Final

Water Management and Conservation Plan

Prepared for

City of Sandy, Oregon

June 2016

Prepared by

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Oregon
Kate Brown, Governor

Water Resources Department
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Salem, OR 97301
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www.wrd.state.or.us

June 3, 2016

City of Sandy
Attn: Mike Walker, Public Works Director
39250 Pioneer Blvd.
Sandy, OR 97055

Subject: Water Management and Conservation Plan

Dear Mr. Walker:

Enclosed, please find the final order approving your water management and conservation plan, and specifying that no diversion of water is authorized at this time under Permit S-48451.

The attached final order specifies that the City of Sandy's plan shall remain in effect until **June 2, 2026**. Additionally, the City of Sandy is required to submit a progress report to the Department by **June 2, 2021**, detailing progress made toward the implementation of conservation benchmarks scheduled in the plan. Finally, the City of Sandy must submit an updated Water Management and Conservation Plan to the Department by **November 30, 2025.**

NOTE: *The deadline established in the attached final order for submittal of an updated Water Management and Conservation Plan (consistent with OAR Chapter 690, Division 086) shall not relieve the City of Sandy from any existing or future requirement(s) for submittal of a water management and conservation plan at an earlier date as established through other final orders of the Department.*

We appreciate your cooperation in this effort. Please do not hesitate to contact me at 503-986-0919 or *Kerri.H.Cope@wrd.state.or.us* if you have any questions.

Sincerely,

Kerri H. Cope

Kerri H. Cope
Water Management and Conservation Analyst
Water Right Services Division

Enclosure

cc: WMCP File
Application # S-65051 (Permit # S-48451)
Watermaster # 20 Amy Kim
GSI Water Solutions, Inc., Attn: Adam Sussman, 1600 Western Blvd., Suite 240, Corvallis, OR 97333

BEFORE THE WATER RESOURCES DEPARTMENT
OF THE
STATE OF OREGON

In the Matter of the Proposed Water Management and Conservation Plan for the City of Sandy, Clackamas County	)))	FINAL ORDER APPROVING A WATER MANAGEMENT AND CONSERVATION PLAN

Authority

OAR Chapter 690, Division 086, establishes the process and criteria for approving water management and conservation plans required under the conditions of permits, permit extensions and other orders of the Department.

Findings of Fact

1. The City of Sandy submitted a Water Management and Conservation Plan (plan) to the Water Resources Department (Department) on January 28, 2016. The plan was submitted to comply with conditions set forth under the City's previously approved plan (Sp. Or. Vol. 73, Pg. 376 issued on September 27, 2007, and a condition set forth in the final order issued on November 16, 2012 approving an Extension of Time for Permit S-48451.

2. The Department published notice of receipt of the plan on February 2, 2016, as required under OAR Chapter 690, Division 086. No comments were received.

3. The Department provided written comments on the plan to the City on April 7, 2016. In response, the City submitted a revised plan on May 16, 2016.

4. The Department reviewed the revised plan and finds that it is consistent with the relevant requirements under OAR Chapter 690, Division 086.

Conclusion of Law

The Water Management and Conservation Plan submitted by the City of Sandy, is consistent with the criteria in OAR Chapter 690, Division 086.

Now, therefore, it is ORDERED:

Duration of Plan Approval:

1. The City of Sandy Water Management and Conservation Plan is approved and shall remain in effect until June 2, 2026, unless this approval is rescinded pursuant to OAR 690-086-0920.

This is a final order in other than a contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review must be filed within the 60-day time period specified by ORS 183.484(2). Pursuant to ORS 536.075 and OAR 137-004-0080, you may petition for judicial review or petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied.

Development Limitation:

2. The limitation of the diversion of water under Permit S-48451 established in the Final Order approving an Extension of Time for Permit S-48451 *(issued on November 16, 2012)* remains unchanged. Subject to other limitations or conditions of the permit, therefore, the City of Sandy is not authorized to divert any water under Permit S-48451 at this time.

Plan Update Schedule:

3. The City of Sandy shall submit an updated plan meeting the requirements of OAR Chapter 690, Division 086 within ten years and no later than November 30, 2025.

