlorine and pH adjustments are added to this water before it leaves the

10 Depending on the seasonal rainfall, Portland can withdraw up to1.8 billion gallons, until the water levels in Bull Run Lake decrease to an elevation of 3,152 feet.

plant. The partners are expanding the treatment plant, and expect to increase the capacity from 60 MGD to 75 MGD by June 2006.

JWC members currently own the 60 MGD treatment plant, a 20 million gallon reservoir, a pumping plant, and 72" and 42" transmission mains. An additional 20 MG reservoir is currently under construction and is scheduled for completion by July 2007.

10-Year Assessment of Water Shortages & Limitations

Drought

Drought has been the principal cause of water shortages for the region in the last 15 years.

1992 Drought Affecting the City of Portland

During 1992, Portland Water Bureau (PWB) and its wholesale customers, including TVWD, experienced severe water supply shortages for five reasons: (1) the Bull Run watershed, which serves the Portland metropolitan region had experienced the lowest spring rainfall and stream flows since the year 1899; (2) demand for water during May and June 1992 was unusually high due to record-breaking temperatures that occurred in the region; (3) reservoir levels were low, as they typically are in the late summer months; (4) the back-up source, the Columbia South Shore wellfield, was unavailable for sustained use because of a contamination plume, which was feared to move into the well field aquifer should those wells be used; and (5) voluntary requests to reduce water use were not effective. Shortages close to this magnitude were also reported in 1952, 1987, and 1991.

As drought conditions produced peak water needs in excess of the PWB's seasonal water supplies in 1992, the response included public announcements and monitoring of water use to urge customers to voluntarily reduce water use. In 1992, the PWB put in place mandatory water restrictions to reduce water use during the peak season and water utility staff circulated through service areas to monitor water use. TVWD, as a wholesale customer of the PWB, was subject to the curtailment measures declared by the PWB. In 1992, the PWB entered into a curtailment period supported by TVWD. TVWD prepared an ordinance in July 1992, declaring a water source emergency and imposing mandatory water conservation on its customers. The ordinance prohibited lawn watering, except in the case of newly seeded or sodded lawn and parks, washing of hard surfaces such as sidewalks and parking lots, and car washing. Following a warning, penalties for ordinance violators ranged from $100 for the first violation to $500 for repeat violations. The JWC sold water supplies to TVWD to relieve the water shortages and the urgency for water use curtailment.

In addition to implementing and enforcing curtailment measures, TVWD activated its three emergency wells and an emergency connection with the City of Hillsboro. In the aftermath, TVWD formed a conservation committee, and designed and installed a demonstration garden to promote the efficient use of water through innovative landscape design, construction and maintenance principles. It further held landscaping workshops for customers, and participated in the conservation activities of the Columbia-Willamette Water Conservation Coalition, which later merged with the Regional Water Providers Consortium (RWPC).

Since 1992, Portland has placed the South Shore wellfield into service. Had the wellfield been used in 1992, there would have been no water shortage. In addition, TVWD has

purchased an ownership interest in the JWC to have access to additional and different water supplies.

2001 Drought Affecting the JWC

The summer of 2001 was not particularly hot, but the rains filled Hagg Lake only 51 percent. As such, all municipalities using supplies from the JWC were asked to curtail use in order to leave supplies for more senior water rights holders in the irrigation industry, as well as to leave adequate water supplies for in-stream use. Evaporation in the lake during the summer took even more water out of municipal supplies. TVWD was able to fully supply its customers using water from the Portland water system. In a similar situation in the future, TVWD would need to ask its customers to curtail water usage by 20 percent in order to fully meet their needs solely with supplies from the Portland water system. The need for 20 percent curtailment is due to an increase in the District's population since 2001. TVWD considers JWC supplies to be 98 percent reliable.

Water Quality Events

Events Causing Turbidity in Bull Run Water Supplies

During severe storms, fires, and volcanic activity, there is no way to filter sediment and ash from the water and the Bull Run supplies must be temporarily shut down. In 1996, 1998, 1999, and 2004, for instance, there were storms that caused the City of Portland to temporarily shut down its Bull Run operations and rely entirely on groundwater well fields**.** The wells were able to fully supply customers' needs during the temporary shutdown; Portland plans to use this technique again should it become necessary. During the winter months, a complete move to groundwater supplies should have no effect on TVWD, as the wellfield can easily supply the entire region. During the summer when demand increases and supply decreases, however, the wellfield can only support the region fully for 100-150 days, assuming that all of Portland's customers cut back their volume of water use to winter levels. As previously mentioned, Portland's use of the wellfield beyond 150 days may result in the need for curtailment measures.

Endangered Species Act (ESA) Plan for the Bull Run System

During March 2005, the City of Portland unveiled a plan for the Bull Run System to improve habitat conditions for fish. The Bull Run watershed is home to several species of salmon and trout protected by the federal Endangered Species Act (ESA). About 100 years ago when the first diversion dam was built in Bull Run, the City of Portland began changing the natural flow of the Bull Run River, which flows into the Sandy River. For this and other reasons, wild populations of chinook and steelhead have declined between 75 and 90 percent in the Sandy River Basin. Operation of the Bull Run supply systems has lowered river flows, raised stream temperatures, and altered habitat. The proposed plan would do the following: (1) vary river flow during the months of July through September to support salmon spawning and rearing; (2) change operations and infrastructure to reduce water temperatures; and (3) protect and improve riparian habitat.

City officials believe that this plan will improve future water supply planning because one aspect of demand—flow releases for fish—will already be set. By some accounts, however, stream flows that are set aside to meet requirements of the Endangered Species Act comprise about one-fifth of Bull Run total supplies (*The Oregonian*, June 8, 2005). Diverting

Bull Run water from municipal drinking water supplies will force the City of Portland to rely on groundwater supplies more frequently than it currently does.

Contamination of Source Water Supplies

The City of Portland's supplies come from the Bull Run Watershed and are mixed with water from the Columbia South Shore Well Field during periods of high water use or high turbidity (amount of sediment in the water) in the Bull Run Watershed. The source of Bull Run water originates in the Mount Hood National Forest in the Cascade Mountains and remains upstream from any industrial, residential, or man-made discharges. Approximately 53 percent of the watershed is classified as "old growth." Black bear, deer, elk, cougar, and bobcat all live in the watershed along with numerous other species, including the northern spotted owl. Possible contamination in Bull Run comes from animal matter and other natural events in the watershed, such as floods and wildfire.

The only treatment process that Portland has in place at this time is disinfection (with chlorine & ammonia) and adjustment for pH to make the water less corrosive to pipes. Although it destroys *Giardia*, chlorine is not considered effective on *Cryptosporidium*—a waterborne organism that can cause illness or even death in immuno-compromised individuals. Although these organisms do exist in very small amounts in the Bull Run Watershed, they are found in more significant numbers in raw sewage. The Bull Run drinking water system has historically had no sewage exposure, as Federal law protects the watershed and trespassing is illegal. The water used by TVWD is contained in pipes and not exposed from the time it leaves Bull Run to the time it exits the customer's tap.

The JWC has two raw water impoundments in separate locations that are well upstream of urban and agricultural runoff. Therefore, the risk of water supply contamination is relatively low. In the event of source contamination, the plant filtration and disinfection processes meet all current regulatory requirements for inactivation and removal of *Giardia,* turbidity, and other primary and secondary regulated contaminants. In addition, the recent treatment plant expansion anticipated upcoming regulations for *Cryptosporidium*. Currently, there is 20 MG of finished water storage in the JWC system. During a disruption of the plant, the finished water storage provides a period of time to allow operational response to treatment of the contaminated supply. During any disruption of treatment, the more finished water storage available in the JWC service area, the longer the response period can be without adversely affecting customers.

System Interruptions

Interruption of Commercial Power Supply to a Critical Part of the City Water System

A power outage could be caused by a number of factors, such as power failure experienced by the local electric utility (Portland General Electric), local damage to transformer facilities, earthquake damage, or flood damage. The JWC plant has experienced power service outages lasting as long as 24 hours. It has back-up power generation for various plant components, but no back-up power supply for the raw or finished water pump stations. In the event of a power outage, system delivery capacity would be limited to stored finished water supplies in the Fern Hill Reservoirs. The maximum supply available during a power outage would be limited to the supply stored in the tanks at the time of the outage. The 20 MG storage capacity corresponds to less than an average day's worth of supply.

Major Water Transmission Line Break

The TVWD distribution system receives water supplies from both the JWC to the west and the City of Portland to the east. The system has closed connections at 23 locations, which provide a means to route supplies in either direction in the event of an emergency.

Reservoir Failure

The Portland metropolitan region is in a seismic Zone III area. Recent studies indicate the Portland metropolitan region may be at risk for a large subduction zone earthquake sometime within the next 200 years. The estimated magnitude of a subduction zone earthquake is approximately 8.7 to 9.2 on the Richter scale. The JWC plant was constructed in an area of soft, silty soils that have liquefaction potential. Its latest upgrade was designed to meet current seismic codes, with components such as the stone columns constructed beneath the flocculation/sedimentation basins to reduce the risk of liquefaction failure. The older plant components would be at greater risk of damage since they were built prior to the Zone III rating. However, the design of the latest plant expansion and upgrades provides a reliable path of treatment following a major earthquake. The Barney Reservoir and Hagg Lake expansions were designed to meet Maximum Credible Earthquake Standards.

Contractual Considerations

Peak Demand Outstripping Contractual Supply

Population growth projections over the next 50 years are showing that total peak customer demands would increase rapidly, from 50 MGD during 2004 to 78 MGD during 2050 even with conservation. TVWD experienced a peak demand of 53 MGD in July 2004. TVWD was able to lease additional capacity from another member of the JWC to make up the shortfall. During 2005 TVWD signed a five-year leasing agreement with other members of the JWC for additional supplies. TVWD is also using its conservation programs as one way to "stretch" our supplies, while we develop additional water sources for an expected future population boom.

Water Rights Withdrawal Limitations

Currently, the City of Portland makes 42.3 MGD available to TVWD through its gravity delivery system. As an owner of the JWC, the District owns 10 MGD from the 60 MGD treatment plant.

Expired Water Purchase Contracts

TVWD owns the right to receive up to 42.3 MGD from the City of Portland through the Washington County Supply Line. When TVWD's contract expires in 2007, TVWD will need to replace those 42.3 mgd, either through a new contract with the City of Portland or through a new water source. As a result, TVWD has begun to explore alternative water source options.

The contract with JWC does not expire.

Planning for Future Events

TVWD has no bottlenecks, such as undersized pumps or small storage capacities, compared to maximum day demand.

TVWD would plan to use these same techniques again in the future—multiple sources, emergency wells, interconnections, and curtailment—should another shortage arise.

Wells

The District has three back-up wells, capable of supplying 3.39 MGD for more than one week during emergencies. One of the wells would require blow-off for one day before using, and all three have taste issues, although the water quality is within state and federal drinking water standards. There are 11 million gallons of water stored in an Aquifer Storage and Recovery (ASR) system at one of the sites, and an additional 300 million gallon ASR system in the permitting stages.

Interconnections

TVWD has agreements with neighboring jurisdictions to provide mutual aid and water supplies during emergencies.

TVWD has emergency interconnections with Hillsboro, Beaverton, West Slope Water District, the City of Tigard, and Raleigh Water District.

TVWD has six emergency interties with Hillsboro: three 12-inch connections, one 10-inch connection, and two 8-inch connections, all located on the west side of the distribution system. Several smaller non-metered interconnections between the two systems also exist. A jointly-owned 42-inch transmission line provides a direct connection between Hillsboro and TVWD supplies.

This transmission line also connects TVWD and the City of Beaverton. Through past operating agreements, TVWD has supplied Beaverton during emergency conditions by "wheeling" water through its system, allowing Beaverton to purchase as much as 4 MGD of additional JWC supply through the southside transmission line. This arrangement has hinged on an administrative policy with PWB to allow TVWD to take an additional 4 MGD of Portland supplies during emergency and peak conditions.

The West Slope Water District connection is a 10-inch turbine meter connection capable of delivering 5,500 gallons per minute (gpm). The Tigard connection is an 8-inch turbine meter connection capable of delivering 1,400 gpm, and the Raleigh Water District connection is a 6-inch connection capable of delivering 1,800 gpm.

The Metzger area of the District can only receive water coming from the City of Portland; it has no connections to the JWC.

Phased Curtailment Plan

TVWD's General Manager will decide when each of these four stages should be enacted:

Stage 1: Routine Summer Advisory

TVWD predicts that we will face these conditions each summer, as warm dry weather settles into the region and drawdown of the reservoirs begin. Summer water use typically doubles or triples winter use, as customers begin to irrigate their landscapes, wash cars, and use water for cooling purposes.

Water Reduction Goals & Objectives

Each user should strive to maintain, not exceed, average summer usage levels.

Triggers (any of these)

- Portland Water Bureau issues a "notice of drawdown," announcing the release of stored water in the Bull Run System.
- Portland Water Bureau activates groundwater wells as part of its supplies.
- Hagg Lake fails to fill 100 percent before summer (May 1). It holds 53,000 acre-feet (17.3 billion gallons).
- Barney Reservoir fails to fill 100 percent before summer (May 1). It holds 20,000 acre-feet (6.5 billion gallons).
- The JWC issues a "notice of drawdown," announcing the release of stored water.

Public Message: Voluntary Conservation Measures

- Each summer, TVWD asks its customers to use a voluntary outdoor watering schedule, based on the weather. Lawns only require one inch of rain per week; during rainy weeks customers do not need to water as much.
- Promote already-existing conservation messages, such as "Use Water Wisely!" See TVWD.org for a list of water saving ideas.

Possible TVWD Actions

- Stop TVWD hydrant flushing program until fall rains resume.
- Partner with Regional Water Providers Consortium and west side providers to send consistent conservation messages to the media.
- Place conservation reminders and tips in Water Words, bill message, and on TVWD's website and conservation hotline. Use various venues to distribute information. Set up public information booths where opportunities exist and look for other opportunities for public outreach, such as speaking engagements, etc.

Partners to Contact

- Work with local agencies to coordinate resources and uniform messages for water customers, and to prepare, review and/or update local water ordinances regarding curtailment enforcement.

Stage 2: Moderate Water Supply Shortage

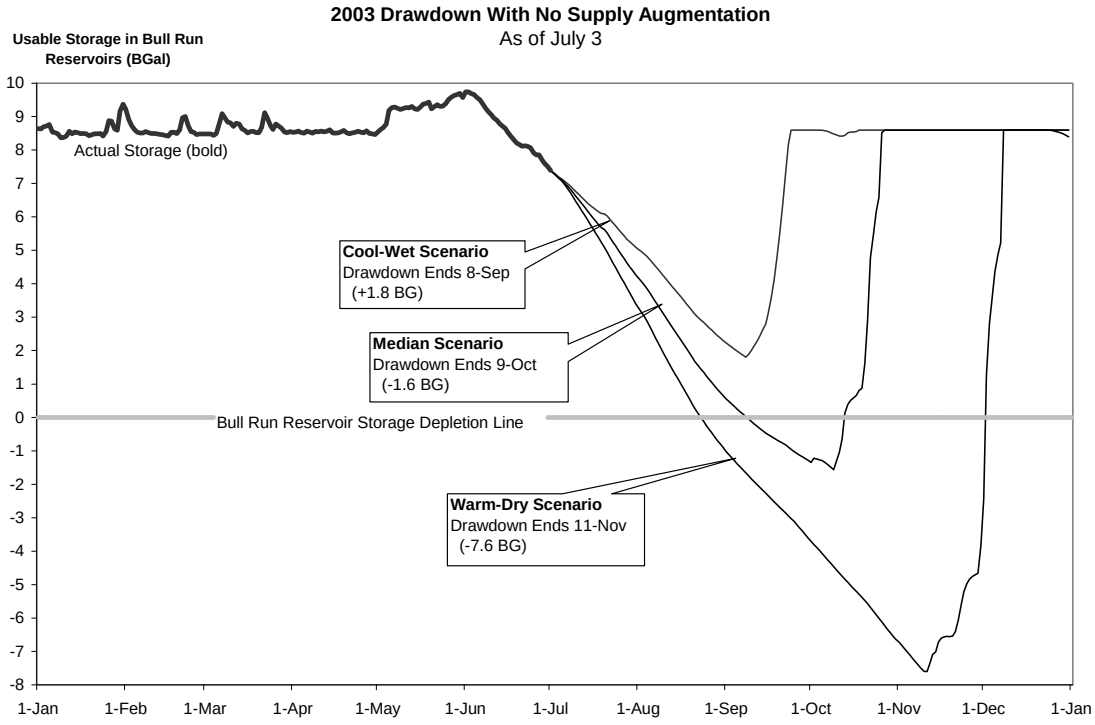
This may be a temporary condition of several days, caused by service interruptions in the region. During this time, TVWD may redirect supplies to areas experiencing shortages. Or, this may be an intermediate stage of an ongoing water supply shortage. Regional reservoirs may have begun "summer drawdown," with no rain in the forecast. Customers should voluntarily limit their use of water.

Water Reduction Goals & Objectives

Stretch existing supplies to last throughout the shortage. Decrease overall daily water use by 10 percent.

Triggers (any of these)

- Portland Water Bureau is operating under a warm-dry scenario [see the example diagram below, updated by city officials each year].



- Hagg Lake fails to fill 80 percent before summer begins on May 1 to 42,400 acre-feet (or 13.8 billion gallons). The JWC will only make the full allotment available to municipal users if the lake fills at least 80 percent.
- TVWD customer use reaches contractual and/or facility capacity for seven consecutive days.

Public Message: Voluntary Conservation Measures

- Reduce all water use by 10 percent (as a rule of thumb, for example, residential customers in a four-person single-family household should try to reduce their use by about 20 gallons per household per day during the winter and 27 gallons per household per day during the summer).
- Limit use of water in commercial businesses (e.g., do not serve water to restaurant customers unless specifically requested).
- Eliminate wasted running water, such as unattended hoses, obvious leaks, etc.

- Reduce watering of lawns, plants, trees, gardens, shrubbery, and flora on private or public property to the minimum necessary. Conduct outdoor watering during early morning hours to reduce evaporation (preferably between 4 and 8 a.m.; must conclude by 10 a.m.).
- Eliminate all other kinds of outdoor water use, including:
    a. Washing down of hard surface areas, decks, buildings, gutters, and vehicles;
    b. Use of freshwater in fountains, reflection ponds, and decorative water bodies for aesthetic or scenic purposes, except where necessary to support aquatic life;
    c. Filling or maintaining private swimming pools (you may use children's wading pools);
    d. Use of fire hydrants for any purpose other than firefighting or flushing essential to maintain water quality.

Possible TVWD Actions

- Issue a notice to the local media that the District is in a Moderate Water Supply Shortage.
- Send postcard notification of Moderate Water Supply Shortage to TVWD customers.
- Turn off automatic irrigation and water features in TVWD's demonstration garden.
- Provide reminders to non-efficient users (including customers who have been given a 30-day notice to repair one or more leaks and have failed to do so).
- Continue to encourage and educate customers to comply with voluntary water conservation.
- Routinely publish in the Beaverton Valley Times, Hillsboro Argus, Tigard Times, and The Oregonian the voluntary conservation measures that the customers are requested to follow during a Moderate Water Shortage.
- Place reminder messages on in Water Words, in the bill message and on the District Website, as well as on billboards, signs, bus-sides, and movie theatre ads.

Partners to Contact

- Contact potential institutional partners in water conservation, including local businesses that are the most affected (e.g. landscapers/green industry, commercial carwashes, nurseries, restaurants, water-intensive manufacturers, etc.).
- Ask cities/counties to postpone enforcement of landscape ordinances.
- Make conservation presentations to Homeowner Associations (HOAs) and Community Planning Organizations (CPOs).

Stage 3: Severe Water Supply Shortage

This is a stage of "restricted" watering; customers still have time to prepare and conserve before a loss of service. Scenarios include protracted period of drought (similar to the drought of 1992) or multi-day disruption of service across sections of TVWD's service territory. Such scenarios may not affect both of TVWD's water sources equally.

Water Reduction Goals & Objectives

Be able to re-direct unaffected supplies without removing any customers from the system. Decrease overall daily water use by 25 percent.

Triggers (any of these)

- Portland moves to groundwater sources entirely.
- The Portland system cannot meet supply demands of wholesale customers.
- JWC reservoirs drop below 40 percent of "normal conditions"; under such circumstances JWC enacts mandatory curtailment for its members.
- Water supplies fail to meet U.S. Environmental Protection Agency Safe Drinking Water Act standards.
- TVWD's distribution system experiences a significant and sustained reduction of water pressure.
- TVWD customer use reaches contractual and/or facility capacity for 14 consecutive days.

Public Message: Mandatory Curtailment Measures

- Water is in short supply.
- Reduce all water use by 25 percent (as a rule of thumb, for example, residential customers in a four-person single-family household should try to reduce their use by about 50 gallons per household per day during the winter and 70 gallons per household per day during the summer).
- TVWD will enforce its Water Supply Shortage Plan.
- Mandatory Actions include:
    a. Eliminating all outdoor water use, including:
        i. Irrigation of established lawns (those at least six weeks old). Exceptions include: commercial sod farms, high-use athletic fields that are used for organized play, and daycare providers. Residents may hand-irrigate ornamental plants, flowers, and vegetable gardens during early morning hours to reduce evaporation (preferably between 4:00 a.m. and 8:00 a.m.; must conclude by 10:00 a.m.);
        ii. Irrigation of golf courses. District water cannot be used to irrigate fairways or greens on golf courses. Hand watering of ornamental plants and flowers is

permitted during early morning hours to reduce evaporation (preferably between 4:00 a.m. and 8:00 a.m.; must conclude by 10:00 a.m.);

iii. Washing down of hard surface areas, decks, buildings, gutters, or vehicles. Wash-down is allowed for sanitary purposes only;

iv. Use of freshwater in ornamental fountains, reflection ponds, and decorative water bodies for aesthetic or scenic purposes, except where necessary to support aquatic life;

v. Filling or maintaining private swimming pools (you may use children's wading pools); and

vi. Use of fire hydrants for any purpose other than firefighting or flushing essential to maintain water quality.

b. Prohibit chemical applications to lawns that require subsequent watering.

c. Limit expanding commercial nursery facilities, placing new irrigated agricultural land in production, or planting or landscaping when required by site design review process.

d. Limit use of water in commercial businesses (e.g., do not serve water to restaurant customers unless specifically requested).

e. Repair leaks in hoses, faucets, and couplings.

Possible TVWD Actions

- Issue a statement that the District is experiencing a Severe Water Supply Shortage; notify the local media and send postcard notification to TVWD customers.
- Turn off automatic irrigation and water features in TVWD's demonstration garden.
- Cease water service to customers who have been given a 30-day notice to repair one or more leaks and have failed to do so.
- Implement the enforcement provisions of TVWD's Water Supply Shortage Plan.
- Routinely publish in the Beaverton Valley Times, Hillsboro Argus, Tigard Times, and The Oregonian the mandatory restrictions to be placed on the use of water supplied by the District.
- Through the media and public outreach efforts, including door hangers, publicize widely the penalties to be imposed for violations of mandatory restrictions and the procedures to be followed if a variance in the restrictions is requested.
- Place reminder messages on in Water Words, in the bill message and on the District Website, as well as on billboards, bus-sides, TV, radio, and movie theatre ads.
- Provide and advertise conservation hotline.
- Update and mail "What If Summer Doesn't End on Labor Day?" conservation brochure to customers.

- TVWD will not reimburse customers for bottled water or hotel stays resulting from any Water Supply Shortage.

Partners to Contact

- Remind business, industrial, and government (B.I.G.) customers of any letters of cooperation that TVWD may have signed with them to prepare for Stage 4 curtailment situations.
- Send pre-drafted letter of intent to local jurisdictions (Portland, Tigard, Hillsboro, and Beaverton) to let them know the District plans to begin issuing fines to any of their residents who are not complying with the District's mandatory restrictions.
- Inform landscape/green industry of prohibitions on irrigation and chemical applications that require irrigation.
- Work with Tualatin Valley Parks and Recreation to suspend irrigation of parks where applicable.
- Work with jurisdictions and HOAs to temporarily suspend regulations that require the use of water (Landscape Ordinances, etc.).

Stage 4: Critical Water Supply Shortage

This may include emergency conditions under which little or no water is flowing to customers (as in the case of natural disasters that result in sudden and acute water loss). It may be necessary for the District to proceed directly to Stage 4. Or, this scenario may indicate an extended period of time in which demand outstrips supply.

Water Reduction Goals & Objectives

Protect safety, health, and economic livelihood. Decrease overall daily water use by 50 percent or more.

Triggers (any of these)

- Portland offloads TVWD from its system and JWC cannot meet TVWD's resulting demands for water.
- JWC offloads TVWD from its system, and Portland supplies cannot make up the difference.
- Supplies are either physically cut off or become unavailable.
- TVWD customer use reaches contractual and/or facility capacity for 28 consecutive days.

Public Message: Mandatory Curtailment Measures

- Water will be used for drinking, cooking, and sanitation purposes only.
- Reduce all water use by 50 percent (as a rule of thumb, for example, residential customers in a four-person single-family household should try to reduce their use by

about 100 gallons per household per day during the winter and 140 gallons per household per day during the summer).

- Eliminate use of water at construction sites.
- Enforcement of TVWD's Water Supply Shortage Plan includes fines.

Possible TVWD Actions

- Issue a statement that the District is experiencing a Critical Water Supply Shortage.
- Issue media releases.
- Continue to enforce Water Supply Shortage Plan with warnings, fines, and discontinued service if necessary.
- Place reminder messages on in Water Words, in the bill message and on the District Website, as well as on billboards, bus-sides, TV, radio, and movie theatre ads.
- Provide and advertise conservation hotline.
- If necessary, conduct the following emergency actions:
  a. Activate TVWD's Emergency Operations Center (EOC).
  b. Begin rationing water as needed.
  c. Activate any curtailment agreements previously negotiated with B.I.G. customers.
  d. Open interconnections with neighboring water suppliers.
  e. Bring emergency wells on-line.
  f. Declare emergency (per TVWD Purchasing Policy) to allow suspension of the normal bidding process.
  g. Place a moratorium on all new water service connections and new water main extensions. Provide notice to developers of the moratorium.
- TVWD will not reimburse customers for bottled water or hotel stays resulting from any Water Supply Shortage.

Partners to Contact

- Ask Tualatin Valley Fire & Rescue Fire Marshall to issue statement banning burning or construction (because these activities are possible fire hazards).
- Activate any previously agreed upon curtailment arrangements with B.I.G. customers.
- Inform developers of the moratorium on all new water service connections and water main extensions.
- Notify and work with neighboring water providers.
- Activate partnerships with bottled water manufacturers, National Guard, Red Cross or other water distributors if needed.

- Contact the Washington County Office of Consolidated Emergency Management for additional resources.

Related Documents

A. American Water Works Association. *Water Resources Planning Manual*. Page 90.

B. JWC. **Resolution 3230**. July 13, 1993. This resolution created an interim water conservation plan for the JWC.

C. JWC. "Water Management Plan of 1998/Water Management Plan Update of 2003." Final Report. Montgomery Watson Harza.

D. Oregon Revised Statute 536-700 allows the state to declare an emergency and require water suppliers within a drought area to adopt and implement a water conservation or curtailment plan.

E. Oregon Administrative Rule 690-019-0070 "Drought Mitigation Rules"

F. City of Portland's Water Bureau /Wholesalers. *Intergovernmental Water Purchase Agency Agreement*. Signed Sept. 20, 1979; expires during 2007.

In times of water shortage, water use will be curtailed to the extent permitted by law in the following order. The curtailment contemplated by Items 1 through 3 will be applied uniformly to all users.

1. Restriction of uses that can be accomplished without serious injury to person or property and prohibition of non-essential uses.
2. Prohibition of irrigation except for commercial greenhouses.
3. Prohibition of every use except for domestic use and for essential commercial enterprises and industry.
4. Prohibition of all use outside the city except domestic uses.
5. Prohibition of all use inside the city except domestic uses.

Each year, the City of Portland provides additional planning details to its wholesale customers, by publishing a "Seasonal Water Supply Augmentation and Contingency Plan." The most recent version was produced May 12, 2004. In it, Portland officials outline three summer supply scenarios. A Cool-Wet scenario line depicts how much water would be needed if the summer were unusually wet and cool. The Warm-Dry scenario describes how much water would be needed if the summer is unusually dry and hot. As the scenarios become more hot and dry, customers not only require more water for drinking, bathing, and outdoor water needs, but the city itself has increased requirements to release water into Bull Run River in order to lower temperatures and increase flows for fish habitat.

The May 2004 correspondence also outlines various water supply curtailment options. For example, in Tier 1, the City of Portland would decrease supplies to Clackamas River Water, it would drop water supplies in Bull Run Lake to an elevation of 3,152 feet, and it would request voluntary curtailment measures. In Tier 2, it would decrease supplies to

Milwaukie, Oregon, it would drop level of both Bull Run Lake and Bull Run Reservoirs, it would implement mandatory curtailment measures, and it would offload TVWD's wells.

G. Oregon Water Utilities Council, SDAO, LOC, and Oregon WRD. Water Management and Conservation Plans: A Guidebook for Oregon Municipal Water Suppliers. May 2003.

H. Tualatin Valley Water District. Ordinances No. 1-92 and 2-92, Amending the District's Rules and Regulations Regarding Water Conservation and Declaring an Emergency. 1992.

Ordinance 2-92 is paraphrased below.

…In the event the Board of Commissioners shall by minute order, resolution, or ordinance determine that conditions exist by which require the restriction and/or prohibition of use of water in order to protect the health, peace, safety, and welfare of the customers of this District, the Board shall establish a schedule of use restrictions and prohibitions…Upon such action by the Board, water shall not be used within the boundaries of the District except for domestic uses of drinking, bathing, and other household uses.

- It shall be expressly prohibited to water, sprinkle, or irrigate lawns, grass, or turf unless it is new lawn, [has received a one-time application of] pesticides and fungicides, part of a commercial sod farm, high use athletic fields that are used for organized play, golf tees and greens, park and recreation areas deemed by the Board to be of particular significance and value to the community, and daycare providers.
- Watering, sprinkling, or irrigating of flowers, plants, shrubbery, groundcover, or trees may only occur between Sunday at 6:00 p.m. to Monday at 10:00 a.m., and between Wednesday 6:00 p.m. to Thursday at 10:00 a.m.
- Customers may not wash, wet down or sweep with water any sidewalks, walkways, driveways, parking lots, open ground or other hard surfaced area unless there is a demonstrable need in order to meet public health and safety requirements, or in preparation for painting, repair, remodeling or reconstruction.
- Customers may not wash land- or water-borne vehicles, except in circumstances listed above.
- Customers should wash windows with a bucket and squeegee.
- Repair leaks in hoses, faucets, and couplings.
- Filling any container, vessel, or tank within the District's water distribution system for the purposes of irrigating lawn, grass or turf for a fee or other compensation is prohibited.

These restrictions shall be enforced with the delivery of a notice of violation, followed by fines in $100, $300, and $500 increments. Nothing herein shall prevent the District from seeking an injunction to prohibit violation of the District's Rules and Regulations, which may include disconnection of water service.

I. Tualatin Valley Water District. Ordinance 1-99. An Ordinance Amending Rules and Regulations. Excerpts of Ordinance 1-99 are below.

"Use of Water." …In the event that the Board of Commissioners shall determine that conditions exist which require the restriction or prohibition of use of water in order to protect the health, safety and welfare of the customers of the District, the Board shall establish a schedule of use restrictions and prohibitions. The schedule shall indicate the uses prohibited or restricted and the period or periods of prohibited and/or restricted use. Any customer using water in violation of said adopted schedule shall be given notice in writing by the District of said violation, which notice shall advise the customer that if said unlawful use is not discontinued upon delivery of said notice, the water service to said premises shall be terminated. The notice of violation and termination shall be delivered to the user of the premises at which the unlawful use is occurring. If the District is unable for any reason to serve said notice on the user personally, the then said notice shall be posted on the premises and said posting shall constitute delivery of notice.

"Private Pool and Tank." When water is to be used for filling a swimming pool, tank, or other uses, which require abnormally large quantities of water, authorization must be obtained from the District prior to the taking of such water.

City of Tigard Curtailment Plan

This section fulfills the requirements of OAR 690-086-0160 (1) – (4).

Introduction

Curtailment planning is the development of proactive measures to reduce demand during supply shortages due to prolonged drought, or system failure from unanticipated catastrophic events (e.g. flooding, landslides, or contamination).

The goal of this curtailment plan is to have objective criteria that trigger actions that will ensure sufficient water to meet the water demands of the water supply system, without jeopardizing the health, safety or welfare of the community.

The curtailment plan presented in this section is based on portions of the City of Tigard's Water System Rules and Regulations ordinance, and is updated to comply with Division 86 requirements.

History of System Curtailment Episodes

OAR 690-086-160(1)

The City of Tigard has not experienced supply deficiencies during the past ten years. This is primarily because of the city's multiple water supply options and inter-ties with other water supply systems.

Curtailment Stages

OAR 690-086-160(2), (3) and (4)

The City of Tigard's curtailment plan, presented here, has four levels of increasing severity:

- Stage 1 – Voluntary
- Stage 2 – Limited
- Stage 3 – Moderate
- Stage 4 – Severe

The curtailment stages will be triggered by the criteria presented in **Exhibit 4-4**.

EXHIBIT 4-4
City of Tigard Water Shortage Stages and Initiating Conditions

Shortage Stage	Initiating Conditions
Stage 1 Voluntary	General recognition of drought conditions in Washington County; or Very hot, dry weather is forecasted.
Stage 2 Limited	Drought Emergency for Washington County declared by the Governor; or Supply capacity is 91 -100 percent of demand.
Stage 3 Moderate	Continuation of hot, dry weather predicted; Supply capacity is 81 – 90 percent of demand ; or Any other unanticipated reduction in supply or distribution system capacity.
Stage 4 Severe	A major transmission line break, contamination of multiple wells, a natural disaster or terrorist act resulting in deprivation of water supply, or other unanticipated catastrophe that severely curtails water supply capacity; or Supply capacity is less than 80 percent of demand.

Stage 1: Voluntary

If there is a general recognition of drought conditions in Washington County or very hot, dry weather is forecasted, a Stage 1 Voluntary alert will be activated.

The City Manager will implement the actions below. The goal under Stage 1 is to reduce demand by approximately 5 percent.

When Stage 1 is triggered, the city will request its customers to voluntarily comply with the following measures:

1. Minimize landscape watering between 10:00 a.m. and 6:00 p.m., the period of highest water loss due to evaporation.
2. Water landscaping on alternate days (even numbered addresses water on even numbered days and odd numbered addresses water on odd numbered days).
3. Implement other conservation measures such as those suggested by the city's website.

Stage 2: Limited

If a Drought Emergency for Washington County is declared by the Governor or if the city's water supply capacity is 81 to 90 percent of demand, a Stage 2 Limited alert will be activated.

The City Manager will implement the actions below under Stage 2. The goal under Stage 2 is to reduce demand by approximately 10 percent.

When Stage 2 is triggered, the city will prohibit the following activities or actions:

1. Watering, sprinkling or irrigating lawn, grass or turf; exceptions:
    a. New lawn, grass or turf that has been seeded or sodded 90 days prior to declaration of a water shortage may be watered as necessary until established;
    b. High-use athletic fields that are used for organized play;
    c. If the Stage 2 declaration so provides, a mandatory rotational watering plan may be imposed rather than an absolute prohibition on watering.
2. Watering, sprinkling or irrigating flowers, plants, shrubbery, ground cover, crops, vegetation or trees except from 6:00 p.m. to 10:00 a.m.
3. Washing, wetting down or sweeping with water, sidewalks, walkways, driveways, parking lots, open ground or other hard surfaced areas; exceptions:
    a. Where there is a demonstrable need in order to meet public health and safety requirements, such as: to alleviate immediate fire or sanitation hazards; for dust control to meet air quality requirements mandated by the Oregon Department of Environmental Quality;
    b. Power washing of buildings, roofs and homes prior to painting, repair, remodeling or reconstruction, and not solely for aesthetic purposes.
4. Washing trucks, cars, trailers, tractors and other land vehicles or boats or other water-borne vehicles, except by commercial establishments or fleet washing facilities that recycle or reuse the water in their washing processes or by bucket and hose with a shut-off mechanism; exception:
    a. Where the health, safety and welfare of the public are contingent upon frequent vehicle cleaning, such as: to clean garbage trucks and vehicles that transport food and other perishables, or otherwise required by law. Owners/operators of these vehicles are encouraged to utilize establishments that recycle or reuse the water in their washing process.
5. Cleaning, filling or maintaining decorative water features, natural or manmade, including, but not limited to, fountains, lakes, ponds and streams, unless the water is re-circulated through the decorative water feature. Water features that do not include continuous or constant inflowing water are not included.
6. Wasting water by leaving unattended hoses running.
7. Water line testing and flushing in connection with construction projects; exception:
    a. Testing and flushing of critical water facilities.
8. Other actions that the City Council determines should be restricted, consistent with a Stage 2 situation, including any restriction or curtailment imposed on the city by water suppliers or applicable law, regulation or order.

Stage 3: Moderate

If continuation of hot, dry weather is predicted or if the city's water supply capacity is 81 to 90 percent of demand, as a result of a natural or human-caused event, a Stage 3 - Moderate alert will be activated.

Under Stage 3, the City Manager will implement the following curtailment program elements with a goal of reducing demand by approximately 20 percent. All of the following actions and activities are prohibited:

1. Actions and activities prohibited in a Stage II situation.
2. Watering of any lawn, grass or turf, regardless of age or usage.
3. Watering, sprinkling or irrigating flowers, plants, shrubbery, groundcover, crops, vegetation or trees.
4. Washing of vehicles other than in establishments that recycle water.
5. Power washing of buildings, regardless of purpose, is prohibited.
6. Any additional actions that the City Council determines should be restricted consistent with a Stage 3 situation.

If needed, water distribution areas will be identified on the city's website, on the radio, and through county dispatch phone calls.

Stage 4: Severe

A Stage 4- Severe alert will be put into effect by the City Manager if the water supply capacity is less than 80 percent of demand for any reason, whether natural or human caused. The goal under Stage 4 is to reduce demand by more than 20 percent or more and to maintain potable water supplies for human consumption and for public health and safety.

The city will inform customers where to obtain potable water if a shortage or contamination occurs and as necessary will implement its emergency plan.

In addition to the restrictions imposed under Stage II and Stage 3, the City Council may impose any other restriction on water use or activities that may require the need for water supplies, consistent with the city water supply contracts. Activities that may require the need for water supplies include fireworks displays and other events that create a risk of fire. In imposing a Stage 4 restriction, the City Council shall consider any restriction recommended by the Public Works Director or by any Fire District serving the city.

Public Information Program

For all alert levels, the public information program elements will include:

1. Contacting local media outlets to publicize the voluntary or required measures, the potential for water shortages or temporary interruptions to normal service delivery.
2. Posting pre-prepared public service announcement and links to conservation tips on the City of Tigard's webpage.

3. Providing notice on water bills or through utility bill inserts.
4. Providing handouts to field personnel with direction to remind customers of voluntary and required measures and shortage status.

For alert levels III and IV, the city will use the "Code Red" automated voice phone notification system to notify people within the Tigard service area of the implementation of curtailment measures.

Authority

Any water curtailment order by the City Manager, or designee, will be reviewed by City Council at its next session following issuance of the order. The City Council may affirm, withdraw or amend the order.

SECTION 5

Water Supply

This section satisfies the requirements of OAR 690-086-0170.

Delineation of Service Areas

OAR 690-086-0170 (1)

The JWC's five member agencies are located in incorporated and unincorporated areas of Washington County in the greater Portland metropolitan region. All member agencies fall under the jurisdiction of the Metro Regional Government (Metro). Metro provides a variety of services for the metropolitan area, including oversight of land use planning and development. Individual government entities must work within the structure that Metro provides when considering expansion of urban growth boundaries. Metro is currently in discussions with local government agencies in the Portland Metro area in a process that will identify and outline potential urban reserve areas for future growth.[11]

Metro has projected that an additional one million people will move into the Portland metropolitan area by 2030, including an additional four to five hundred thousand people within the JWC service area in Washington County. Because Washington County has significant land area zoned and available for industrial development, growth of several industrial sectors is expected. Potential industries include high tech chip manufacturers, solar equipment manufacturers, and bio-tech research firms. These industries will provide employment opportunities, and will require water. JWC member agencies have been working closely with Metro to identify urban reserve areas for water service in Washington County to meet anticipated future industrial and residential growth, and have developed water use projections based on these efforts.

A discussion of existing service areas is contained in Section 2. Exhibit 2-1 is a map of the existing service areas of the five JWC members. At this time the Cities of Forest Grove and Tigard, and TVWD do not expect their water service areas to expand within the next 20 years. However, all JWC member agencies will adjust their service areas within the process of Metro's urban growth boundary expansion structure. Future demand projections for these three JWC members will include additional areas identified in the final report of the Metro Urban Reserve Study. Initial findings from the Metro study indicate that expansion of infrastructure in Washington County may be favorable compared to other areas of the Metro region.

Exhibit 5-1 shows current and potential urban reserve areas for the Cities of Hillsboro and Beaverton. The areas outside of the Urban Growth Boundary highlighted in Exhibit 5-1 have been included in Hillsboro and Beaverton's Comprehensive Land Use Planning Process. The areas outlined in blue (dark and light) have been included in Hillsboro's current water

[11] MORE INFORMATION ABOUT THIS PROCESS IS AVAILABLE AT THE FOLLOWING WEB ADDRESS: http://www.oregonmetro.gov/index.cfm/go/by.web/id=26257

demand projections. The areas outlined in purple (potential urban reserves identified for Hillsboro water service) and orange (potential urban reserves – provider to be determined) will be included in subsequent demand projections by the appropriate water service provider.

Population Projections

OAR 690-086-0170 (1)

JWC members regularly assess their service populations and project future service populations for master planning efforts, and for regional demand planning efforts.

JWC members use population data from Portland State University's Population Research Center, population data provided by Metro (such as the Traffic Analysis Zone (TAZ) population estimates for the year 2030 developed for the "2000-2030 Regional Forecast" (Metro 2002)), and long-range county-wide population projections developed by the Office of Economic Analysis (OEA). **Exhibit 5-2** presents both historic population growth for Washington County reported by PSU's Population Research Center, and the county-wide population projection developed by the Office of Economic Analysis. The historic average annual growth rate between 1990 and 2000 was 3.7 percent, and from 2000 to 2008 was 1.8 percent. The Office of Economic Analysis population projections used annual growth rates adjusted every five years from a high of 2.05 percent in the period 2005 to 2010 to a low of 1.50 percent in the period 2035 to 2040; the overall average annual growth rate from 2000 to 2040 was 1.8 percent.