Progress Report Schedule:

4. The City of Sandy shall submit a progress report containing the information required under OAR 690-086-0120(4) by June 2, 2021.

Other Requirements for Plan Submittal:

5. The deadline established herein for the submittal of an updated Water Management and Conservation Plan (consistent with OAR Chapter 690, Division 086) shall not relieve the City of Sandy from any existing or future requirement(s) for submittal of a Water Management and Conservation Plan at an earlier date as established through other final orders of the Department.

Dated at Salem, Oregon this 1 day of June, 2016.

Dwight French
Water Right Services Division Administrator, for
Thomas M. Byler, Director
Oregon Water Resources Department

Mailing date: JUN 07 2016

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Executive Summary

The City of Sandy (City), the eastern-most city in Clackamas County, serves as a gateway to Mt. Hood. The City is surrounded by scenic rivers and wilderness areas appreciated by both residents and tourists. This proximity to precious natural resources continuously reminds the City of the importance of environmental sustainability. As a result, the City views management and conservation of its water resources as a key priority. With this in mind, the City has developed this updated Water Management and Conservation Plan (WMCP, or Plan), to guide development and implementation of water management and conservation programs promoting sustainable water use. This updated WMCP meets the requirements of three final orders issued by the Oregon Water Resources Department (OWRD). The final order approving the City's first WMCP (issued on September 27, 2007) included the requirement that the City submit an "updated" WMCP within 10 years and no later than January 31, 2016. The final order approving an extension of time for the City's water use Permit S-48451 for use of water from the Salmon River (issued on November 16, 2012) included the requirement that the City submit a WMCP by November 16, 2015. (This date was later extended by OWRD to January 29, 2016.)

This WMCP describes the City's water supply, water management and conservation programs, water curtailment plan, and water supply projections and plans.

Municipal Water Supplier Description

Currently, the City's water supply comes from three sources: Alder Creek (a tributary of the Sandy River), Brownell Springs, (a tributary of Beaver Creek), and the City of Portland's Portland Water Bureau (PWB), which provides the City water from its Bull Run surface water supply. The water rights that the City holds for these sources are as follows:

- **Brownell Springs**: Certificate 5427 for the use of up to 0.2 cubic feet per second cubic feet per second (cfs), Certificate 26132 for the use of up to 0.7 cfs, and Certificate 91156 for the use of up to 0.3 cfs from Brownell Springs.
- **Alder Creek**: Certificate, 91176, approved on January 28, 2016, for the use of up to 3.0 cfs.
- **Alder Creek:** Permit S-36601 for the use of up to 1.0 cfs (pending extension of time).
- **Salmon River**: Permit S-48451 for the use of up to 25.0 cfs from the Salmon River.

The City's 2014 estimated service population is 10,387, which includes the estimated population of 10,170 inside the City and the estimated population of 217 served through 81 connections outside city limits.

From 2006 through 2014, the City's annual demand averaged 395.8 million gallons (MG). Average day demand (ADD) averaged 1.08 million gallons per day (mgd) during the same period and the highest maximum day demand (MDD) was 1.24 mgd, which occurred in 2006. For this WMCP, demand refers to the quantity of water delivered to the City's water distribution system. This includes the Alder Creek water pumped to the Terra Fern Reservoir from the Alder Creek Water Treatment Plant (WTP), the water diverted from Brownell Springs that is chlorinated then blended with the Terra Fern Reservoir water, and

wholesale water from the PWB. Annual demand decreased by nearly 100 MG from 2006 to 2014, which the City attributes to reduced irrigation as a result of in-filling in the City's single-family and low-density zones, implementation of higher water rates, the City's water conservation efforts, and to a lesser degree, the economic downturn. The City's ADD also showed a decreasing trend during that time period and the City's MDD dropped markedly in 2013 and 2014, possibly reflecting milder summer weather during those years.