EXHIBIT 5-2
Historic and Projected Population within Washington County

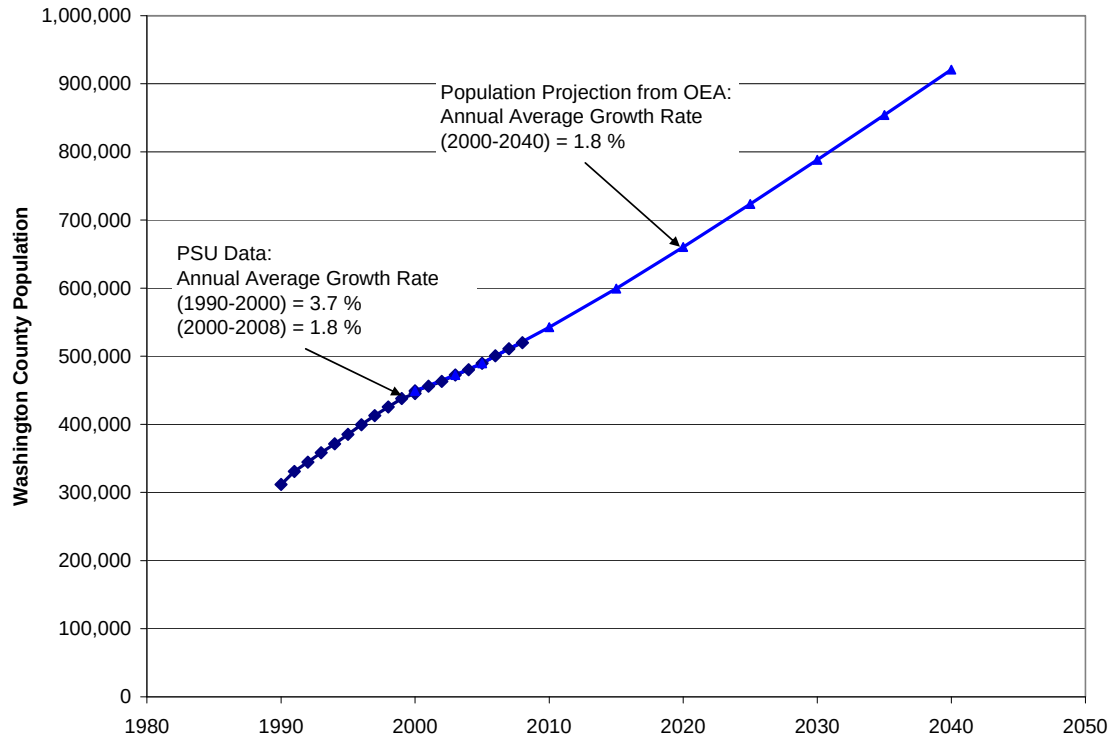
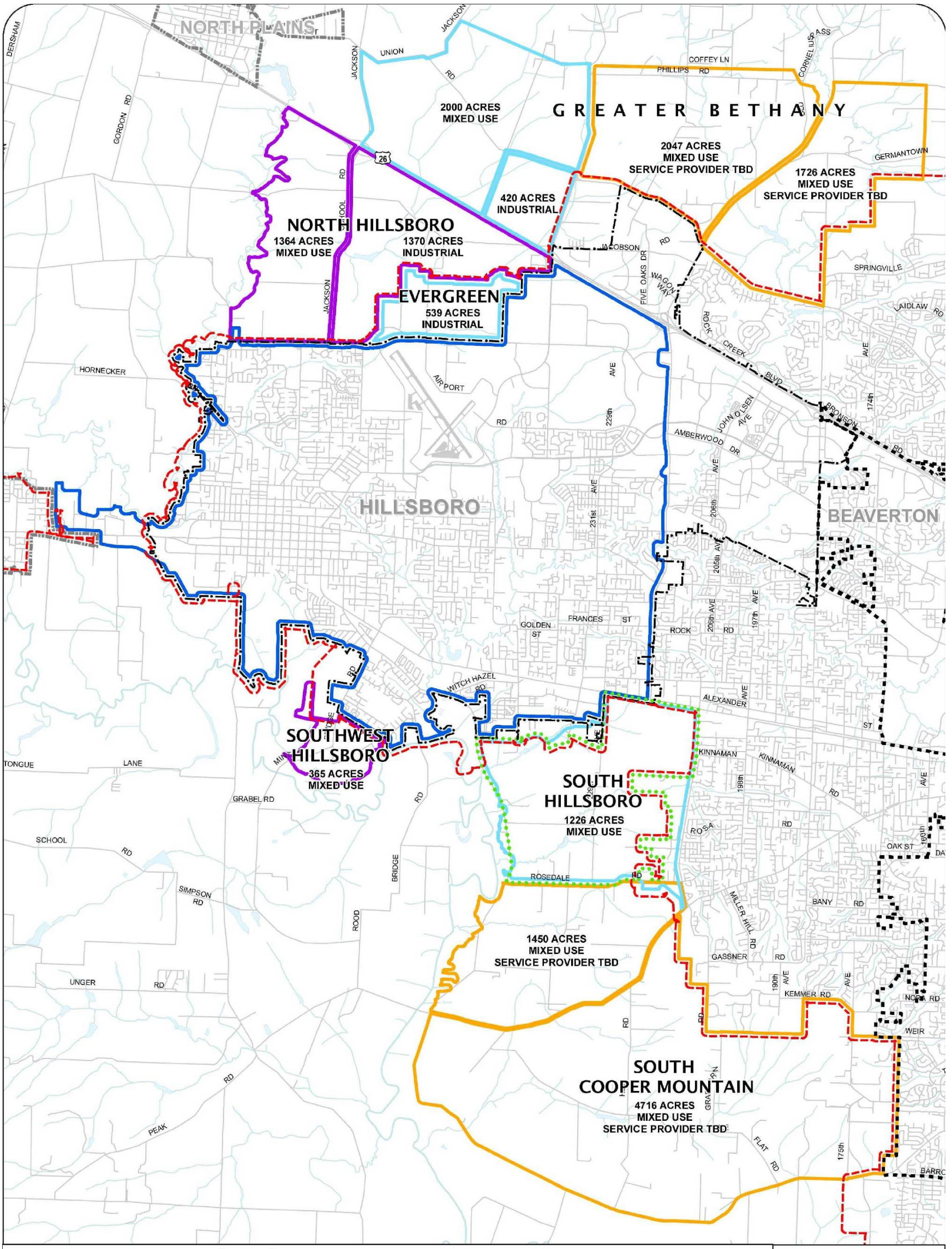


EXHIBIT 5-1
Potential Water Service Areas for the Cities of Hillsboro and Beaverton



MAP NOTES TO USERS

Map Scale:	1:60,000
Created By:	Steve Kincade Black & Veatch
Date:	November 2008
Altered By:	Kristel Fesler City of Hillsboro
Date:	June 2009
Sources:	City of Hillsboro Washington County Metro Data Resource Center
Notes:	Urban Reserve Areas are defined by Metro Regional Government.

0 0.375 0.75 1.5 Miles

Legend

Base Features
- Urban Growth Boundary
- Hillsboro City Limits
- Beaverton City Limits
- Other City Limits
- City of Hillsboro Water Service Area
- Streets
- Rivers
- Waterbodies

Potential Urban Reserves
- Current Urban Reserve Area
- Areas included in Hillsboro's Demand Projections
- Areas to be included in subsequent Demand Projections
- Water Service Provider To Be Determined

DISCLAIMER
This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

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JOINT WATER COMMISSION

WATER MANAGEMENT AND CONSERVATION PLAN

POTENTIAL URBAN RESERVES MAP (2008)

Exhibit 5-3 presents population projections, to the nearest 1,000 people, developed by JWC member agencies.

EXHIBIT 5-3
JWC Member Agency Service Population Forecast

Year	Hillsboro	Forest Grove[1]	Beaverton	TVWD[2]	Tigard[3]	Overall
2010	83,000	21,000	67,000	201,000	57,000	429,000
2025	107,000	30,000	86,000	241,000	62,000	526,000
2050	117,000	36,000	87000	312,000	70,000	622,000

[1] Forest Grove 2000 Water Master Plan estimated ultimate population to occur in the year 2034

[2] TVWD 2007 Water Master Plan Update

[3] Cities of Lake Oswego and Tigard Joint Water Supply System Analysis Technical Memorandum No. 1 & Tigard's 2000 Water Master Plan: buildout in 2045.

Demand Forecast

OAR 690-086-0170 (3)

Several sources were used to estimate future demand for JWC and member agencies. Each member agency routinely projects future demand to plan for infrastructure needs during water system master planning activities. Projections developed for the *Tualatin Basin Water Supply Study* are based on demand projections developed by individual members through their own master planning efforts.[12] ADD, MDD, and peak season demand (PSD) were projected. JWC defines peak season as the six month period from May 1 through October 31, and non-peak season as the remaining six months of the year. Even though May and October are included in the peak season, demand during these months is higher than the average non-peak season demand (NPSD) and lower than the MDD. Because JWC's water right Permit 50879 for 75 cfs (48 mgd) includes the months of May and October, both NPSD and demand during the months of May or October were projected for this plan.

Assumptions associated with the demand projections are described below. With the exception of Hillsboro, JWC members used the constant per capita demand method for projecting future water demands. The City of Hillsboro used an integrative land use analysis to project demand. Per capita demand factors were estimated based on historic data, adjusted to reflect reduction in demand because of conservation, and including safety factors to account for annual variation in demand and fire suppression requirements. Therefore, some per capita demands used for demand projections differ from the 2007 per capita demands reported in Exhibit 2-59.

[12] *Technical Memorandum 04, Member Partner Supply and Demand Summary-DRAFT*, Black & Veatch Corporation

ADD and MDD Forecast Methodology by JWC Member Agency

Hillsboro

Projections were developed by City of Hillsboro staff based on projected land use development and unit demands for each customer class in gallons per acre per day. An integrative land use demand projection was used because of the significant amount of industrial water usage (35 to 40 percent of total demand) in Hillsboro's service area and the amount of undeveloped industrial land. Customer classes included single-family residential, multi-family residential, commercial, industrial, irrigation, and wholesale customers. Hillsboro's entire service area including its Upper System was assumed to be supplied by the JWC for an emergency back-up supply because the Cherry Grove slow sand filtration WTP frequently experiences service interruptions from turbidity events. Demand projections for the LA Water Cooperative and the Cities of Cornelius, Gaston, and North Plains were included in the Hillsboro demand projections as wholesale customers. Peaking factors specific to customer classes were used to estimate MDD from projected ADD.

Forest Grove

Projections were based on the Forest Grove 2000 *Water Master Plan*, updated to include the most recent water demand trends, population forecasts, and per capita demand factors.

Water use projections for the 2000 *Water Master Plan* included both land use analyses and population projections. Key forecasting factors in the master plan included an annual population growth rate of 2.23 percent and an average day per capita water demand of 199 gpcd. Master plan demand projections were updated using the same methodology but using a revised growth rate of 2.65 percent and a lower per capita demand of 160 gpcd. The recent reduction in per capita demand was attributed to successful conservation efforts. Demand forecasting includes a group of approximately 160 residential water customers outside Forest Grove's city limits in an area referred to as the Gales Creek Service Area. Buildout for Forest Grove's service area was estimated to occur in 2034. Forest Grove's own Clear Creek supply was subtracted from overall demand to determine the JWC projections. The division of ADD between JWC and Forest Grove's Clear Creek sources was based on the historical proportion of supply from each source. Under MDD conditions Forest Grove's water supply from the Clear Creek drainage is limited to a reliable summer stream flow of 1.5 mgd. Based on historical trends the MDD to ADD peaking factor was 2.0.

Beaverton

Projections were based on city staff update to projections in Beaverton's 2000 Water Master Plan. The City of Beaverton's water system current service area covers approximately 85 percent of the land area within the city limits and serves 80 percent of the city population. The service population was projected to stay at 80 percent of the city population into the future.

The overall average day per capita demand, including commercial and industrial demand, was 130 gpcd. This per capita demand was multiplied by population projections to obtain future demand projections. The ratio of commercial and industrial use to residential use was assumed to remain constant until buildout in 2026. Based on historical demand data, an MDD to ADD peaking factor was 2.0.

The city's population projections are benchmarked to the most recent population estimates and regional planning data developed by Metro and the Portland State University Center for Population Research and Census.

TVWD

Because of differences in the customer base and development within TVWD's two service areas, individual per capita demand factors and growth rates were used to project demands in the Wolf Creek and Metzger Service Areas. The Wolf Creek per capita demand factor was 117 gpcd, and Metzger per capita demand factor was 124 gpcd. These factors incorporated actual and expected reductions in per capita demand that TVWD anticipates from its water conservation programs. Per capita demand factors were assumed to remain constant through the projection period. The MDD to ADD peaking factor was 2.14 for the Wolf Creek Service Area and was 2.28 for the Metzger Service Area.

Tigard

City of Tigard demands were based on projections developed for 2005, and 2030 for the 2007 City of Lake Oswego and Tigard Water Service Area Joint Water Supply System Analysis. Saturation demands were based on Tigard's 2000 *Water Master Plan,* with buildout projected to occur in 2045. Demand for intermediate years was calculated by interpolation.

Tigard has entered into an agreement with the City of Lake Oswego to obtain water from Lake Oswego's WTP on the Clackamas River, rather than continuing to partner with the JWC. Tigard maintains an option to revive its relationship with JWC by July 2009, and intends to remain a preferred wholesale customer of the JWC for emergency back-up water supply.

Exhibits 5-4 and 5-5 present ADD and MDD projections, respectively, for individual JWC members and JWC as a whole through 2057. Because Tigard is expected to become a preferred wholesale customer, instead of a JWC member, the overall JWC demand projections with and without Tigard are presented.

At the end of the 20-year planning period in 2029, the JWC ADD is expected to approach 73 mgd without Tigard, and 80mgd with Tigard. By 2029 the overall MDD is expected to approach 127 mgd without Tigard and 140 mgd with Tigard.

EXHIBIT 5-4
JWC Member Agency and Overall ADD Projections

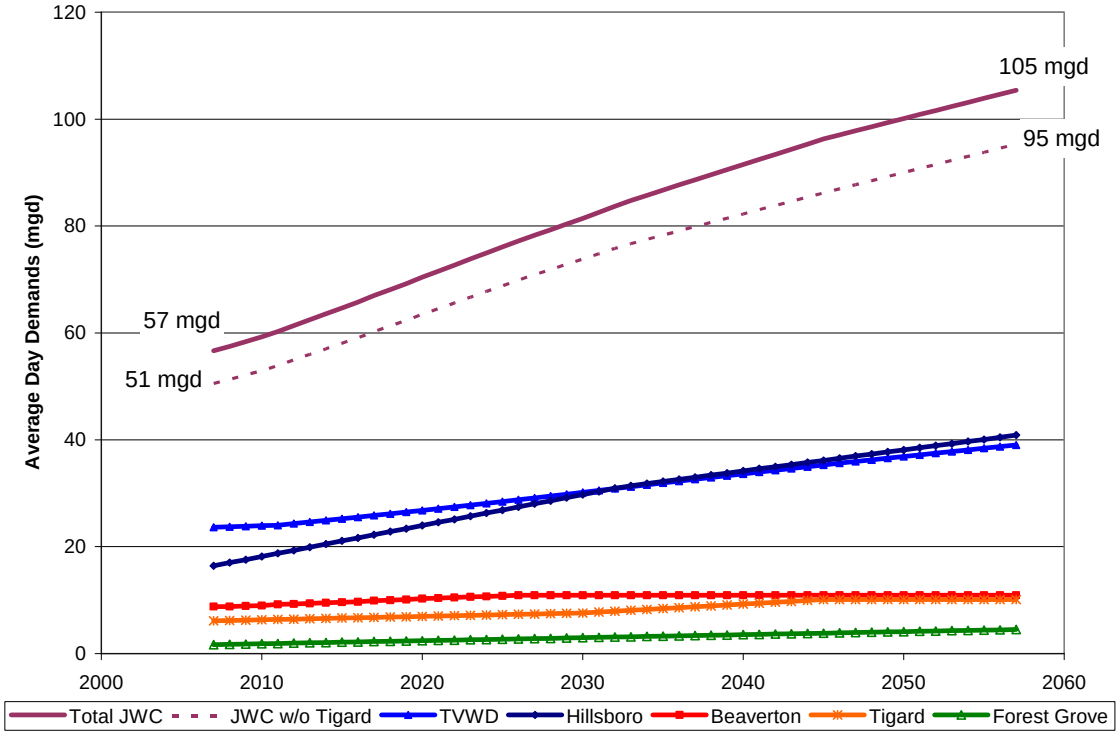
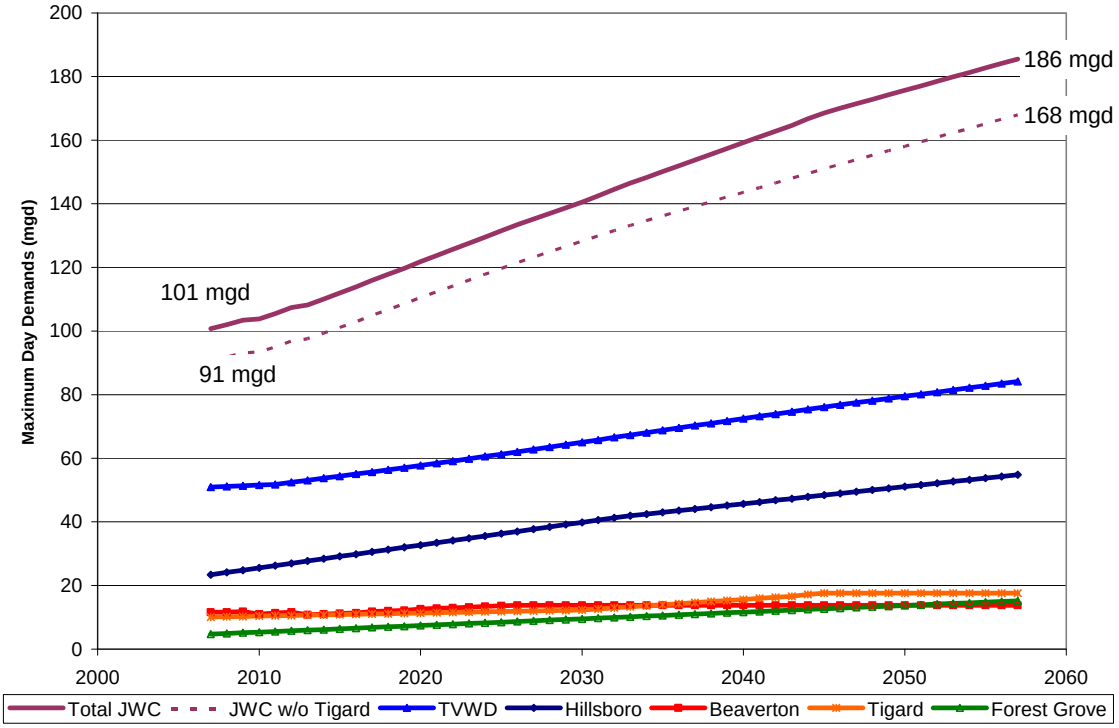


EXHIBIT 5-5
JWC Member Agency and Overall MDD Projections



Demand Forecast Methodology for Use of Natural Flow Rights

Non-peak season demand projections demonstrate the need for non-peak season water rights. Several water rights associated with the JWC are regulated off during the peak season. JWC's Permit 50879 for 75 cfs (48 mgd) includes the months of May and October.[13] Therefore, demand projections specific to these shoulder months also were determined.

One application of NPSD is for storage in ASR systems. Several JWC members have begun developing ASR projects, and the JWC is actively investigating additional ASR opportunities. [14] A recent evaluation indicates that ASR requirements may reach a maximum rate of 18.7 mgd by 2029.

Historical monthly demands[15] for all members except Tigard for the period 2002 through 2007 were averaged to develop the composite monthly demand curve shown in **Exhibit 5-6.** Also shown on the exhibit are the average ADD, and NPSD values for the six year period. Historically, average demand during the month of May and October has been approximately 92 percent of annual ADD, and the NPSD to ADD peaking factor has been 0.75. Error bars represent plus and minus one standard deviation from the average monthly demands. As shown on Exhibit 5-6 demands during the shoulder months of May and October approach and sometimes exceed the ADD. Therefore, ADD was used to estimate the anticipated demand during October and May.

Exhibit 5-7 presents projected NPSD for all JWC members except Tigard, potential JWC ASR development, and the sum of the two components of demand. The JWC total NPSD, including contributions to aquifer storage, is projected to be approximately 73 mgd (113 cfs) by 2029, and is projected to be approximately 90 mgd (140 cfs) by 2057.

The period for filling ASR systems includes the month of May, and possibly October. Therefore, **Exhibit 5-8** presents the projected May and October demand along with potential ASR development. The JWC total potential May or October demand, including contributions to aquifer storage, is projected to be approximately 92 mgd (142 cfs) by 2029, and is projected to be approximately 114 mgd (176 cfs) by 2057.

If for some reason the City of Tigard resumed its membership in the JWC, the total potential May demand would approach 99 mgd (153 cfs) by 2029 and 124 mgd (192 cfs) by 2057.

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[13] This permit has bypass requirements of 20 cfs (12.9 mgd) from October 1 through November 30, and 15 cfs (9.7 mgd) from December 1 through May 31.

[14] (JWC Master Plan 2009 Technical Memo: **DRAFT Cost Estimate and Planning to Develop Aquifer Storage and Recovery in the Tualatin Basin Within the Context of the Proposed Tualatin Basin Water Supply Project**)

[15] Monthly consumption data were used in place of demand data for the City of Hillsboro, and only the JWC portion of Forest Grove's demand were included. Forest Grove's Clear Creek WTP is expected to continue to supply Forest Grove's customers in the future.

EXHIBIT 5-6
Total JWC Member (excluding Tigard) Average Monthly Demand, Average Annual ADD, Average Annual NPSD From All Sources, 2002-2007

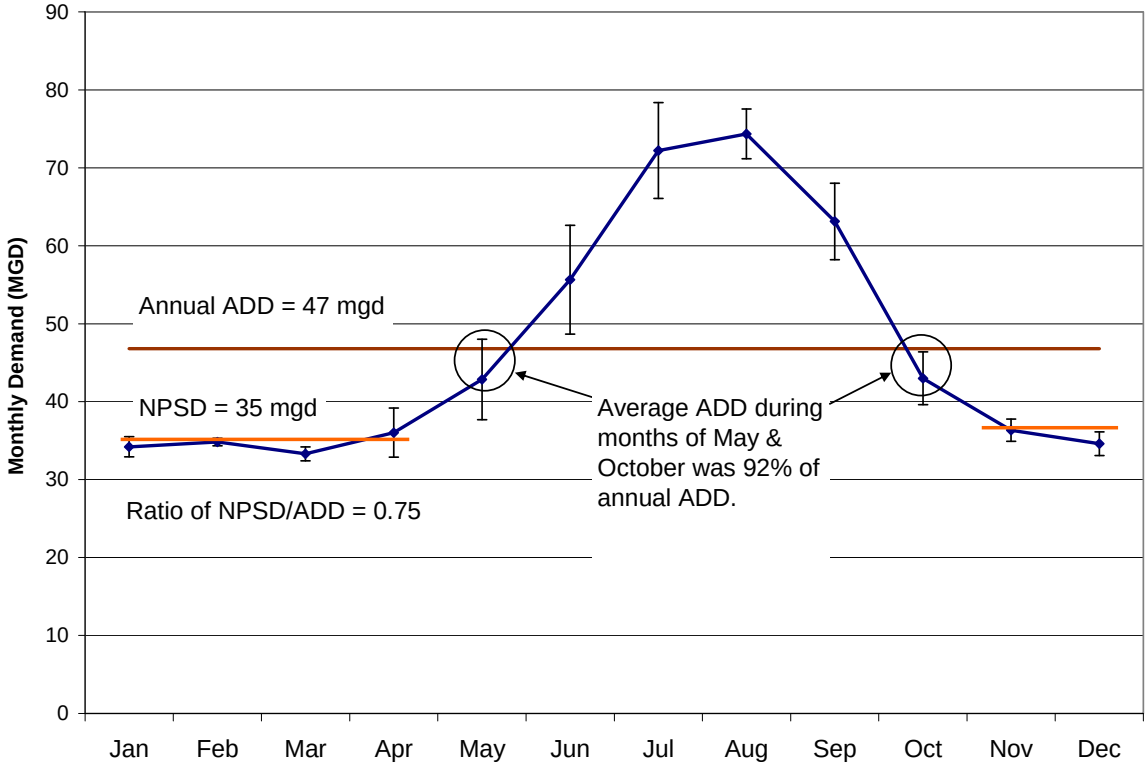


EXHIBIT 5-7
Total JWC NPSD Projection (excludes Tigard) and ASR Potential

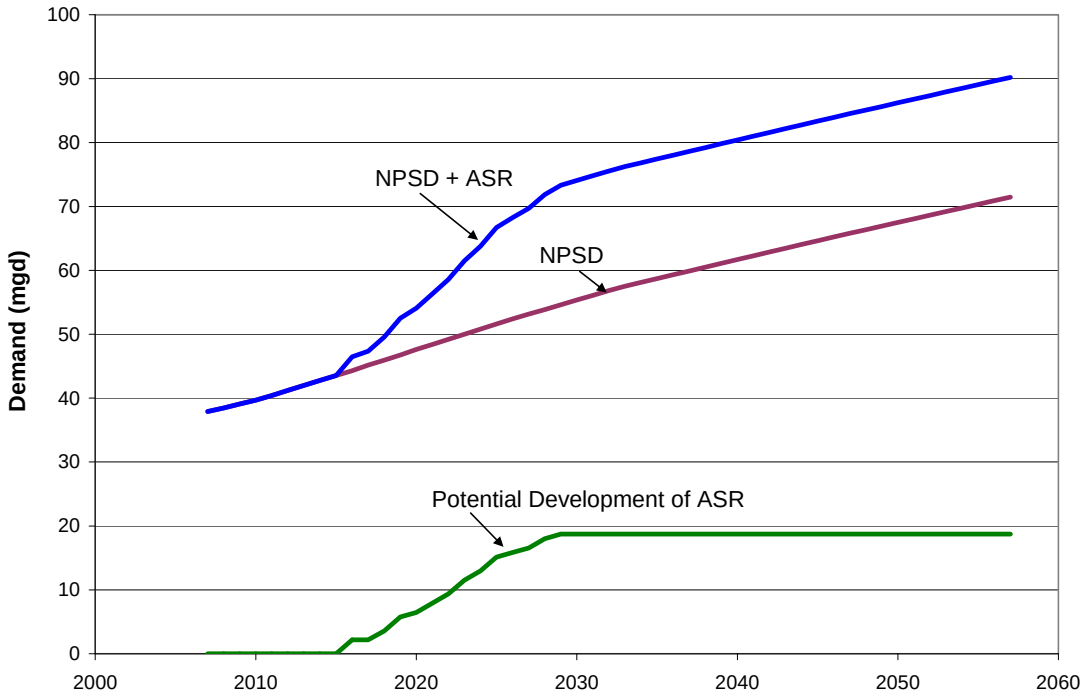
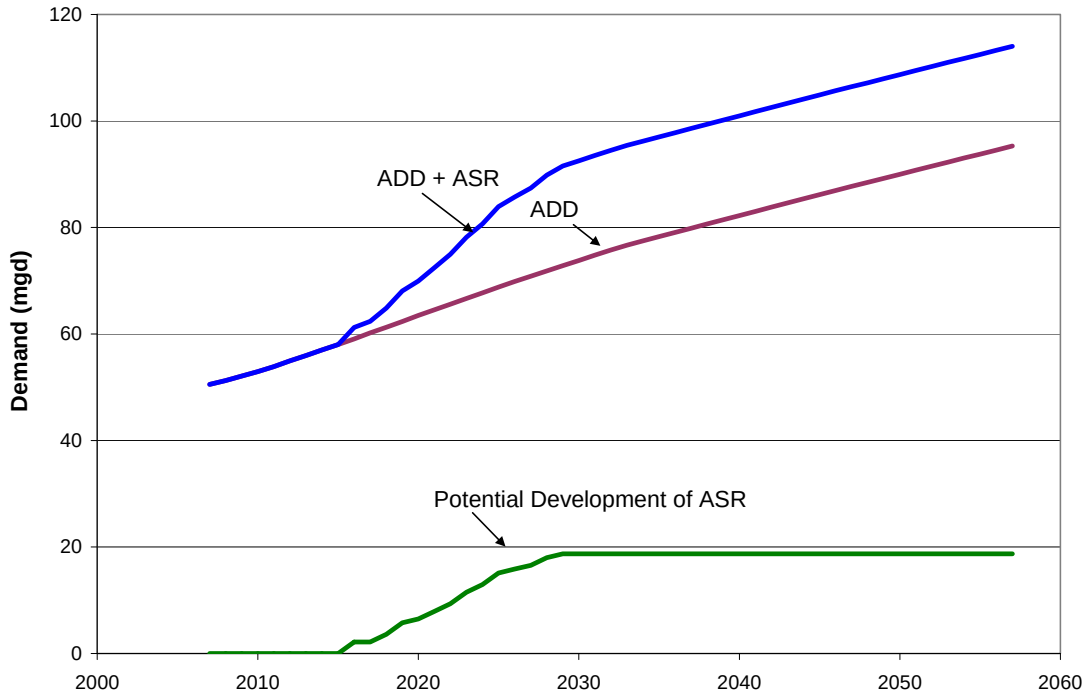


EXHIBIT 5-8
Total JWC May or October Demand Projection (Equals ADD and Excludes Tigard) and ASR Potential



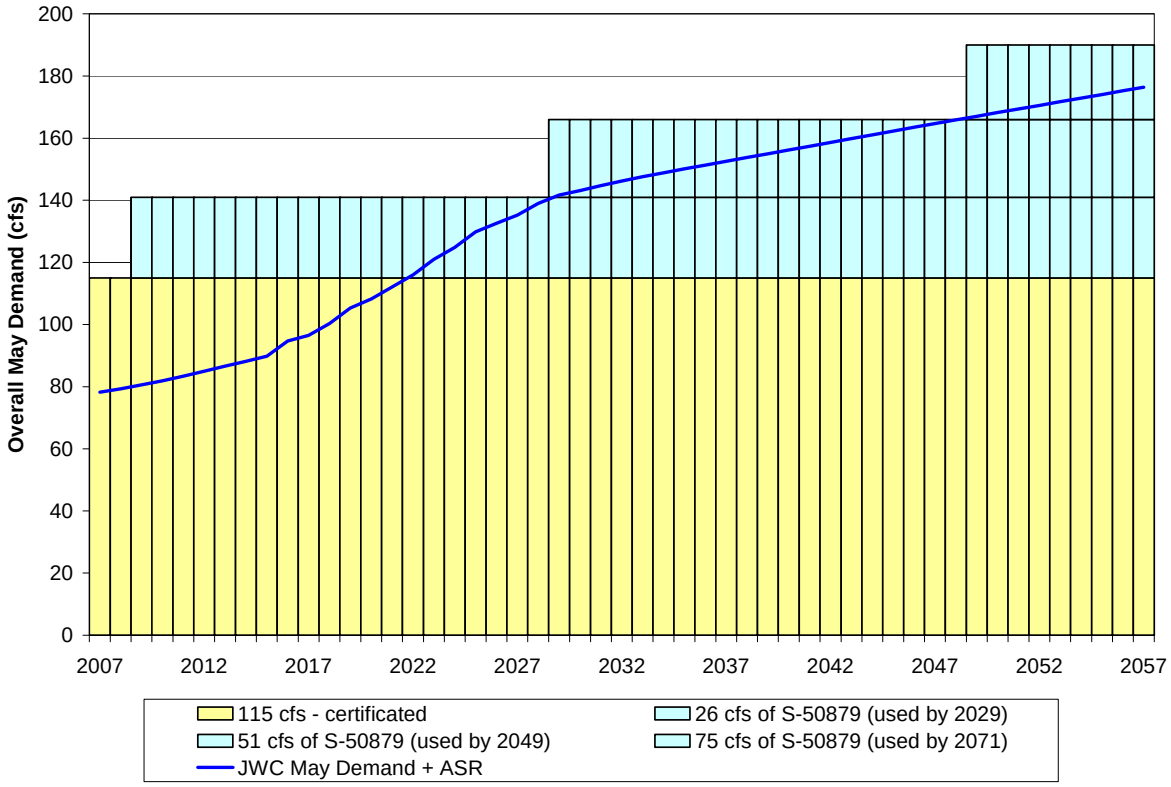
Schedule to Exercise Permits and Comparison of Projected Need to Available Sources

OAR 690-086-0170 (2) and (4)

As noted, the JWC water year is divided into two periods. During the peak season, defined as May 1 through October 31, JWC members rely primarily on stored water to meet demands. During the non-peak season of November 1 through April 30, JWC meets its NPSD with live flow water rights. JWC associated water rights that are available during the non-peak season total 74.3 mgd (115 cfs) (Certificates 81026, 81027, 67891, 85913, 85914, and 85916). In addition, the JWC has an extension application pending for its permit S-50879 for 48 mgd (75 cfs) that will be coordinated with the approval of this WMCP.

JWC's need to appropriate water under permit S- 50879 is based on demand during the month of May plus storage in ASR systems. **Exhibit 5-9** presents the total projected May demand (ADD) compared to JWC's water rights. Based on this projection, the JWC anticipates needing 26 cfs of water under permit S-50879 for the 20-year planning horizon. This 26 cfs is the projected "green light water" to be diverted under "extended permit" S-50879. A total of 51 cfs is expected to be needed by 2049, and extrapolating demand beyond the period shown, Permit 50879 is expected to be fully beneficially used by approximately 2071. If the City of Tigard resumed its membership in the JWC, 39 cfs of Permit 50879 would be needed by 2029, and the permit would be fully beneficially used by 2057.

EXHIBIT 5-9
JWC Projected Total May Demand Versus Water Rights



Quantification of Maximum Rate and Monthly Volume

690-086-0170(6)

JWC anticipates an initial diversion of water authorized under its existing permit S-50879 within the 20-year planning period. The anticipated maximum rate of diversion is 26 cfs, and the anticipated monthly volume is approximately 93 million gallons.

Alternative Non-Peak Season Sources

690-086-0170 (5)

Over the past several years, the JWC has been evaluating alternative water supply sources, including conservation. As discussed in the "New Water Rights" section below, through a series of extensive regional water supply planning efforts including the *Tualatin Basin Water Supply Feasibility Study*,[16] and the Tualatin Basin Water Supply Project's *Draft*

[16] The Water Supply Feasibility Study and related documents and information about the on-going Tualatin Basin Water Supply Project are available at the following Web address: http://www.tualatinbasinwatersupply.org

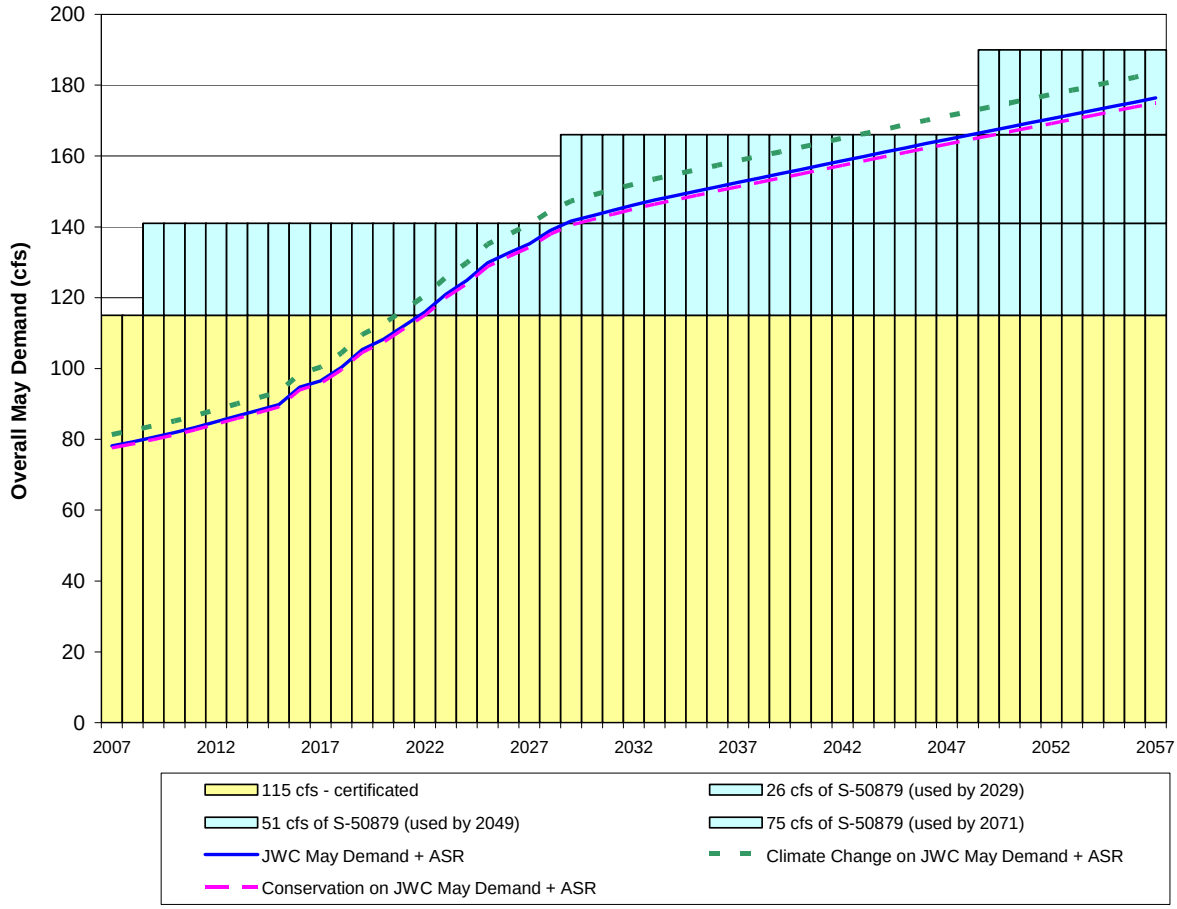
Report/Environmental Impact Statement, the JWC has evaluated alternative supply sources in terms of availability, reliability, feasibility and likely environmental impacts.

Conservation Measures

690-086-0170(5)(a)

Analysis of water conservation and climate change impacts on water supply show that the projected need for 26 cfs of water under Permit S-50879 by 2029 falls below water demand projections incorporating climate change effects, and slightly above projections that incorporate water conservation measures. **Exhibit 5-10** presents the total projected May demand (ADD) compared to JWC's water rights, as well as the projected May demand (ADD) increased as a result of the effects of climate change and the projected May demand reduced as a result of conservation measures.

EXHIBIT 5-10
JWC Projected Total May Demand Scenarios Versus Water Rights



The 2002 report "The impacts of climate change on Portland's water supply: An investigation of potential hydrologic and management impacts on the Bull Run System," projected that climate change could increase current water demand projections by 4 percent. When accounting for a 4 percent increase in projected May demand related to climate change, the 26 cfs of greenlight water requested under Permit S-50879 could be fully

beneficially used by 2027, or two years earlier than the projection without the effects of climate change.

Based on modeling and on-the-ground experience, there is a range of professional judgment as to a realistic conservation savings goal. For demonstration purposes, a 0.8 percent water conservation savings goal used by the Board of the Tualatin Valley Water District (TVWD) was chosen because of results observed from TVWD's aggressive and well-funded conservation program. When accounting for a 0.8 percent demand decrease in the projected May demand from implementation of conservation measures, the 26 cfs of water under Permit S-50879 would be fully beneficially used in 2029, the same year as shown in the projection in Exhibit 5-9.

The JWC also has considered whether additional NPSD can be met through conservation measures. As demonstrated in Section 3 of this plan, the JWC and its individual member agencies have implemented a wide variety of conservation programs. Per capita demand factors used for demand projections were adjusted to reflect water conservation. The JWC's need for additional water under Permit S-50879 is not precluded by current and anticipated conservation measures.

Interconnections

690-086-0170(5)(b)

The member agencies of the JWC are interconnected and have cooperative water management agreements. These agreements allow the partners to make use of other member agency's unused water supply, providing further water supply options.

Cost Effectiveness

690-086-0170(5)(c)

The water to which the JWC is requesting access is available for diversion with the JWC's existing infrastructure. As a result, conservation measures would not provide water at a cost equal to or lower than the cost of using water from this source. However, the JWC and its member agencies are committed to implementing and improving upon their conservation measures described in Section 3.

Other Activities

JWC members use ASR and water reuse when possible, to augment their water conservation activities. CWS administers wastewater collection, treatment, and reuse opportunities in Washington County. CWS currently has reuse projects for golf courses and works with JWC members to identify reuse opportunities. However, the CWS may be limited in its ability to promote reuse because of permit requirements for returning water to the Tualatin River. Finally, while ASR is not a water "source" during non-peak season, water produced during the non-peak season will be used to help fill ASR systems to help meet peak season demands. JWC members intend to expand ASR development based on the use of the JWC Permit S-50879.

Mitigation Actions under State and Federal Law

OAR 690-086-0170(7)

There are no known mitigation requirements for initial diversion of water under existing Permit S-50879.

New Water Rights

OAR 690-086-0170 (8)

Tualatin Basin Water Supply Project

Because the JWC and its partner agencies rely on the Tualatin Basin for a large proportion of their water supply, and because there are no natural flow rights available for use during the peak season to meet future demands, JWC and its partners are involved in a planning process called the Tualatin Basin Water Supply Project to help ensure future water supply.

In 1999, water managers in the Tualatin Basin completed an Integrated Water Resources Management Strategy to provide a framework for water users and resource managers to meet shared objectives in planning for future water supply. In 2001, local water managers formed a partnership and funded a *Water Supply Feasibility Study* (WSFS) to identify and evaluate options to meet regional water demands through the year 2050. The WSFS, completed in 2004, estimated that an additional 50,000 acre-feet (Approximately 15 billion gallons) of supply will be needed annually by 2050, and recommended further evaluation of a range of supply options. These included raising Scoggins Dam at Henry Hagg Lake by 20 to 25 feet and constructing an irrigation exchange pipeline from the Willamette River or raising Scoggins Dam by 40 feet. The study also concluded that conservation, wastewater reclamation, aquifer storage and recovery (ASR), and planned Portland Bull Run system improvements should be factored in to any project option.

During 2005, various supply options were evaluated, and two were identified for study in a *Draft Planning Report/Environmental Impact Statement* (Draft PR/EIS) developed to comply with the requirements of the National Environmental Policy Act. Based on the WSFS and local comprehensive plans, year 2050 annual water supply requirements were revised upward to 52,550 acre-feet (17.2 billion gallons). The two alternatives selected to be compared to a "no action" alternative include the following:

- A 40-ft dam raise at Henry Hagg Lake with a 6.5-mile bi-directional raw water pipeline to carry water between the JWC WTP and the reservoir. In normal and dry years, when the reservoir cannot fill with natural inflow from the upstream drainage area, water could be pumped from the Tualatin River to fill the reservoir. The maximum capacity of the pump back facility would be 300 cfs.
- The multiple source option includes a 25-ft dam raise at Henry Hagg Lake with a bi-directional (pump back) raw water pipeline, plus an approximately 22-mile transmission pipeline to carry water from the Willamette River WTP in Wilsonville to serve water users in southeastern Washington County. The Wilsonville WTP capacity would be expanded to accommodate demand. The maximum capacity of the pump back facility would be 200 cfs.

The no action alternative assumes that the JWC and other water providers in the Tualatin Basin will expand existing facilities to fully use existing water rights and permits, and that the City of Portland will extend existing contracts and continue to supply Tualatin Basin water providers. Because the City of Portland's first priority is to serve its residents, as the city's population increases, its ability to continue to serve "outside" customers will decrease. For planning purposes, JWC and its members assume that this source may be limited in the future, and there currently is not enough transmission line capacity from Bull Run to meet the future needs in Washington County. A portion of the water provided by the project will be used by CWS to supplement stream flow in the Tualatin River to allow wastewater dischargers to meet temperature and nutrient requirements during the summer months.

Because Henry Hagg Lake and Scoggins Dam are owned by the United States and are under the jurisdiction of the Bureau of Reclamation, when the final EIS is completed Reclamation in cooperation with local partners will select a final project through a Record of Decision.

At the time of this Water Management and Conservation Plan, the PR/EIS is still in draft form. The JWC and its members are awaiting the completion of the PR/EIS revisions and the final decision. However, the least cost option to date is the 40-ft dam raise at Henry Hagg Lake. The storage volume and flows allocated to the three JWC members funding the project, and the CWS are contained in **Exhibit 5-11.**

EXHIBIT 5-11
Preliminary Allocations for Municipal Partners in the Tualatin Basin Water Supply Project – 40-foot Dam Raise

Agency	Volume (ac-ft)	Flow (mgd)	Percentage Share
TVWD	23,000	41.6	43.40%
City of Hillsboro	11,500	20.8	21.70%
City of Beaverton	2,000	3.6	3.77%
CWS[1]	16,500	44.8	31.13%
Total	**53,000**	**66**	**100%**

[1] CWS and Forest Grove are currently negotiating a buy-back agreement.

Tualatin Supply Project Title Transfer

In the spring or 2007, the U.S. Bureau of Reclamation and local water resource agencies began discussing the feasibility of transferring the ownership of the Tualatin Project (Scoggins Dam and related facilities and lands) from the federal government to local ownership. The U.S. Bureau of Reclamation has a Title Transfer program to assist in the process. The partners in the TBWSP are currently negotiating the details of a Title Transfer agreement and reviewing the costs and benefits of such a transfer.

Through these regional water supply planning efforts the JWC has evaluated alternative peak season water supply sources in terms of availability, reliability, feasibility and likely environmental impacts.

Moreover, as participants in the Tualatin Basin Water Supply Project, the JWC has fully investigated the use of conservation and interconnections with other suppliers. Water conservation, wastewater reuse, and ASR were common to all supply alternatives evaluated

in the *Draft Planning Report/Environmental Impact Statement* for the Tualatin Basin Water Supply Project. To date the conclusion has been that need for new water supply may be delayed, but cannot be eliminated by conservation, reuse, ASR, or interconnection with other suppliers.

JWC Member Agencies

As described in Section 2 of this WMCP, many of the JWC member agencies hold water rights in addition to the water rights held by the JWC. To varying degrees, the member agencies meet water demands within their service areas through the combined use of water supplied under their own water rights and water from the JWC. The following subsections discuss the individually-held municipal water rights for each of the JWC member agencies.

The sections above includes descriptions the JWC's individual members current and potential service areas, and each member's estimated water demand projections for the next 10, 20 and 50 years. The following sections describe each JWC member's schedule to exercise its own water rights, where relevant, and other information necessary to complete the municipal water supply element of the WMCP for each agency.

City of Hillsboro

Schedule to Exercise Water Rights and Permits, and Comparison of Projected Need to Available Sources OAR 690-086-0170(2) and (4)

The above discussion of JWC's and Hillsboro's water supply and demand provides a complete picture of the City of Hillsboro's schedule to exercise its water rights, including certificate 67891 which is a fully developed water right. The City of Hillsboro's water right certificate 67891 (9.0 cfs from the Tualatin River at Haines Falls POD or Spring Hill POD) is the water supply for the city's Cherry Grove slow sand filter plant and is also a JWC water supply at the Spring Hill facility.

Alternative Sources, Quantification of Maximum Rate and Monthly Volume, and Mitigation Actions under State and Federal Law 690-086-170(5) (6) and (7)

Hillsboro has made full beneficial use of certificate 67891, which is for use at the City's Cherry Grove slow sand filter plant and is also a JWC water supply at the Spring Hill facility; therefore, the City of Hillsboro will not be "expanding or initiating" diversion of water under any of its own existing permits. As a result, this section is not applicable to the City of Hillsboro.

City of Forest Grove

Schedule to Exercise Water Rights and Permits, and Comparison of Projected Need to Available Sources OAR 690-086-0170(2) and (4)

In addition to using water from the JWC, the City of Forest Grove meets a portion of its demand through use of its surface water rights. Forest Grove holds four municipal water right certificates on Branches of Clear Creek and Gales Creek (Certificates 2194, 13471, 13797 and 85513). These certificates authorize a total combined use of use of up to 7.26 cfs. Forest

Grove also holds a municipal use permit for use of Roaring and Clear Creeks (S-40615). Forest Grove submitted a claim of beneficial use for this permit on May 21, 2002.

As described in Section 2, Forest Grove's MDD ranged from 5.4 mgd to 6.7 mgd, and averaged 5.9 mgd during 2002 through 2007. Forest Grove's summertime surface water supply is, however, limited by low flows (1.5 mgd or less from the Clear Creek drainage) and the junior priority date of the Gales Creek source (regulated off as early as June). Forest Grove must rely on water supply from the JWC to meet much of its peak water demands. Similarly, Forest Grove's projected future water needs will need to be met through water supplied by the JWC.

Alternative Sources, Quantification of Maximum Rate and Monthly Volume, and Mitigation Actions under State and Federal Law 690-086-170(5), (6) and (7)

Forest Grove has made full beneficial use of its individually-held water rights and will not be "expanding or initiating" diversion of water under any of its own existing permits. As a result, this section is not applicable to Forest Grove.

City of Beaverton

Schedule to Exercise Water Rights and Permits, and Comparison of Projected Need to Available Sources OAR 690-086-0170(2) and (4)

The City of Beaverton has a groundwater registration (GR 343) that claims a maximum rate of 3.00 cfs. In addition, Beaverton is developing an ASR program under limited license ASR LL-002. Beaverton's ASR program currently has capacity to divert up to 6.0 mgd of stored water.

As described in Section 2, Beaverton's MDD ranged from 13.95 mgd to 16.86 mgd, and averaged 15.48 mgd from 2002 through 2007. Despite having an ASR program and a groundwater registration, Beaverton currently meets the majority of its demand through water supply from the JWC. Similarly, the majority of Beaverton's projected future water needs will need to be met through water supplied by the JWC.

Alternative Sources, Quantification of Maximum Rate and Monthly Volume, and Mitigation Actions under State and Federal Law 690-086-170(5), (6) and (7)

Beaverton does not hold any unexercised permits and, accordingly, will not need to expand or initiate diversion of water under any of its own existing permits. As a result, this section is not applicable to Beaverton.

Tualatin Valley Water District

Schedule to Exercise Water Rights and Permits, and Comparison of Projected Need to Available Sources OAR 690-086-0170(2) and (4)

TVWD holds two certificates (36440 and 36441) that authorize total use of up to 3.30 cfs of groundwater for municipal purposes. In addition, TVWD also holds Certificate 86081 that authorizes up to 0.58 cfs of groundwater for municipal use. TVWD is developing an ASR program under limited license ASR LL-002, which has a current capacity of approximately 3 mgd. Finally, TVWD is a member of the WRWC that holds a 202.0 cfs permit (Permit

S-49240) for use of water from the Willamette River. Permit S-49240 has been extended until October 1, 2047.

TVWD's MDD ranged from 45.1 mgd to 52.3 mgd, and averaged 48.7 mgd from 2002 through 2007. TVWD is developing its ASR program and currently uses its groundwater rights as an emergency backup water supply. As a result, TVWD meets its water demand through water supply from the JWC and the PWB. The majority of TVWD's projected future water needs in the near-term will be met through water supplied by the JWC. When TVWD elects to use the WRWC Willamette River permit as a long-term water supply, it will need to develop a WMCP that meets the conditions of the extension order for the WRWC permit (Permit S-49240).

Alternative Sources, Quantification of Maximum Rate and Monthly Volume, Mitigation Actions under State and Federal Law 690-086-170(5), (6) and (7)

TVWD intends to meet its near-term future water demands through water supplied by the JWC. When TVWD prepares to use the WRWC Willamette River permit as a long-term water supply, it will develop a WMCP that meets the conditions of the extension order for the WRWC permit, and will include the analysis required under these provisions.

City of Tigard

Schedule to Exercise Water Rights and Permits, and Comparison of Projected Need to Available Sources OAR 690-086-0170(2) and (4)

The City of Tigard holds municipal groundwater rights and groundwater registrations authorizing the use of up to approximately 3.64 cfs (2.35 mgd). Tigard has fully exercised each of these water rights. Tigard is also developing an ASR program, which has a current system capacity of 5.4 cfs.

Tigard's MDD ranged from 12.4mgd to 14.3 mgd from 2002 through 2007. Since Tigard's MDD significantly exceeds the maximum authorized rate of its groundwater rights, Tigard has relied on water from other water providers. Tigard purchases the majority of its water supply (approximately 78 percent) from the PWB and the remaining portion has come primarily from its ASR program, native groundwater, the JWC, and the City of Lake Oswego.

After July 1, 2016, Tigard currently plans to use its connections with PWB and JWC as back-up or emergency water supplies. Tigard plans to rely on water supply from Lake Oswego and its ASR program to meet its projected maximum day demands by that date.

Tigard's longer-term strategy to meet its projected need beyond 2030 is to rely on water from the Willamette River under permit S-49420 held by the WRWC. To access this water, however, Tigard will need a water management and conservation plan meeting the requirements of OWRD's extension order for Permit S-49420.

Alternative Sources, Quantification of Maximum Rate and Monthly Volume, and Mitigation Actions under State and Federal Law 690-086-170(5), (6) and (7)

Tigard intends to meet its near-term future water demands through water supplied by Lake Oswego and its ASR program. Tigard intends to utilize the WRWC Willamette River

permit to meet its long-term future water supply needs. When Tigard prepares to use water under the WRWC permit, it will develop a water management and conservation plan that meets the conditions of the extension order for the permit, and will include the analysis required under these provisions.

APPENDIX A

Sample Letter to Affected Local Governments

Joint Water Commission

General Manager
Kevin Hanway
150 E. Main Street
Hillsboro, OR 97123
503-615-6585

Board of Commissioners

City of Hillsboro
Will Crandall
Gordon Faber
John Godsey

City of Forest Grove
Rod Fuiten
Carl Heisler
Victoria Lowe

City of Beaverton
Forrest Soth
Marc San Soucie
Denny Doyle

City of Tigard
Dick Winn
Nick Wilson
Craig Prosser

Tualatin Valley Water District
Greg DiLoreto
Jim Doane
Dick Schmidt

July 7, 2009

Lorna Stickel
Water Resources Planning Manager
Portland Water Bureau
1120 S.W. 5th, Room 600
Portland, OR 97204

Subject: Water Management and Conservation Plan for the Joint Water Commission

Dear Ms. Stickel:

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

JWC has prepared this plan to fulfill the requirements of OAR Chapter 690, Division 86 of the Oregon Water Resources Department. Under these rules, prior to submittal, the water supplier is to make the plan available for review by affected local governments and seek comments relating to consistency with the local governments' comprehensive land use plan.

In an effort to be more sustainable, we have included the Draft JWC Water Management and Conservation Plan on a compact disk. If you would prefer a hard copy, please contact me within 5 days of receiving this notice.

Please provide comments to me within 30 days of the date of this letter. You may either send your comments to me via e-mail at nikii@ci.hillsboro.or.us, or by letter to

Attention: Niki Iverson
Water Department
Hillsboro Civic Center
150 East Main Street, Third Floor
Hillsboro, OR 97123-4028

You are also welcome to call me at 503-615-6770 if you have questions about this plan. Thank you for your interest.

Sincerely,

Niki Iverson
Water Resources Manager
City of Hillsboro

APPENDIX B

IGA Details

APPENDIX B

Summary of Intergovernmental Agreements

Title	Date	Parties	Scope
Repayment Contract between the United States of America and the Tualatin Valley Irrigation District, Contract No. 14-06-100-6956	10-Mar-71	TVID, BOR	Provides TVID with 37,000 ac-ft per year for beneficial use on 17,000 acres of project land from the Tualatin Federal Reclamation Project.
Repayment contract between the United States of America and the City of Hillsboro, Contract No. 14-06-100-7180	11-Nov-71	Hillsboro, BOR	Hillsboro enters into contract with BOR for construction and repayment of costs of the Tualatin Federal Reclamation Project. Provides Hillsboro with 4,500 ac-ft per year of municipal and industrial water supply from the project.
Repayment contract between the United States of America and the Tigard Water Distrct, Contract No. 14-06-100-7182	18-Nov-71	Tigard Water District, BOR	Provides Tigard Water District with 2,500 ac-ft per year of M&I water from the Tualatin Federal Reclamation Project.
Repayment Contract between the United States of America and the City of Forest Grove, Contract No. 14-06-100-7197	17-Dec-71	Forest Grove, BOR	Provides Forest Grove with 4,500 ac-ft per year of M&I water from the Tualatin Federal Reclamation Project.
Repayment Contract between the United States of America and the United Sewerage Agency, Contract No. 14-06-100-7458	4-Oct-72	United Sewerage Agency, BOR	Provides United Sewerage Agency with 16,900 ac-ft per year water from the Tualatin Federal Reclamation Project to maintain minimum streamflows at USGS-State Engineer Gage No. 14-2075 in West Linn, Oregon. Indicates
Repayment contract between the United States of America and the Lake Oswego Corporation, Contract No. 14-06-100-7465	20-Oct-72	Lake Oswego Corporation, BOR	Provides 500 ac-ft per year of M&I water to Lake Oswego from the Tualatin Federal Reclamation Project.
Repayment contract between the United States of America and the City of Beaverton, Contract No. 14-06-100-7969	6-Nov-73	Beaverton, BOR	Provides Beaverton with 1,500 ac-ft per year of M&I water from the Tualatin Federal Reclamation Project.
Supplemental contract between the United States of America and the City of Hillsboro, Contract No. 14-06-100-8069	8-Mar-74	Hillsboro, BOR	Adds construction of the Spring Hill Pumping Plant to the Tualatin Federal Reclamation Project.
Joint Water Commission Water Service Agreement	February 1, 1976	Hillsboro, Forest Grove	Establish a joint operation for the pumping, treatment and transmission of Municipal and Industrial Water, Creating a Joint Water Commission.
Amendatory repayment contract between the United States of America and the Tualatin Valley Irrigation District, Contract No. 14-06-100-6956A	14-Jun-76	TVID, BOR	Increases TVID's project pressure irrigation service to 11,300 acres from 8,000 acres. TVID is now premited to furnish water for suburban agriculture.
Joint Water Commission Water Service Agreement	April 17, 1979	Hillsboro, Forest Grove, Beaverton	"Establish joint operations for the supply, pumping, treatment and transmission of municipal and industrial waters." Adds Beaverton as member of Joint Water Commission
Assignment of repayment contract No. 14-06-100-7182	21-Aug-80	Tigard Water District, Hillsboro, BOR	Transfers Contract No. 14-06-100-7182 from Tigard Water District to Hillsboro.
Spring Hill Pump Plant Bypass Construction Agreement	28-Feb-84	Hillsboro, Forest Grove, Beaverton Joint Utilities Commission, TVID, BOR	Springhill Pump Station Construction, JWC providing an advance of funds ($91,000) to construst the bypass to reduce sediment accumulation.
Repayment contract between the United States of America and the City of Hillsboro, Contract No. 2-07-10-W0867	26-Dec-91	Hillsboro, BOR	Provides Hillsboro with 500 ac-ft per year of M&I water from the Tualatin Federal Reclamation Project.
Ordinance Amending District's Rules and Regulations Regarding Water Conservation and Declaring an Emergency Ordinance No. 1-92	July 15, 1992	TVWD	Amends the District adopted Rules and Regulations (Ordinance 3-86 August 20, 1996) of water conservation and curtailment during an emergency.
Interim Water Conservation Plan Resolution No. 3230	July 16, 1993	Hillsboro, Forest Grove, Beaverton, TVWD	"Committing to an Interim Water Conservation Plan." Conserving to comply with Barney Reservoir Expansion Project

APPENDIX B
Summary of Intergovernmental Agreements

Title	Date	Parties	Scope
By-Laws of the Columbia-Willamette Water Conservation Coalition	between 1993 and 1997	Municipal water providers of the Portland Metropolitan area	Establish the Conservation Coalition, establish goals, objectives, outline powers, duties and committees.
Joint Water Commission Water Service Agreement Amendment	June 30, 1994	Hillsboro, Forest Grove, Beaverton, TVWD	Adds TVWD as member of Joint Water Commission
Joint Ownership Agreement- Barney Project (Rev 6-08-94) (AKA the "Original Barney Agreement")	July 19, 1994	Hillsboro, Forest Grove, Beaverton, TVWD, United Sewerage Agency	"Establish joint ownership [and management] of a proposed expanded water reservoir commonly known as 'J.W. Barney Reservoir'." Includes Warranty Deed for land ownership in Yamhill (June 19, 1968) and Washington Counties (April 29, 1968).
Hillsboro-Beaverton-TVWD Joint Water Transmission Agreement	September 21, 1994	Hillsboro, Forest Grove, Beaverton, TVWD	Amends Joint Water Service Agreement of April 17, 1979, by adding TVWD as part owner of the joint transmission line system.
Northside Water Transmission Agreement	April 11, 1997	Hillsboro, Forest Grove, Beaverton, TVWD	Construction of Phase I of Northside Transmission Line
Proposed Bylaw Revision	July 17, 1997	Columbia-Willamette Water Conservation Coalition	Adds new section of Finance Manager, establishes standing coalition committees
Tualatin Valley Water District Resolution No. 7-98	May 20, 1998	TVWD	Establishes rates for the purchase of water from TVWD.
Northside Water Transmission Agreement-Phase II	14-Jan-00	TVWD, Hillsboro, JWC	Construction of Phase II of Northside Transmission Line
Transmission Line Intergovernmental Agreement	14-Jan-00	JWC, Hillsboro, TVWD, Cornelius	To coordinate the design and construction of replacement 72-inch water line that runs from the slow sand filter plant to Forest Grove and Cornelius and from which Cornelius has obtained doemstic water service pursuant to a contract between HIllsboro and Cornelius.
Joint Funding Agreement IWRM Water Supply Feasibility Study	14-May-01	United Sewerage Agency, TVWD, Hillsboro, Beaverton, Forest Grove, Tigard, Sherwood, Tualatin, North Plains, Cornelius, Banks	Enters parties into an agreement under which they shall jointly fund a feasibility study of two alternatives and a 'no action' alternative to increasing the water supply for users within the Tualatin Basin. The two alternatives are Scoggins Dam Raise and Willamette River Exchange Pipeline. (IWRM = Integrated Water Resource Management)
Tualatin Basin Water Supply Agreement Memorandum of Understanding	18-May-01	JWC (H, B, FG, TVWD), Tigard	Memorandum of Understanding outlining cooperation in planning for the developent or expansion of water sources in the Tualatin River Basin and water supply facilities.
Ordinance No. 1-03	19-Feb-03	TVWD	TVWD authorizing an Intergovernmental Agreement Continuing the JWC - Hillsboro, Forest Grove, Beaverton and Tualatin Valley Water District.
Authorizing Ordinances	Mar-03	Hillsboro, Forest Grove, Beaverton, TVWD	Each city authorizing an intergovernmental agreement titled "Joint Ownership Agreement Barney Project" which continues the Barney Reservoir Joint Ownership Commission.
Ordinance No. 5239	4-Mar-03	Hillsboro	City of Hillsboro authorizing an Intergovernmental Agreement Titled "Joint Water Commission - Hillsboro, Forest Grove, Beaverton and Tualatin Valley Water District Water Service Agreement".
Agenda Bill #03072	31-Mar-03	Beaverton	City of Beaverton authorizing the Mayor to Sign the JWC - Hillsboro, Forest Grove, Beaverton and Tualatin Valley Water District Water Service Agreement
Ordinance No. 2003-06	14-Apr-03	Forest Grove	City of Forest Grove authorizing an Intergovernmental Agreement Continuing the JWC - Hillsboro, Forest Grove, Beaverton and Tualatin Valley Water District.

APPENDIX B

Summary of Intergovernmental Agreements

Title	Date	Parties	Scope
Joint Ownership Agreement- Barney Project	27-Oct-03	Hillsboro, Forest Grove, Beaverton, TVWD, CWS	Terminates and Replaces the "Original Barney Agreement" (Rev 6-08-94).
Joint Water Commission Water Service Agreement (JWC IGA)	27-Oct-03	JWC	Terminates and Replaces the Water Service Agreement, the Amended Water Service Agreement, the Transmission Agreement, the Amended Transmission Agreement, the Northside Water Transmission Agreement and the Northside Water Transmission Agreement Phase II.
Ordinance No. 5348	3-Feb-04	Hillsboro	Authorizing a first amendement to the water service agreement and joinder agreement relating to the Joint Water Commission.
First Amendment to Joint Water Commission Water Service Agreement and Joinder Agreement	1-Mar-04	JWC, Tigard	Adds Tigard as a JWC member, and places membership stipulation that Tigard must make Capital Contributions in the Hagg Lake expansion.
Ordinance No. 1-04	1-Apr-04	TVWD	Authorizing a first amendement to the water service agreement and joinder agreement relating to the Joint Water Commission.
City of Cornelius Water Supply Agreement	1-Jan-05	Hillsboro, Cornelius	City of Hillsboro wholesale water supply agreement with City of Cornelius, expires in December 31, 2014.
City of Gaston Water Supply Agreement	24-Jan-05	Hillsboro, Gaston	City of Hillsboro wholesale water supply agreement with City of Gaston, expires in December 31, 2014.
City of North Plains Water Supply Agreement	14-Jan-05	JWC, North Plains	Joint Water Commission wholesale water supply agreement with City of North Plains, expires in December 31, 2014.
LA Water Cooperative Water Supply Agreement	17-Nov-05	Hillsboro, LA Water Cooperative	City of Hillsboro wholesale water supply agreement with LA Water Cooperative, expires in December 31, 2014.

APPENDIX C

PR-01 Comprehensive Water Audit Report

REGIONAL WATER PROVIDERS CONSORTIUM

YEAR-END REPORT

for

July 1,2005 - June 30, 2006

SEPTEMBER 2006

Regional Water Providers Consortium
1020 S.W. 5th Ave. Room 600
Portland, Oregon 97201
(503) 823.7528
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2005 Marketing Campaign

The Consortium amended and approved contract terms for a second year with Ant Hill Marketing. Contract was approved in January 2005 for the planning and development of a multi-media campaign, which includes an expanded schedule of our television and radio campaign (using the same 5 TV ads and 2 Radio), an enhanced web page, new public relations outreach and events.

The Consortium increased its overall media schedule for television and radio spots for the 2005 summer campaign. This resulted in more ads being placed over the summer months and over an elongated period of time – ads running from May – September. For the month of August, the Consortium once again partnered with the City of Portland on the PARC (Portland Area Radio Council) radio ad. This new radio ad blanketed our region's listening audience with 23 radio stations and 11,000 spots in a four-week segment during the month of August 2005. TV ran May through Sept 1; Radio ran May through August – Infinity stations (KINK, KUPL, KLTH, KVMX) ran June/July and KKSN ran May through August.

The Consortium kicked off its summer marketing campaign one month earlier in 2005 – launching the media campaign in May. Media packets were distributed to press throughout the region – blanketing television, radio and print markets. Media packets included the following: RWPC Press Release, RWPC Organization Backgrounder, RWPC Fact Sheet, Frequently Asked Water Questions sheet, top 10 Indoor and Outdoor Water Conservation Tips sheet. Conservation Kits were also included in television and radio press packets. A total of (5) radio stations and (3) television stations promoted our message May through August 2005.

In addition, the Consortium increased its media schedule (television ads) through fall (September) to promote a "back to school" water conservation message targeting kids, parents and teachers. A total of (2) new .15 sec. television ads were developed and launched the weeks of Sept. 12 – Sept. 23rd with a focus on kids. The ads also promoted and directed the kids, parents and teachers to the Consortium's web page – specifically calling out the Youth Education page. In addition to the (2) new ads, AM NW offered a segment on Water Conservation (focusing on kids) which highlighted indoor water conservation tips. Consortium staff Kristi Senecaut from City of Hillsboro served as Consortium spokesperson on this television appearance. The AM NW spot was featured on Wednesday, Sept. 21st.

- Television schedule:

  KOIN (CH 6) – began 5/23 and ran through August 2005 / 144 spots over 6 weeks
  - Produced and aired 60-second Water Conservation Moment to air during newscasts – vignettes promoted water conservation and aired in best available times in am/noon and early evening newscasts. Aired 30 vignettes during campaign
  - Aired 30 news segment billboards during newscasts – basically water conservation tips

KATU (2) – began 5/23 and ran through August 2005 / 135 spots over 10 weeks

- Two new AM Northwest segments
- Joint promotion of Landscape Giveaway Contest with Infinity Radio stations – promote on station, website and during AM Northwest
- Tagged one version of the RWPC spots with information about the Landscape Giveaway and drive people to enter
- Link on station website

KGW (8) – began 5/23 and ran through August 2005 / 160 spots running 8 – 10 weeks

- **Added Value Television Vignettes–** Both KOIN (Ch 6) and KGW (Ch 8) developed additional: 60 Water Conservation TV Vignettes, which aired during weekend, AM news, noon and evening news. KOIN developed (2) :60 water conservation spots and KGW developed (4) :60 water conservation spots. Approximately (80) spots aired during newscast and campaign timeframe. Ads were also downloaded to our website for additional viewing.
- Produced and aired two different 60-second vignettes on water conservation – aired 1 vignette per month during news ($10,000 pro bono).

➢ Media Interviews:

- June 5: Mallory Lynch KPAM Gardening Radio Program w/ Lindsey & Jesse
- June 7: AM NW TV Interview w/ Mike Darcy and Duane
- June 28: Metroscope Radio Interview w/ Laura Young & Lindsey Berman
- July 10: Mallory Lynch KPAM Gardening Radio Program w/ Chris H. and Mandy
- July 18: AM/NW TV Interview with Mike Darcy and Chris Hollenbeck
- July 26: KOIN (CH 6) TV Interview w/ Lindsey and Jeff Reiger from 7-Dees Nursery
- August 13: KEX The Garden Doctor Radio Show w/ Duane Karstens
- August 21: Mallory Lynch KPAM Gardening Radio Program w/ Lindsey and Mandy
- September 19: AM NW TV Interview - Kid's Conservation Program w/ Kristi Senecaut

➢ Radio Schedule:

4 stations, 439 spots total

- **KINK (102)**
  - ⇒ Ran six weeks during the May 23 through August schedule
  - ⇒ Promotion of *Landscape Giveaway Contest* during media flights
  - ⇒ Subject Earth – "brought to you by" promos
  - ⇒ PSAs, 10 per week

- **KUPL (98.7)**
  - ⇒ Ran five weeks during the May 23 through August schedule
  - ⇒ Promotion of *Landscape Giveaway Contest* during media flights
  - ⇒ PSAs, 10 per week

- **KLTH (106.7)**
  - ⇒ Ran four weeks during the May 23 through August schedule

⇒ Promotion of *Landscape Giveaway Contest* during media flights
⇒ PSAs, 10 per week

- **KVMX (107.5)**
  ⇒ Ran four weeks during the May 23 through August schedule
  ⇒ Promotion of *Landscape Giveaway Contest* during media flights
  ⇒ PSAs, 10 per week

- **KKSN (97.1)**
  ⇒ Ran six weeks during the May 23 through August schedule
  ⇒ 120 - 180 spots total
  ⇒ This station helps get the "older" end of our target audience.
  ⇒ 20 live 15-second promotional announcements 3 - 4 days prior to event
  ⇒ Coordinated with Whitney Farms to use their products for additional on-air giveaways, mainly promoting water conservation tips
  ⇒ Added links on their website

➢ 2005 PARTNERSHIP EVENTS

- **Nursery Events**
  The Consortium was involved in a total of (6) summer landscape and gardening events held at nurseries throughout the Portland metro region. At two of these events, the Consortium also partnered with Whitney Farms Soil – providing free samples to the public and working with Whitney Farms landscaping staff to promote water–wise landscaping tips and information. The following is a schedule of summer nursery events.
  - 6/11/05: Max and Hildy's/ Whitney Farms Soil will partner
  - 6/25/05: Farmington Gardens
  - 7/09/05: Drakes 7 Dees
  - 7/16/05: Tualatin River Nursery
  - 7/23/05: Cornell Farms
  - 8/27/05: Portland Nursery / Whitney Farms Soil will partner

- July 1-Aug.28**:** **Street of Dreams** – Consortium event display with collateral materials and outreach information were provided for this event

- September 7: **RWPC Open House** – Display and public event showcasing all RWPC conservation programs and providing opportunities to meet and interact with Consortium staff.

- September 17: **Build It Green Info Fair** – The Consortium staffed a booth at the fourth annual fair, presented by the Office of Sustainable Development, Metro, and the Solar Energy Association of Oregon. RWPC water conservation materials and information were offered to the public. The event took place at the Environmental Building Supplies Center.

- October 8-9: **Salmon Festival** - The Consortium participated again this year in the 21st Annual Salmon Festival, a family-focused public education event that

promotes fish, water education and conservation. This year, the Consortium sponsored two water conservation musical shows performed by Recycleman. In addition, the Consortium had a display booth focused on fun activities for kids, including making rain gauges and coloring magnets. Handouts included the kid's activity book, along with a variety of water conservation materials for adults. Over 6,000 participants attended this year's event.

- December 8: **Oregon Landscape Contractors Association (OLCA) Expo** - The Consortium hosted an information display booth for the 2nd year, focusing on waterwise irrigation and landscape practices. Members representing the landscaping industry throughout the state will attend this year's Expo. The Expo will be held on Dec. 8th at the Oregon Convention Center, culminating in a day of workshops and vendor exhibits.

➢ 2005 WATER-EFFICIENT LANDSCAPE GIVEAWAY CONTEST

The Consortium launched its Landscape Giveaway Contest via web from June 20 – July 17th for one free design, landscape installation, and irrigation system to a homeowner in the Consortium region. The contest ran for 4 weeks and was advertised on the Consortium web page, as well as promoted through TV and radio partners. Television program AM NW also promoted the contest with Mark Darcy and Consortium staff. The purpose of the contest was to drive people to our web page and to promote water conservation through proper landscaping techniques and tips. The public completed entry forms on our Consortium page. The winner, Leslie Brunker from SE Portland, was announced on the RWPC web page the week of October 3, 2005. The landscape installation process began in October with Drakes 7 Dees is a planning the landscape and incorporating water efficient plants.

- Purpose: This Contest was designed to promote water conservation and ultimately have a homeowner landscape that the RWPC can showcase from the design phase through installation and watch the landscape evolve and grow. Partnering with Drake's 7 Dees Garden Center and Landscaping, the prize package features water conserving plants, materials and methods. The RWPC plans to follow the design and installation process of the water conserving landscape to showcase as a case study on their Web site as well as in other marketing activities.

- Partnerships: Drake's 7 Dees as the exclusive nursery partner provided one prize to the winner - a water efficient landscape design, installation and materials – for up to a 2,000 sq. ft. area. Total prize value of up to $9,000. The Contest was held in conjunction with Infinity station partners KINK, KUPL, KVMX and KLTH to aid in promoting the RWPC's 2005 Summer Water Conservation campaign efforts. These four stations promoted the contest on-air and direct entrants to the RWPC Web site for on-line entry.
- Photos, interviews, etc of the winner will continue to take place throughout the process to use in RWPC marketing activities and on the Web site.

➢ 2005 RWPC WEB PAGE

Review and additions to RWPC web page continued with the following updates:

- Web audit
- Experts page revised
- Events page updated
- New photos added
- New pdf files added
- Kid's conservation music/lyrics added (Recyleman Rockin' Water Roadshow)
- Homeowner Landscape Contest added
- New graphics added
- Consortium calendar updated
- RWPC information/ news updated
- Communication Awards added

➢ 2005 REGIONAL RESOURCES

- **Conservation Kits**: For a second year, the Consortium ordered another start-up supply of (50) indoor conservation kits to distribute to each provider member. Kits were distributed under each provider's discretion – i.e.: given out at events, open houses, walk in public distribution, schools etc. Contents of kit include the following:

- RWPC welcome letter
- (3) RWPC brochures
- Content list and Instructions
- Low-Flow Massage Showerhead
- Kitchen Faucet Aerator
- Bathroom Faucet Aerator
- Teflon Tape
- Shower Timer
- Toilet Dye tablets

- **Event Display Panels:** The Consortium designed and produced (2) new sets of portable tabletop display panels. The displays were used for multiple functions during our summer landscape and gardening events, as well with school programs. Event display panels will be used for both a kids and adult target audience. An updated Salmon Festival and YGP display has been produced – showcasing a revised and updated provider list. Consortium tablecloths (2 sets) were also designed and produced for added name recognition at our annual events.

➢ 2005 TRADE ALLY

- **Water Wise Workshop:** The Consortium sponsored its first annual Water-Wise Workshop office to industry members (OLCA, IA and other members of the landscaping industry) on Nov. 17th at the Earth Advantage office. The Consortium had several representatives from the industry conducting presentations at this workshop. Approximately 33 attendees participated in the 4-hour workshop.

  Topics included:
- Into of Regional Water Providers Consortium: who we are/what we do
- Subject: Soils
- Subject: Plants
- Irrigation technologies
- History of water-wise & how to market

  Workshop speakers represented a variety of landscape and irrigation partners including:
  Scott Winkleman - OLCA
  Dave Snell – Clackamas Community College
  Kelly Duncan – Irrigation Association
  Mallory Gwynn – Simply Gardening Radio program
  Duane Voik – Earth Advantage

➢ 2005 YOUTH EDUCATION

- **School Shows:** The Consortium began its school outreach water/conservation program beginning in September with the "Where's Rosie?"assembly program. This program targets the K – 2nd grade students. The assembly program is one of the Consortium's most successful school shows – providing schools with a unique puppet production coupled with lively music, and a clear message about the value of water conservation and personal responsibility. Consortium members will receive one free school sponsored show for their respective community.

- **School Signage**: The Consortium produced signage for school shows that we sponsor. Signage was produced for the Where's Rosie puppet show and the Recycleman concerts. Signage was also produced for water provider entities that sponsor these shows independently.

- **Youth Education Web page:** A new kid's activity was added to the web page (3rd phase of development) to illustrate and explain the Water Cycle to kids.. Flash technology was incorporated to this project in order to promote interest and interactive capabilities. A continuation of kid's interactive web activities will carry forward to 2006.

2006 Marketing Campaign

The Consortium media (television and radio) launched one month earlier this year to coincide with our "Be Water Smart" nursery events. Press releases were sent out on April 25th (enclosed in packet). Radio ads have been placed with the following (6) stations: KINK, KUPL, KVMX, KUFO, KCMD and launched the week of April 24th – July 17th. Television ads have been scheduled on KATU Channel 2, and KGW Channel 8. Television ads have been scheduled to run from April 24th – end of September.

Radio promotions will centered around nursery events with on-air promotions weeks of the events, on-site appearances by stations, on-air giveaways of nursery gift certificates. For the month of August, the Consortium will again partner with the City of Portland on the PARC (Portland Area Radio Council) radio ad. This radio ad will blanket our region's listening audience with 23 radio stations and 11,000 spots in a four-week segment during the month of August 2006.

Radio interviews began in June and continued through the summer months. The following radio interviews were scheduled:

Television Interviews:

- May 23: AM NW television segment on Native Plants – Chris Hollenbeck
- July 20: AM NW Television segment on Irrigation Systems – Steve Carper

Radio Interviews:

- June 8: KPAM Radio – Chris Hollenbeck
- July 8: KXL RADIO with Mike Darcy – Jesse Engum
- July 12: KINK Radio – Judi Ranton and Lindsey Berman
- July 23: KPAM Radio – Duane Karstens
- August 5: KPAM Radio – Tacy Steele

➢ 2006 PARTNERSHIP EVENTS

- **"Be Water Smart" Nursery Events**
  The Consortium was involved in a total of (8) summer landscape and gardening "**Be Water Smart"** events held at nurseries throughout the Portland metro region. The purpose of these events is
  - To educate nursery customers on the basics of implementing water conservation techniques in landscapes and gardens.
  - To promote water–wise landscaping tips and information.
  - To collect contact information for the RWPC to use in future communications/partnerships.

- To focus on a particular gardening/landscape theme for all events.

All events include:

- Radio promotions (short commercials a part of the media buy) advertising the RWPC nursery events.
- Public relations outreach in local media calendars.
- Public outreach and education
- Conservation kit giveaways
- Coupon drawings for nursery gift certificates
- Radio stations will be on site for 1 hour during the event giving away radio station promo items. The following promotions about the event will be offered in the following way:
  - Web site info at www.conserveh20o.org, radio promotions on CBS Media stations: KUPL, KVMX, KHITS, KUFO/KCMD and public relations efforts.

April 29th Events: "Building Healthy Soils" theme 10:00 – 2:00

- Portland Nursery – Jesse Engum and Lindsey Berman
- Drakes 7 Dees – Duane Karstens
- Oregon Grape Nursery – Chris Hollenbeck

May 20th Events: "Native Plants" theme 10:00 – 2:00

- Artemesia Nursery – Judi Ranton
- Drakes 7 Dees – Deb Martisak and Duane Karstens

June 24th Events: "Right Plant, Right Place" theme 10:00 – 2:00

- Farmington Gardens – Judi Ranton and Steve Carper
- Cornell Farms – Mandy Hayes
- Al's Garden Center (Sherwood) – Chris Hollenbeck and Frank Reed

➢ 2006 EVENTS:

- February 6-8: **AWWA 2006 Water Sources Conference and Exposition -** Consortium staff attended this national training in Albuquerque, NM. Seminars ranged from technical sessions to education and outreach topics. Conference included information and networking opportunities relating to water conservation – including conservation issues, planning, and irrigation techniques and marketing programs.

- February 18-20: **Yard, Garden, and Patio Show** - The Consortium once again participated in the Yard, Garden and Patio Show at the Oregon Convention Center. This is one of the largest national landscape and gardening shows in the country – attracting close to 30,000 attendees. The Consortium partnered with 7 Dees Nursery for plant and landscaping assistance of our display booth. CCC staff worked this 3-day event, communicating our water conservation messages, answering questions and distributing materials, brochures, rain gauges and other Consortium handouts related to water conservation. This event was a great opportunity for Consortium public education outreach as well as potential cross-promotional opportunities.

➢ 2006 TRADE ALLY

- **RWPC /OLCA Grants:** In cooperation with the Oregon Landscape Contractor's Association (OLCA) and United Pipe, the Consortium offered scholarship grants for a limited number of qualified applicants from the Portland metropolitan area (Clackamas, Multnomah, and Washington Counties) for several irrigation and landscape classes offered in the early spring. CCC staff was also eligible for scholarship grants. All classes were held at Clackamas Community College in Oregon City. A total of (4) landscape and irrigation classes were offered with a total of $640.00 allocated for scholarship grants supporting these classes. Grants for $150.00 were given for those who passed the examination.

➢ 2006 YOUTH EDUCATION

- **12th Annual Clean Water Festival Event –** The Consortium is one of many sponsors of this event, which was held April 15, 2005, at PCC Sylvania campus. The Clean Water Festival is a community-supported conference, organized by a group of public, private, and non-profit organizations, all committed to water and environmental education in our region. The festival is designed for 4th and 5th grade students, with a purpose to teach students about water and how it relates to our world. The festival provides students with an opportunity to learn about and explore water science and conservation. Twelve school districts and 27 elementary schools were represented, over 65 organizations participated, 56 volunteers donated time and approximately 1,270 students were impacted. The Consortium again played a major role in sponsoring this event – both in-kind and financial support was provided.

  The Clean Water Festival began in 1994. Since then, 13 festivals have been conducted, impacting approximately 15,920 4th and 5th grade students about the importance of water in our everyday lives.

- **Where's Rosie School Programs –** A total of 20 school assembly programs were scheduled and performed for Consortium members this school year. These shows impacted a total of 2,800 of 1st and 2nd grade students. In addition to the free school show, each student receives a copy of the "Where's Rosie" water conservation activity booklets to take home with them.

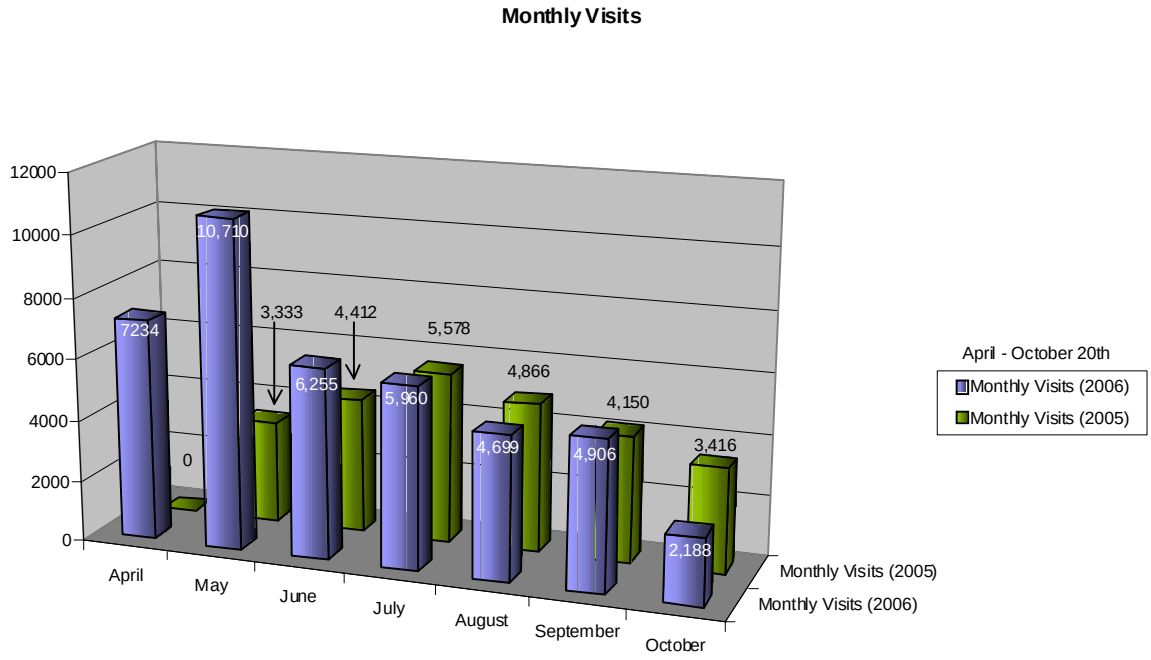
- **Spanish Bookmarks and Stickers for Kids –** The Consortium has printed the kid's water conservation bookmarks and stickers in Spanish due to interest and requests from CCC staff – (interest generated predominantly from schools). Since much of the kid's collateral is distributed through schools, special events, and "fix-it" fairs, the CCC decided to produce a small quantity of these items on a "pilot" basis to determine interest and outreach potential.

➢ 2006 RWPC WEB PAGE

Updates to the web page continue with new photos and information. The following updates have been added to our web page:

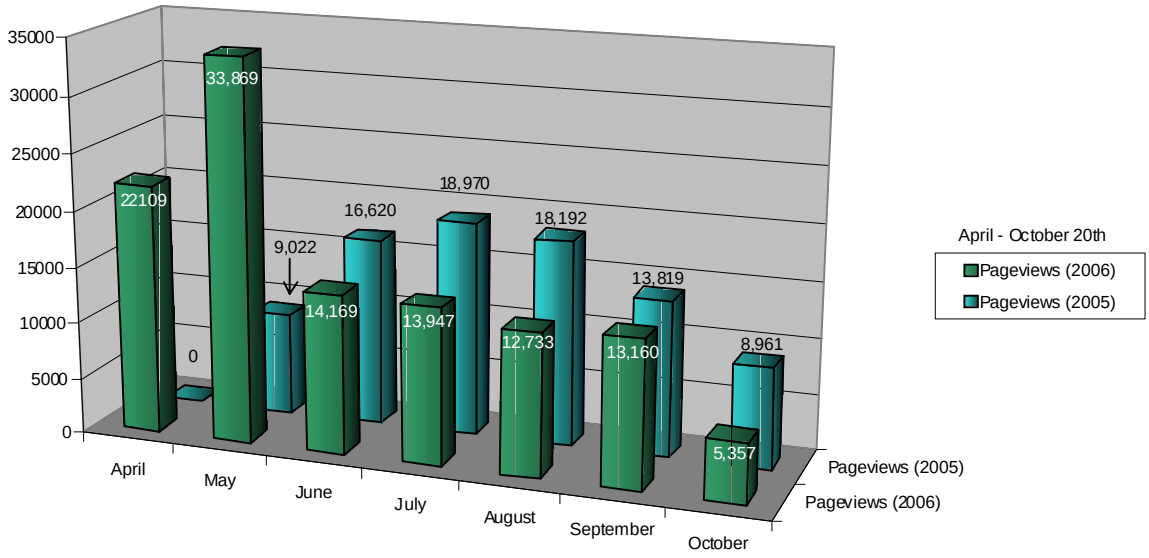
- Homeowners Contest Winner photos of installed landscape. We will continue to track and photograph this water efficient landscape.
- New press release and media campaign press kit information packets added.
- Ask the Expert Articles – new articles submitted with emphasis on garden and landscaping information relating to water conservation.
- Information on our Where's Rosie School Shows and a listing of all the Consortium-sponsored school shows throughout our region, along with performance dates.
- Updated Calendar of Events information as a listing and also in a monthly calendar format (which is new). We added a calendar and a pop-up window for additional event information.
- Added a "Resource" link to main navigation area in order to find our collateral materials more efficiently.
- Reorganized content on Resource page - moving outdoor and indoor product information and Demo Garden info to "Ways to Conserve".
- Completed Water Cycle Activity to Youth Education page.

Web Data for 2005 and 2006 are as follows:



Month	Monthly Visits (2006)	Monthly Visits (2005)
April	7234	0
May	10,710	3,333
June	6,255	4,412
July	5,960	5,578
August	4,699	4,866
September	4,906	4,150

Pageviews



Month	Pageviews (2006)	Pageviews (2005)
April	22109	0
May	33,869	9,022
June	14,169	16,620
July	13,947	18,970
August	12,733	18,192
September	13,160	13,819

Page Visits reflect the overall number of hits to the site.
Page Views reflect the number of actual pages on the site viewed.

We increased our media campaign schedule for television and radio – beginning in the month of April and carrying us through September. As reflected in the surge for the months of April and May, we witnessed a large increase in people visiting our web site – corresponding to our earlier launch in media and media promotions.

On the Page Views, we see people coming to our site earlier and digging deeper into the site earlier in the launch of the campaign. The total number of Page Views over the campaign timeframe for 2006 increased by 74% - 115,344 page views as compared to 85,584 page views in 2005 - again, correlating to heavy media concentration and promotions.

We witnessed a slight decrease in page views from June – August 2006 compared to the previous year (2005). We attribute this decrease to placing a higher emphasis on traditional media (elongating the campaign months) and consequently decreasing efforts to

update the web, specifically to the front page in order to encourage people to drive them further in content.

A major focus for the 2007 marketing campaign will be centered on new updates (paying particular attention to the front page) which will encourage further exploration throughout our site. Additional updates will include web enhancements, an interactive web calculator, new information and easier navigation of the website which we hope will both attract new visitors and increase visitor activity on the site. Overall, we witnessed an increase in web activity over the course of our campaign timeframe; however, our goal will be to see consistent increases throughout the year.

➢ 2006 REGIONAL RESOURCES

- **Conservation Kits** - For a third year, the Consortium ordered another start-up supply of (50) indoor conservation kits that were distributed to each provider member. Kits were distributed under each provider's discretion – i.e.: given out at events, open houses, walk in public distribution, schools etc. Contents of kit include the following:

- RWPC welcome letter
- (3) RWPC brochures
- Content list and Instructions
- Low-Flow Massage Showerhead
- Kitchen Faucet Aerator
- Bathroom Faucet Aerator
- Teflon Tape
- Shower Timer
- Toilet Dye tablets

- **Consortium Shirts /Tablecloths** – CCC staff participating in Consortium sponsored events and media interviews, will be receiving a new RWPC shirt to wear at public events. The purpose of the shirts is to have a uniform look for staff while participating in public outreach events, media interviews and television appearances. Additionally, a new set of Consortium tablecloths have been produced to be used for events, shows and other demonstrations where our Consortium tabletop displays will be used. All produced goods – i.e.: shirts, tabletops, displays and collateral programs will feature RWPC logo and coordinated colors to enhance and promote the Consortium's brand marketing identification and statement.

➢ 2006 PUBLIC COMMENTS

The Consortium received a phone message from an individual who received a conservation kit at our April 29th kick-off nursery event. He wanted to tell the RWPC how delighted he was to receive a kit that was so useful. He installed all elements (low flow showerhead, kitchen aerator, and bathroom aerator) and shower timer (!) and was appreciative of receiving the kit. He also communicated that the enclosed information (indoor/outdoor conservation brochures) was also very informative. He thanked the Consortium for offering these and reiterated how happy he was to receive the kits.

A similar situation occurred at the April 29th Portland Nursery event. An individual came up to our Consortium booth and communicated his appreciation for our being there. He was a strong advocate of conserving our natural resources and felt that outreach such, as ours was important. He also mentioned how delighted he was to receive a conservation kit with a shower timer in it since his two teenagers take 20-minute showers and that the timer would be a part of their bathroom fixtures!

The Consortium received a large packet of thank you letters from Beaverton District students (Vose Elementary), representing a Spanish Immersion class. The students wrote thank you letters (all written in Spanish) thanking the Consortium for being part of the "Where's Rosie" school assembly program. For those of you who have not seen these school programs, they are definitely a must. The school shows are educational, interactive, informative and a whole lot of fun. RWPC members, staff and board members are encouraged to attend.

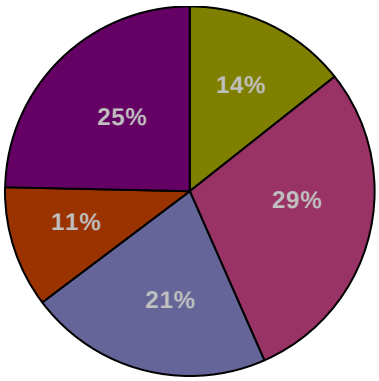
2007-2008 Snapshots of Success

In fall 2007, Consortium Conservation staff took over management of the multi-media marketing campaign, which was previously managed by marketing firms. This resulted in a savings of **$50,000** that was then put directly back in to supporting other conservation program projects.

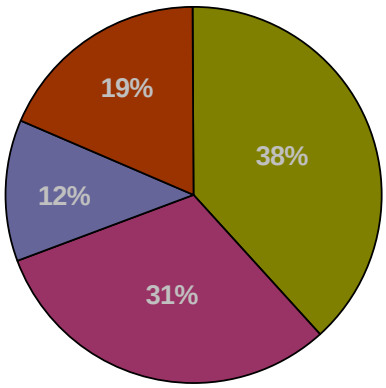
Here is a snapshot of successes from the first year:

- Negotiated **$50,000 television campaign** that reached **94.5%** adult viewers (aged 25-54) an average of **6.1** times during the three-month campaign. (The RWPC package included **double** the amount of ad spots and **2** feature stories – see chart below).
- Increased the **PARC radio campaign** from 1-**3 months** and aired **2** radio ads **3920** times on **25** stations which reached **1.3 million people** an average of **3** times per week
- Hired a part-time **public relations consultant** (25-30 hours/month March- September) on projects which resulted in successfully securing **5 print articles** reaching **668,000 readers** in the greater Portland metro area (March-August 2008)
- Hired a **web consultant team** (of 2) who dedicates an average of **20 hours per month** (year-round) on projects resulting in completely re-programming the back-end of the site, retooling the water saving computer and creating an interactive H2ouse
- Provided approximately **41,000 community members** with more than **11,000 water conservation outreach materials** at **16 community events** and workshops (this is an increase of **3** events from last year)
- Produced **4 quarterly e-newsletters** reaching an audience of **861** subscribers and resulting in more than **1400 click thrus** to www.conserveh2o.org
- Completed **2 waterwise workshops** that were attended by **70** participants (**8** are planned for the 2008-2009 year)
- Started a **Weekly Watering Number email listserve** that currently has **60** recipients - still growing!

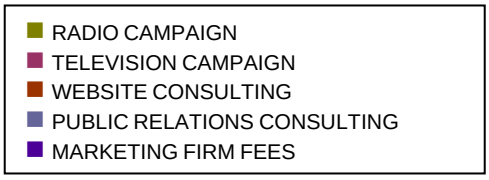
2007-2008 MARKETING CAMPAIGN BUDGET COMPARISON



PROPOSED BY MARKETING FIRM



MANAGED BY CONSORTIUM STAFF



Regional Water Providers Consortium

Conservation Program

2008 Members

City of Beaverton
Boring Water District #24
Clackamas River Water
City of Fairview
City of Forest Grove
City of Gladstone
City of Gresham
City of Hillsboro
City of Lake Oswego
Metro
City of Milwaukie
City of Newberg
Oak Lodge Water District
City of Portland
Raleigh Water District
Rockwood Water PUD
City of Sandy
City of Sherwood
South Fork Water Board
Sunrise Water Authority
City of Tigard
City of Tualatin
Tualatin Valley Water District
City of Wilsonville
West Slope Water District

Water. Save a Little. Help A Lot.
www.conserveh2o.org

About the Consortium

The Regional Water Providers Consortium (RWPC) is a collaborative organization dedicated to providing efficient and effective programs in the areas of water conservation, emergency preparedness and regional water supply coordination.

Formed in 1996, the Consortium serves the Multnomah, Clackamas, and Washington counties and is comprised of 24 water providers and the regional government, Metro. Participation in the RWPC is voluntary, and funding is derived from dues paid by Consortium members.

The Importance of Water Conservation

Although we live in the Pacific Northwest where we receive an abundance of rainfall, our water consumption is at its highest during summer months — a time of year when our rainfall is at its lowest. During the summer, outdoor water use can more than double, resulting in an additional need for water from reservoirs, rivers, and groundwater sources.

With increased population growth and climate changes, our region's water supplies will continue to be stretched to meet increased future water demands. Learning to use water more efficiently now will play a key role in meeting future water needs, and could delay major water-related infrastructure costs.

About Our Water Conservation Program

Focused on educating the public about water-related issues and what they can do personally to conserve water, the Consortium's conservation program consists of five key elements:

1. **www.conserveh2o.org** – The Consortium's interactive and informative website includes a wide selection of water conservation-related information, a kid's section, a quarterly e-newsletter and more!
2. **Community Events & Workshops** –The Consortium provides indoor and outdoor-focused water conservation outreach materials and water conservation devices to homeowners, commercial property managers, landscape professionals, gardeners and kids at a variety of community events and workshops.
3. **Outreach Materials & Conservation Devices –** The Consortium distributes a wide selection of informative outreach materials and water conservation devices at workshops and community events through out the year. Many of these resources are also available through participating water providers and on the Consortium's website www.conserveh2o.org
4. **Summer Marketing Campaign** – The Consortium conducts a multi-media campaign each summer (when water usage is at its highest) to remind people how important it is to conserve water. Incorporating print, radio, and television, the campaign consists of feature stories, commercial spots, and on-air interviews.
5. **School Assembly Programs** – The Consortium provides an interactive school assembly program to approximately 5,000 students (kindergarten- 5th grade) throughout the greater Portland metro area each year.

CITY OF BEAVERTON
BORING WATER DISTRICT #24
CLACKAMAS RIVER WATER
CITY OF FAIRVIEW
CITY OF FOREST GROVE
CITY OF GLADSTONE
CITY OF GRESHAM
CITY OF HILLSBORO
CITY OF LAKE OSWEGO
METRO
CITY OF MILWAUKIE
OAK LODGE WATER DISTRICT
CITY OF PORTLAND
CITY OF NEWBERG
RALEIGH WATER DISTRICT
ROCKWOOD WATER PUD
CITY OF SANDY
CITY OF SHERWOOD
SOUTH FORK WATER BOARD
SUNRISE WATER AUTHORITY
CITY OF TIGARD
CITY OF TUALATIN
TUALATIN VALLEY WATER DISTRICT
WEST SLOPE WATER DISTRICT
CITY OF WILSONVILLE

Regional Water Providers Consortium

Conservation Year-End Highlights

(JULY 1, 2007 – AUGUST 31, 2008)

2008 Marketing Campaign

The Consortium's 2008 marketing campaign ran June through August – concentrating on promoting conservation in the peak water-use season – ***summer***.

KGW TELEVISION (JUNE - AUGUST)

- Co-sponsorship of KGW's "*Going Green*" campaign - co-sponsorship and ad campaign valued at **$117,896** at a cost to the Consortium of **$50,000**
- KGW "*Going Green*" co-sponsorship – Reached **94.5%** adult viewers (aged 25-54) an average of **6.1** times during the three-month campaign
- Gnome ad aired **134** times during key hours & programs *(:30 second)*
- **Two** PSA spots featuring KGW's weather talent Matt Zaffino aired **205** times *(:30 second)*
- Weekly Watering Number bonus spots featuring KGW's weather talent Matt Zaffino aired **64** times *(:15 second)*
- KGW "*Going Green*" co-sponsorship – Outdoor water conservation story segment aired **twice** *(Viewed by 39,000 households on Earth Day during KGW's half-hour Going Green Special)*
- KGW "*Going Green*" co-sponsorship – **5** web banners on KGW's Going Green page and the Consortium's profile page (see above right) resulting in **714,424** impressions and more than **239** click thrus to www.conserveh2o.org
- KGW "*Going Green*" co-sponsorship – **3** featured links (indoor tips, outdoor tips, Weekly Watering Number) located on KGW.com's Going Green campaign page
- KGW "*Going Green*" co-sponsorship – Consortium profile page accessed **579** times *(featured Consortium's PSAs and feature stories, conservation tips, event information, and kid's activities)*
- KGW "*Going Green*" co-sponsorship – Featured hyperlink for **13** weeks in KGW's e-newsletter which reaches **50,000** each week.
- Logo presence on KGW's Going Green Campaign banner at the Better Living Show and KGW's Shred Day event.
- Distributed more than **150** Consortium Watering Gauges at KGW's Shred Day recycling event *(July 18, 2008)*

RADIO (MAY – AUGUST)

- PARC (Portland Area Radio Council) campaign – **3,220** spots aired on **25** stations throughout region May – July 2008 *(August provided in partnership with the City of Portland)*
- PARC campaign – reached **1.3 million** listeners weekly during the 4-month campaign
- PARC campaign – average radio listener heard the Consortium's ad **3** times per week
- KPAM Radio advertising - **34** spots aired during "Simply Gardening" which has an audience of approximately **350,000**
- Sponsored the "Garden Tip of the Week" resulting in **26** on-air mentions during "Simply Gardening" which has an audience of approximately **350,000**
- Featured link on www.simplygardeningwithmallory.com which had a total of **2,736** visitors June-August 2008 resulting in **123** streaming video downloads of RWCP "Hell Strip" (area between sidewalk and street that is particularly hard to grow plants in) feature story from 2007

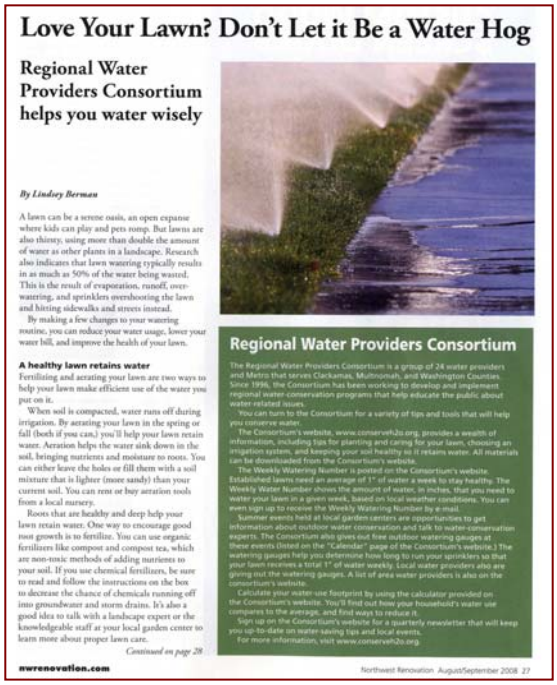
2008 Marketing Campaign

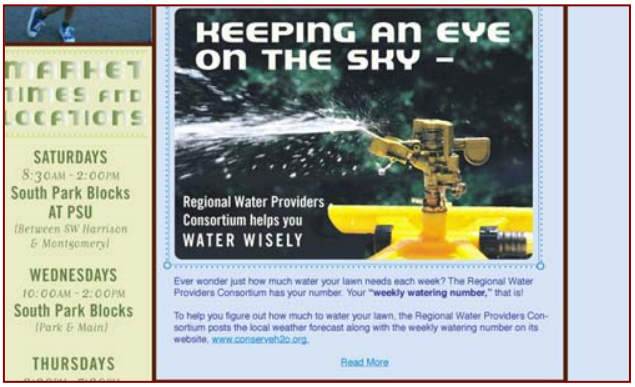
ON-AIR INTERVIEWS (MAY – AUGUST)

- Consortium representatives conducted **1** television interview with Judy Alleruzzo from Garden Time on KPTV *(Aired September 6, 2008 on Channel 12)*
- Consortium representatives conducted **4** live, in-studio radio interviews with Mallory Gwynn during "Simply Gardening" on KPAM radio *(Conducted and aired May-August 2008)*

PRINT MEDIA (MAY – AUGUST)

- *Homes and Gardens of the Northwest* – Cover story "Light Drinkers Make A Splash in a Conservation Expert's Garden reaching approximately **574,000** readers in the four county Portland metro area (4 pages, August 21, 2008 issue)
- *NW Renovation Magazine* - "Don't Let Your Lawn Be A Water Hog" article reaching about **10,000** readers in the greater Portland metro area (1.5 pages, August/September issue)
- *Beaverton Valley Times, Lake Oswego Review, Tigard-Tualatin Times* –"Keep Your Eye on the Sky" article featured in special home and garden issue reaching approximately **80,000** readers (.5 page, March 27, 2008 issue)
- *Portland Farmer's Market e-Newsletter* - "Keep Your Eye on the Sky" article featured in quarterly e-newsletter reaching about **4,000** readers in the greater Portland metro area. (.5 page, Summer issue)



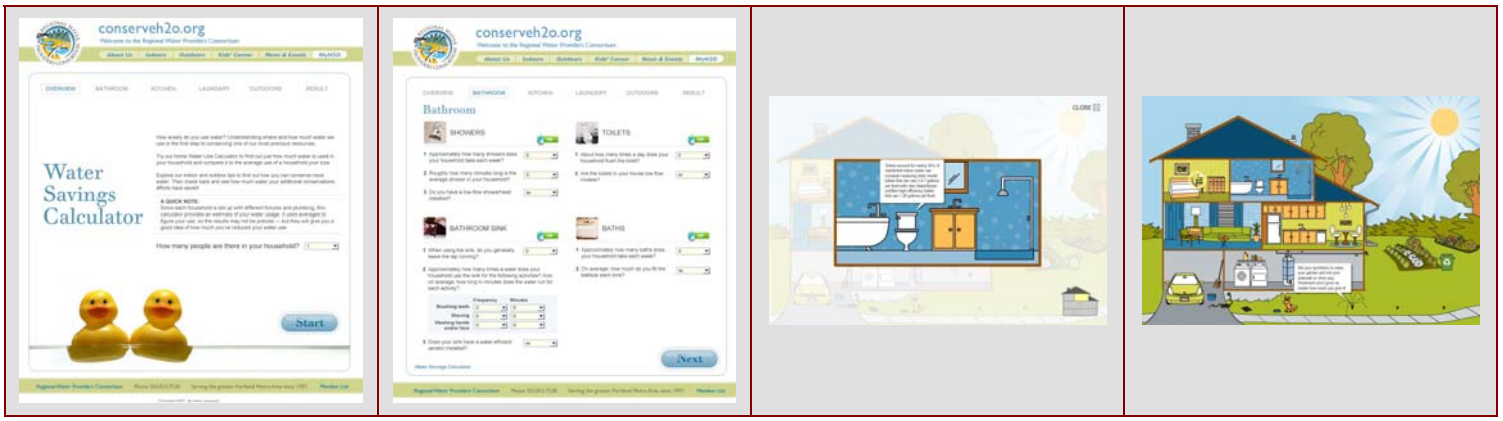


www.conserveh2o.org

The Consortium's website (www.conserveh2o.org) continues to serve as the RWPC's "storefront", showcasing a variety of informative water conservation topics, fun kid's games and activities, educational workshops and events, e-newsletter and other Consortium-related information.

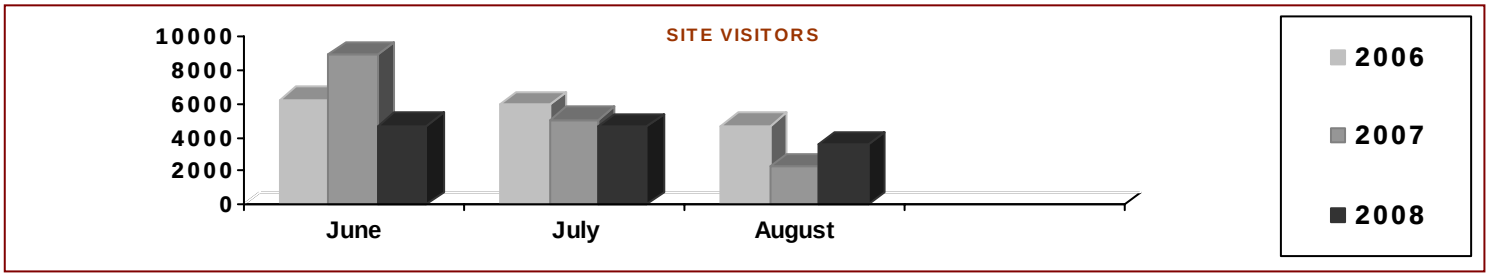
WEBSITE HIGHLIGHTS

- Website content and image updates completed by Consortium staff on a weekly and quarterly basis
- Converted back-end programming to a **Drupal content management system** which will enable in-house staff to more easily maintain the site, improve tracking of website traffic abilities, and ensure the site's ADA compliance
- Redesigned **MyH2O Water Savings Calculator** to include a more user-friendly interface and advanced data saving capabilities (the interactive calculator allows visitors to calculate their "water footprint" and provides them with related water conservation tips)
- Launched an **interactive H2OUSE** that invites visitors to navigate from room-to-room and into the garden and provides them with related water conservation tips
- Revamped **outdoor water section** to include more in-depth information
- Published the **Weekly Watering Number** (amount in inches to water lawns) each Thursday from March-October
- Established **Weekly Watering Number email listserve** with **60** recipients – still growing!
- **Search bar** added to aide visitors with efficiently accessing information on the site



WEBSITE STATISTICS

The Consortium's site received **62,256** visitors and approximately **136,248 page** views from July 1, 2007 – September 12, 2008, and averages about **100** visitors a day. The slight lag in visitors during 2008's summer months can be attributed to several factors including cooler, wetter weather, a surge in conservation-related and "green" online resources, and a lack of newer content being added to the site as a result of other back-end programming being conducted.



www.conserveh2o.org

The site's top five visited pages include (July 2007 – August 2008):

1. Homepage
2. Water Smart (*information on the Weekly Watering Number*)
3. Members Page (Roster of *Consortium members and their contact information)*
4. Water Use Calculator
5. About Us (the Consortium)

Google Analytics

The Consortium installed a new free traffic statistics tool called Google Analytics which went live on August 26, 2008. The new tool will ensure that the Consortium can more effectively track how its website is used and by whom. Here is a snapshot of information collected August 26 - September 12, 2008:

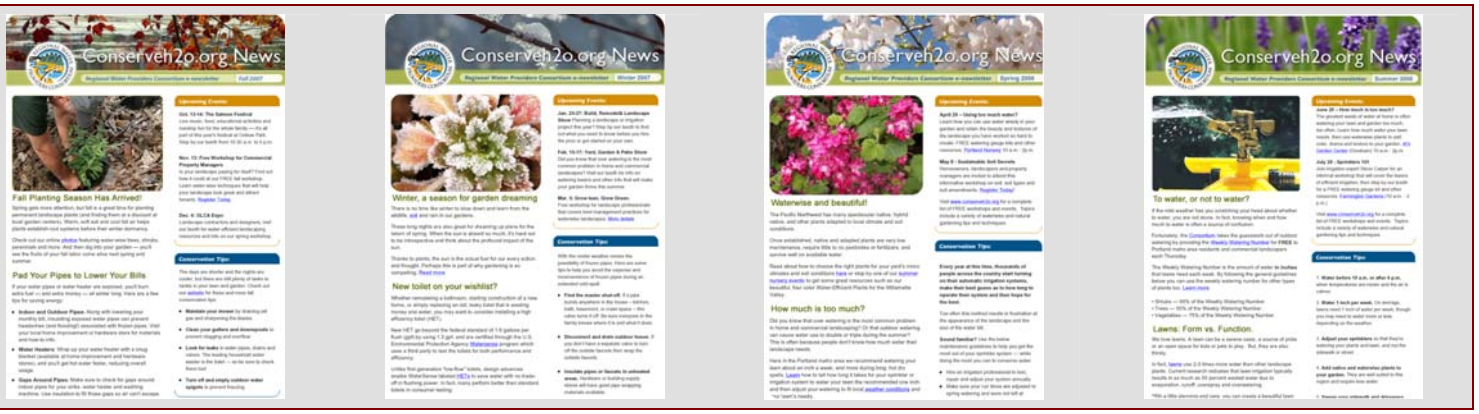
- **518** visitors; **97** visitors returned to the site more than once
- **1938** page views
- **3.74** average page views per visit (this is an increase from 2 in 2006 and 3 in 2007)
- **2:51** average time on site
- **40%** of visitors looked at two or more pages during their site
- **Water H2Ouse** viewed **36** times
- **My H2O Water** Savings Calculator viewed **29** times

Conserveh2o.org News

E-NEWSLETTER HIGHLIGHTS AND STATISTICS

The Consortium's quarterly e-newsletter reached a total of approximately **1,000** recipients in the 2007-2008 program year. All aspects of the **4** newsletters including story text, images and programming were completed in-house by Consortium staff.

- Added **560** subscribers resulting **861** total subscribers to Conserveh2o.org News as of August 2008
- Approximately **31%** of subscribers opened and viewed one or more issue of Conserveh2o.org News
- Each issue featured **seasonally focused story content** linked to www.conserveh2o.org
- More than **1,400** viewers linked from Conserveh2o.org News to www.conserveh2o.org for additional information
- Featured **upcoming workshops and events** in each issue
- Recruited approximately **25%** of Water Lean Grow Green workshop participants via links in Conserveh2o.org news



Events & Workshops

Last year, the Consortium provided approximately **41,000** community members with more than **11,000** water conservation outreach materials at **16** community events and workshops.

METRO MULTI-FAMILY HOUSING ASSOCIATION (MMHA)

Distributed **745** educational and outreach materials at **2** full-day, educationally-focused MMHA-sponsored events (Fall Spectrum & Spring Maintenance Fair) which were attended by **1228** commercial property managers located in the greater Portland metro area. (September 20, 2007 & March 5, 2008)

SALMON FESTIVAL

Provided a kid's social marketing activity which included making a button that displayed a personal commitment to conserve water. Approximately **5,500** kids and adults attended the event. (October 12-13, 2007)

WATER LEAN. GROW GREEN. WORKSHOPS

The Consortium hosted **2** "Water Lean. Grow Green." workshops which were attended by more than **70** large-scale property managers, landscape contractors, landscape designers & homeowners. The workshops focused on educating attendees about best management practices of waterwise landscaping. (November 13, 2007 & March 5, 2008)

OLCA EXPO

Provided **122** outreach & educational materials, opportunities and classes to approximately **1200** landscape industry members. (December 6, 2007)

BUILD, REMODEL & LANDSCAPE SHOW

Distributed **1116** outreach materials to more than **1,100** attendees during the three-day show. Messaging concentrated on outdoor water conservation, workshop information and website promotion. (January 25-27, 2008)

Events & Workshops

YARD, GARDEN AND PATIO SHOW

Distributed **3106** outreach materials to the show's more than **26,500** attendees. Messaging concentrated on outdoor water conservation, nursery events and newsletter promotion. (February 15-17, 2008)

CHILDREN'S CLEAN WATER FESTIVAL

Played a key role in sponsoring the event and distributed more than **1,000** buttons and **861** other kid-related outreach materials. Approximately **1,500** elementary students from **54** classes and **27** schools attended the Festival. (April 24, 2008)

NURSERY EVENTS

Conducted **5** events at area nurseries and distributed approximately **1,100** outreach materials. Events were featured on each nursery's website and in several nursery e-newsletters. (April - August 2008)

ROSE FESTIVAL KID'S PAVILION

The Consortium sponsored **2**, forty-five-minute Recycleman shows. (June 7, 2008)

GARDEN OF NATURAL DELIGHTS TOUR

Distributed **588** outreach materials. Approximately **2,700** participated in the day-long tour that showcased natural gardening practices. (July 13, 2008)

Schools Program

WHERE'S ROSIE SHOW

Last year, the Consortium brought the interactive and educational puppet show "Where's Rosie" to approximately **3,000** students (kindergarten- 2nd grade) from **21** schools throughout the greater Portland metro area. Consortium staff introduced each Consortium-sponsored show and provided more than **60** teacher resource packets which included information about the Consortium, and samples of its educational outreach materials and website.




Awards

2007 PNWS AWWA EXCELLENCE IN COMMUNICATIONS AWARD

The Pacific Northwest AWWA awarded the Consortium a first place award for its new website at its annual conference. This is the Consortium's **12th AWWA award** received for its marketing and outreach programs.

Information & Outreach Materials

The Consortium developed the following **3** outreach materials during the 2007-2008 program year:

1. **Watering Gauge Kit –** the kit contains two watering gauges with easy-to-follow instructions printed on the back. More than **1300** kits were distributed at events from February-August 2008.


2. **Rain Barrels & Water Conservation –** This simple black and white brochure provides basic information on rain barrels and directs readers to www.conserveh2o.org for more effective water conservation methods.
3. **Consortium Conservation Program Information Sheet –** This outreach piece is designed to give the reader important information about the Consortium and its Conservation Program at-a-glance.

Water. Save a Little. Help a Lot.

*www.**conserveh2o**.org*

APPENDIX D

Update of the Regional Water Supply Plan Conservation Element: Executive Summary

UPDATE OF THE REGIONAL WATER SUPPLY PLAN CONSERVATION ELEMENT

Final Report

By

William Y. Davis
William Christiansen

Submitted to:

Regional Water Providers Consortium
Portland, Oregon

By

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www.pmcl.com

March 31, 2003

EXECUTIVE SUMMARY

The Regional Water Providers Consortium completed the Regional Water Supply Plan (RWSP) in 1995. One component of the RWSP was the identification and evaluation of a broad range of voluntary and mandatory water demand management and conservation options. This report provides an update of the evaluation of water conservation programs as a component of the RWSP Update.

The original RWSP evaluated conservation programs on an aggregate level corresponding to the three county areas within the Portland metropolitan region. The evaluation of conservation programs for the RWSP Update as described in this report is conducted at the utility, or water provider level. There are 23 provider members of the Consortium at this time.

Some of the study objectives were altered during the course of the analysis. First, the projected number of accounts by provider are driven by the growth rate of population and employment projections for each provider. Updated forecasts by the Metropolitan Service District of population and employment at the provider level have not been released (as of January 2003) and thus the analysis described in this report is based on the rate of growth in 1997 population and employment projections. Secondly, an end-use model estimation of water conservation savings was to be developed as a comparison with the assumed program savings. The effort to develop end-use model savings estimates was foregone so that more resources could be put toward further refinement of assumptions used in the analysis of the ConEAST model.

THE CONEAST MODEL

The Conservation Economic Analysis and Screening Tool (ConEAST) is an Excel spreadsheet model developed by Gary Fiske & Associates that calculates the following elements for either multiple or single agencies:

- Water savings
- Costs
- Economic benefits
- Unit costs
- Benefit-cost ratios

For this evaluation, ConEAST was used to develop these estimates on a provider-by-provider basis. The provider-level estimates of savings, costs and benefits are aggregated to the regional level within the ConEAST model and regional unit-costs and benefit-cost ratios are then calculated.

Inputs into the ConEAST model include:

- Number of conservation program participants per year
- Average gallons saved per day per participant
- Conservation program costs to the utility and participant
- Marginal cost of water and sewer service
- Marginal cost of water supply to the utility
- Other economic factors

A REGIONAL ANALYSIS

This analysis of water conservation programs is conducted at the regional level. Thus, while inputs into the ConEAST model are entered at the provider level, the inputs for this analysis are regional level data that have been allocated among the providers for entry into the ConEAST model. Some of the ConEAST inputs, such as the gallons saved per participant and the marginal price of water and sewer were determined at the provider level to the extent possible within the scope of this study and as available data permitted. Thus, some effort was made to adjust inputs for variations among provider service area characteristics. Nonetheless, this analysis should not be interpreted as a provider level analysis of programs. Rather, the analysis assumes a regional implementation of programs by the Consortium. Program participation and program costs are consistently allocated among providers based on the distribution of customer accounts.

Inherent to the Consortium concept is the core value of managing a shared resource. There are inequities in sharing the cost of managing the resource, as in funding conservation programs that may benefit some members of the consortium more than others. There are inequities in allocating program costs by size of the provider and there are inequities in the market reached by a program. Some provider service areas have more industrial customers than others, some providers have older residences than others, some providers have more irrigated area than others, etc. However, conducting this analysis at the provider level would not only involve a more extensive analysis beyond the scope of this study, but also undermine the shared resource concept of the Consortium. The regional analysis of programs corresponds with the role of the Consortium in collaborating on water resource management issues and promoting region-wide conservation programs. Regional implementation of conservation programs offers economies of scale and reaches the unified area with consistent programming.

THE INTEGRATED RESOURCE PLANNING PROCESS

Two workshops were conducted during this project with Consortium members and their conservation staff to include stakeholder input into the evaluation process. In addition, two draft documents were submitted to the stakeholders for review and resulting comments and additional inputs were incorporated into the analysis. The economic analysis of programs is contingent

upon the assumed program parameters, which include participation rates, program costs, water use reduction and the baseline water use per account. To the extent possible, values for these parameters are based on findings reported in the literature for similar conservation programs, the opinions of the consultant, and opinions of local stakeholders. Actual participation rates and water savings may only be known after a program has been implemented and properly evaluated.

EVALUATION CRITERIA

Evaluation criteria were established for screening conservation programs for potential implementation and further evaluation. The purpose of the screening process is to select conservation programs that are feasible, acceptable to customers and effective in reducing water use (*Evaluation of Urban Water Conservation Programs: A Procedures Manual*, Dziegielewski et al., 1992). Criteria identified for screening conservation programs for the RWSP Update are:

- Technical/implementation feasibility
- Administrative feasibility and acceptability
- Customer acceptability
- Potential water savings
- Cost-effectiveness/ benefit-cost analysis
- State requirements
- Externalities, such as environmental benefits, reduced sewer flows, energy savings, public expectations and public relations

The evaluation of the feasibility and acceptability ratings of potential conservation programs is an attempt to quantify subjective opinions and attitudes. The programs were scored for implementation feasibility, stakeholder (utility) acceptability, and customer acceptability as follows:

5 – Excellent
4 – Good
3 – Average
2 – Fair
1 – Poor

Results of these ratings were used to rank program feasibility and acceptability. The weighted scores for the three criteria were added to provide an overall score for each program. The overall score for each program was then classified as *good*, *mixed*, or *poor*.

The rating process and subsequent ranking of programs can be biased by a number of factors. Bias factors may include:

- Low response rate among those asked to rate potential programs
- Difficulty in rating programs from a regional perspective, rather than from a provider perspective
- Preference or inclination to rate higher those programs already implemented or familiar
- Insufficient information on implementation conditions of programs

The financial indicators for the evaluation of program cost effectiveness, as calculated by the ConEAST model, include:

- Unit cost of water saved (utility perspective)
- Unit cost of water saved (society perspective)
- Benefit-cost ratio (utility perspective)
- Benefit-cost ratio (society perspective)
- Benefit-cost ratio (customer perspective)

These financial indicators are calculated at both the provider-level and the regional-level. For this analysis, only the regional indicators are used to select programs for further analysis.

The assumed marginal cost of water supply in summer is $374 per acre-foot, or $0.86 per hundred cubic feet (ccf). The summer marginal cost of supply was used as a benchmark of utility willingness to pay for water. Thus, an estimated unit cost of $0.80 per ccf or less was classified as *cost-effective*. Unit costs between $0.80 and $1.00 per ccf were classified as *marginally* cost-effective; and unit costs greater than $1.00 per ccf were classified as *not* cost-effective. As noted in the report, the actual marginal cost of water supply may vary significantly by provider depending upon the source, accounting practices and other factors.

The benefit-cost ratios are calculated as discounted benefits divided by discounted costs. A benefit-cost ratio greater than 1.0 indicates that the benefits are greater than costs, and thus the program is cost-effective. Programs with benefit-cost ratios between 0.9 and 1.05 were classified as *marginally* cost-effective. Programs with estimated benefit-cost ratios less than 0.9 were classified as *not* cost-effective.

The classifications of the program unit cost estimates and the benefit-cost ratios were combined into an overall cost-effectiveness score. A *good* cost-effectiveness score required a program unit cost to be cost-effective for both the utility and society perspectives and the benefit-cost ratios to be cost-effective for the utility, society, and customer perspectives. A *poor* cost-effectiveness score was given if the unit costs were not cost-effective and all benefit-cost ratios were not cost-effective. Some programs were given a *mixed* cost-effectiveness score indicating that the unit costs and benefit-cost ratios were in the marginal range, or that there were conflicting scores between the perspectives. The overall cost-effectiveness score of each program is shown in Table 1.

The cost-effectiveness ratings may be biased by the assumption that a given program is applicable in all provider service areas. An example is the program to eliminate single-pass cooling. As demonstrated by the Portland Business, Industry and Government (BIG) program, elimination of single-pass cooling results in dramatic water savings and can pay for itself in a short time period at selected customer facilities. However, evaluating the program at an aggregate level such as estimating the percent reduction in water use for the Commercial Industrial and Institutional sector dilutes the cost-effectiveness of the program. Furthermore, some providers may not have any customers with single-pass cooling within their service area. Assuming implementation of the program among all providers for the regional analysis further dilutes the cost-effectiveness rating of the program, which may be very cost-effective for a selected facility.

Similarly, the cost-effectiveness ratings are based on the regional assumption of an implementation rate for a given program across all providers. Realistically, participation rates may vary among provider service areas. Variation of assumed water usage rates (the gallons per day per account) and variation in marginal water and sewer rates among providers also affect the cost-effectiveness of a program by provider. Thus, programs that effectively save water when implemented at a given facility, or at the provider level, may not appear cost-effective when evaluated at the regional level.

Other factors are considered in the selection of recommended programs in addition to the acceptability ratings and estimates of cost-effectiveness. Factors considered and discussed with RWPC staff include:

- State requirements (Oregon Administrative Rule 690-86)
- Mix of programs targeting residential and nonresidential sectors
- Mix of programs targeting indoor and outdoor water use
- Need to address peak use as well as total demand
- Environmental issues, such as the benefits of reduced sewer flow

As a final component of stakeholder input, Consortium members reviewed a draft list of program evaluations and collectively developed a list of recommendations.

FINDINGS AND RECOMMENDATIONS

The evaluation of programs by the overall acceptability score and the cost-effectiveness score allows the programs to be grouped into the following categories:

- Feasible, acceptable, and cost-effective
- Poor feasibility and acceptability, but cost-effective
- Mixed feasibility and acceptability, and marginally cost-effective
- Mixed feasibility and acceptability, and not cost-effective
- Poor feasibility and acceptability, and not cost-effective

The programs are grouped in Table 1 according to these categories. Programs that are feasible, acceptable and cost-effective are recommended for implementation. Programs that are cost-effective but were ranked poorly on perceived feasibility and acceptability may be recommended on the condition that marketing and public education can improve the acceptability of the program. Other programs may be recommended contingent upon a redesign of implementation conditions and assumptions used in the evaluation process.

In situations where multiple implementation scenarios of a given program are evaluated (e.g., Scenario A and B), the highest ranked scenario is selected for recommendation. Thus, there are fourteen programs that can be recommended for further analysis with the supply alternatives from the first three groupings. In addition, the washing machine rebate program is included in the set of programs for further analysis on the basis of its marginally effective unit cost, mixed acceptability and the recommendation of the Consortium members.

Realistically, conservation managers may modify the implementation specifications of the recommended programs based on individual provider target populations (i.e., their customers), budgets, and resources available. However, for the purpose of this analysis and the RWSP Update, the implementation specifications of the recommended programs are assumed reasonable for the average provider and will serve as input into the Confluence Integration Model for further analysis with water supply alternatives.

The following fifteen programs are recommended for further analysis in the RWSP Update. A description of each program is provided in Appendix A.

- Residential Information, Education and Awareness
- Property Manager Workshops
- Trade Ally Irrigation and Landscape Workshops
- CII Irrigation ET Controller Retrofit (Option A)
- Large Landscape Audit (Option B)
- Nonresidential Irrigation Submetering
- Multifamily Submetering
- CII Indoor Audits (Option A)
- Toilet Rebate Program
- Residential Indoor Audits (Option A)
- Residential Irrigation ET Controller Retrofit
- Waterless Urinals (awaiting approval from the Oregon State Plumbing Board)
- CII Outdoor Ordinance
- Eliminate Single-Pass Cooling (Option C)
- Washing Machine Rebate

Note that the description of programs listed in Appendix A are arranged in the order listed above and as shown in Table 1.

The regional-level savings in millions of gallons, program costs, and unit costs from the ConEAST analysis are shown in Table 2. The savings, costs, and unit cost of each program at the provider level are shown in Appendix B. In Table 2, and in Appendix B, the discounted savings

is the discounted volume of water saved over the 30-year period. This discounted volume is calculated in order to determine the unit cost, as discussed in Chapter II. Similarly, the discounted cost is the discounted 30-year cost of the program. The unit cost is calculated as the discounted cost divided by the discounted volume, as described in Chapter II. The unit cost shown in Table 2 and Appendix B is the unit cost from the utility perspective. The provider-level savings and costs shown in Appendix B are arranged in the order listed above.

TABLE 1
RANKING AND GROUPING OF PROGRAMS BY CRITERIA

	Program	Implementation Feasibility	Stakeholder Acceptability	Customer Acceptability	Overall Score	Overall Acceptability	Final Selection	State Requirements	Unit Cost Utility ($/ccf)	Unit Cost Society ($/ccf)	B/C Ratio Utility	B/C Ratio Society	B/C Ratio Customer	Cost-Effective
Acceptable and Cost-effective	**Residential Information, Education and Awareness**	4.88	4.73	4.81	14.42	**Good**	Yes	E	$0.28	$0.28	1.76	1.76	n/a	**Good**
	Property Manager Workshops	3.63	3.73	3.69	11.05	**Good**	Yes	E, A	$0.33	$0.33	2.63	2.63	n/a	**Good**
	Trade Ally Irrigation and Landscape Workshops	3.34	3.73	2.84	9.90	**Good**	Yes	E, A	$0.19	$0.19	4.42	4.42	n/a	**Good**
Mixed Acceptability and Cost-effective	**CII Irrigation ET Controller Retrofit A**	1.88	1.33	4.53	7.74	**Mixed**	Yes	A, R	$0.19	$0.31	4.55	2.77	13.66	**Good**
	CII Irrigation ET Controller Retrofit B	2.56	1.33	3.00	6.90	**Mixed**		A, R	$0.28	$0.28	3.05	3.05	n/a	Good
	Large Landscape Audit B	1.88	1.33	4.53	7.74	**Mixed**	Yes	A, R, U	$0.80	$0.80	1.07	1.07	n/a	**Good**
	Nonresidential Irrigation Submetering	1.34	1.10	1.34	3.79	**Poor**	Yes	O	$0.02	$0.11	57.04	7.51	16.61	**Good**
	Multifamily Submetering	1.28	1.17	1.53	3.98	**Poor**	Yes	O	$0.03	$0.03	16.40	16.40	n/a	**Good**
Mixed Acceptability and Mixed Cost-effectiveness	**Large Landscape Audit A**	2.94	2.87	3.56	9.37	**Good**		A, U	$0.58	$0.92	1.49	0.73	4.80	**Mixed**
	CII Indoor Audits A	3.00	3.73	3.38	10.11	**Good**	Yes	A, U	$0.48	$0.70	0.88	0.61	22.08	**Mixed**
	CII Indoor Audits B	**2.75**	**1.33**	**4.47**	**8.55**	**Mixed**		A, R, U	$0.66	$0.66	0.64	0.64	n/a	**Mixed**
	Toilet Rebate or Replacement	1.50	1.33	4.44	7.27	**Mixed**	Yes	R	$0.44	$0.44	0.95	0.95	n/a	**Mixed**
	Residential Indoor Audits A	1.56	1.53	1.38	4.47	**Poor**	Yes	A	$0.39	$0.62	1.09	0.68	19.60	**Mixed**
	Residential Irrigation ET Controller Retrofit	1.94	1.13	2.75	5.82	**Poor**	Yes	A, R	$0.49	$2.21	1.76	0.39	0.89	**Mixed**
	Waterless Urinals	1.44	1.20	1.31	3.95	**Poor**	Yes	R	$0.49	$0.49	0.87	0.87	n/a	**Mixed**
	Residential Indoor Audits B	1.50	1.33	2.44	5.27	**Poor**		A, R	$0.60	$0.60	0.70	0.70	n/a	**Mixed**
	CII Outdoor Ordinance	1.31	1.73	1.31	4.36	**Poor**	Yes	A, U	$0.77	$4.43	1.12	0.19	0.44	**Mixed**
	Eliminate Single-Pass Cooling C	*	*	*	*	*	Yes	R, U	$0.03	$6.41	15.97	0.07	0.77	**Mixed**
Mixed Acceptability and Not Cost-effective	**Washing Machine Rebate**	1.63	1.40	4.63	7.65	**Mixed**	Yes	R	$0.99	$0.99	0.43	0.43	n/a	**Poor**
	Residential Landscape Workshops B*	3.75	3.73	2.81	10.30	**Good**		E, A	$2.81	$47.60	0.31	0.02	0.03	**Poor**
	Residential Landscape Workshops A*	3.75	3.73	2.81	10.30	**Good**		E,A	$7.03	$7.03	0.12	0.12	n/a	**Poor**
	CII Landscaping and Irrigation System Rebate A	2.19	1.33	3.09	6.61	**Mixed**		R	$7.46	$11.18	0.12	0.08	0.43	**Poor**
	CII Landscaping and Irrigation System Rebate B	2.13	1.17	3.97	7.26	**Mixed**		R	$9.79	$9.79	0.09	0.09	n/a	**Poor**
	Residential Landscaping and Irrigation System Rebate A	2.00	1.87	3.06	6.93	**Mixed**		R	$17.12	$29.36	0.05	0.03	0.12	**Poor**
	Residential Landscaping and Irrigation System Rebate B	1.94	1.07	4.00	7.00	**Mixed**		R	$28.55	$28.55	0.03	0.03	n/a	**Poor**
Poor Acceptability and Not Cost-effective	**SF Outdoor Audit A**	1.63	1.67	2.69	5.98	**Poor**		A	$3.01	$6.51	0.28	0.13	0.44	**Poor**
	SF Outdoor Audit B	1.38	1.47	2.16	5.00	**Poor**		A, R	$6.42	$6.42	0.13	0.13	n/a	**Poor**
	Eliminate Single-Pass Cooling B	*	*	*	*	*		R, U	$1.62	$6.41	0.26	0.07	1.03	**Poor**
	Eliminate Single-Pass Cooling A	*	*	*	*	*		R, U	$3.22	$6.41	0.13	0.07	1.54	**Poor**

***Residential Landscape workshops were split into two programs after programs were ranked; Eliminate single-pass cooling was added after ranking.**

Requirement codes: E - education, A - technical assistance, R - rebates and financing retrofits, U - reuse, recycling, and non-potable use, O - Other

TABLE 2
PROGRAM SAVINGS AND COSTS

Program	30-year savings MG	Discounted Savings MG	Average Annual Savings MG	30-year total cost	Discounted Cost	Average Annual Cost	Unit Cost$/MG	Unit Cost$/ccf
Residential Information, Education and Awareness	23,266	13,582	776	$8,477,729	$5,137,771	$282,591	$378.27	$0.28
Property Manager Workshops	1,155	639	38	$462,030	$278,397	$15,401	$435.72	$0.33
Trade Ally Irrigation and Landscape Workshops	2,349	1,307	78	$558,950	$339,121	$18,632	$259.50	$0.19
CII Irrigation ET Controller Retrofit A	11,949	7,751	398	$2,547,467	$1,954,797	$84,916	$252.18	$0.19
CII Irrigation ET Controller Retrofit B	47,794	31,006	1,593	$15,232,491	$11,664,545	$507,750	$376.20	$0.28
Large Landscape Audit B	7,022	3,934	234	$7,242,127	$4,223,573	$241,404	$1,073.68	$0.80
Nonresidential Irrigation Submetering	18,164	9,788	605	$298,908	$196,956	$9,964	$20.12	$0.02
Multifamily Submetering	4,685	2,382	156	$140,807	$97,766	$4,694	$41.04	$0.03
Large Landscape Audit A	3,511	1,967	117	$2,570,001	$1,515,219	$85,667	$770.37	$0.58
CII Indoor Audits A	14,199	7,865	473	$8,673,756	$5,049,366	$289,125	$642.02	$0.48
CII Indoor Audits B	56,533	31,314	1,884	$47,584,044	$27,605,089	$1,586,135	$881.55	$0.66
Toilet Rebate or Replacement	15,235	8,429	508	$5,888,894	$4,986,553	$196,296	$591.60	$0.44
Residential Indoor Audits A	22,214	12,475	740	$11,003,845	$6,465,283	$366,795	$518.25	$0.39
Residential Irrigation ET Controller Retrofit	3,146	2,042	105	$1,729,276	$1,330,782	$57,643	$651.63	$0.49
Waterless Urinals	10,321	5,710	344	$4,384,960	$3,711,890	$146,165	$650.08	$0.49
Residential Indoor Audits B	44,427	24,951	1,481	$34,317,265	$20,122,116	$1,143,909	$806.48	$0.60
CII Outdoor Ordinance	6,160	3,325	205	$5,613,260	$3,407,760	$187,109	$1,024.82	$0.77
Eliminate Single-Pass Cooling C	14,377	7,953	479	$332,850	$281,343	$11,095	$35.37	$0.03
Washing Machine Rebate	6,480	3,362	216	$7,531,648	$4,430,481	$251,055	$1,317.78	$0.99
Residential Landscape Workshops B	338	189	11	$1,175,371	$711,158	$39,179	$3,761.00	$2.81
Residential Landscape Workshops A	135	76	5	$1,175,371	$711,158	$39,179	$9,403.80	$7.03
CII Landscaping and Irrigation System Rebate A	535	305	18	$5,046,163	$3,041,359	$168,205	$9,968.53	$7.46
CII Landscaping and Irrigation System Rebate B	1,101	626	37	$13,601,937	$8,187,938	$453,398	$13,081.74	$9.79
Residential Landscaping and Irrigation System Rebate A	481	281	16	$10,518,491	$6,420,191	$350,616	$22,888.36	$17.12
Residential Landscaping and Irrigation System Rebate B	963	561	32	$35,072,937	$21,412,068	$1,169,098	$38,167.64	$28.55
SF Outdoor Audit A	4,609	2,586	154	$17,764,100	$10,423,676	$592,137	$4,030.42	$3.01
SF Outdoor Audit B	9,217	5,173	307	$75,750,719	$44,385,880	$2,525,024	$8,581.12	$6.42
Eliminate Single-Pass Cooling B	14,377	7,953	479	$20,383,739	$17,260,197	$679,458	$2,170.21	$1.62
Eliminate Single-Pass Cooling A	14,377	7,953	479	$40,434,628	$34,239,051	$1,347,821	$4,305.05	$3.22