The City has four customer categories: single family residential, multi-family residential, commercial/industrial, and wholesale. The City's wholesale customers are Alder Creek Barlow Water District (District) and Skyview Acres Water Company (Skyview). In 2014, residential water use represented 65 percent of total consumption, while commercial/industrial water use represented 22 percent, multi-family residential water use represented 11 percent, and wholesale water use represented 2 percent.

Consumption refers to the portion of water use that is metered. The City's total annual consumption fluctuated between 287.1 MG and 322.6 MG during the period from 2006 through 2014. Metered consumption did not follow a decreasing trend similar to demand, which likely reflects improvements in customer meter accuracy. The City believes that customer meters were reading low, so that more of the water produced was actually recorded as consumed following meter replacement.

The City's unaccounted-for water was 11.5 percent in 2014 and averaged 22.3 from 2006 through 2014, both substantial reductions in unaccounted-for water compared to the period 1999 through 2005. For the purposes of this WMCP, unaccounted-for water is the difference between demand and metered water consumption. The City attributes its reduction of unaccounted-for water in recent years to a meter replacement efforts and installation of meters at previously unmetered connections, and water demand and consumption accounting improvements.

Section 2 provides more details about the City's water supply, water use, water rights, and water system.

Water Conservation

Highlights of the City's recent water management and conservation efforts include:

- The City implemented a fixed-based radio Automatic Meter Reading (AMR) metering system for all new service connections in December 2011.
- The City gives all new homeowners a welcome packet containing information on indoor and outdoor conservation measures.
- The City distributes indoor and outdoor water conservation kits at the City's Earth Day event, a rotating neighborhood-specific event in the fall, and at additional neighborhood fairs/block parties upon request.
- The City joined in the EPA "Water Sense" program in 2012 and participated in the WaterSense "Fix a Leak Week" in 2013.
- The City partnered with Iseli Nursery in August 2012 to implement a water reuse project at the nursery.

OWRD requires that all water suppliers establish five-year benchmarks for initiating or expanding water management and conservation measures associated with required conservation programs. **Exhibit ES-1** lists the five-year benchmarks associated with the required conservation programs.

Exhibit ES-1. Five-Year Water Conservation Benchmarks.

Conservation Program	Five-year Benchmarks
Annual Water Audit	• The City will continue to conduct an annual water audit. • In the next two years, the City will investigate its billing software for potential sources of accounting errors.
System-wide Metering	• The City will continue to install AMR meters on all new connections. • In the next five years, the City will complete a cost-benefit analysis of replacing all non-AMR meters with AMR meters and will decide how to proceed with meter replacement.
Meter Testing and Maintenance	• The City will continue its meter testing and maintenance program. In the next five years, the City will begin to track the number of meters that it replaces at existing connections. • In the next five years, the City will complete a cost-benefit analysis of replacing all non-AMR meters with AMR meters and will decide how to proceed with meter replacement.
Water Rate Structure and Billing Practices that Encourage Conservation	• The City will continue to bill customers based on the quantity of water metered at the service connection. • The City will continue to bill its customers monthly and to periodically include water conservation messages in utility bills.
Leak Detection	• The City will continue to conduct its leak detection and repair program.
Public Education	• The City will continue to be a member of the Regional Water Providers Consortium. • The City will continue to promote water conservation at the City's Earth Day event and neighborhood events.

Exhibit ES-1. Five-Year Water Conservation Benchmarks Continued.

Conservation Program	Five-year Benchmarks
Technical and Financial Assistance	• In the next five years, the City will explore ways to increase interest in the xeriscaping outreach program materials.
Supplier Financed Retrofit or Replacement of Inefficient Fixtures	• The City will continue to make water conservation kits available at no charge to any customer requesting one.
Water Reuse, Recycling, and Non-potable Opportunities	• The City will continue to make downspout rain barrels available to water customers to reduce demand for finished water for residential irrigation. • The City will continue the water reuse project with Iseli Nursery. • In the next five years, the City will explore additional water reuse, recycling, and non-potable water opportunities.

Section 3 contains more details about the City's water management and conservation programs.

Water Curtailment

Water curtailment plans outline proactive measures that water suppliers may take during short-term water supply shortages. The City has adopted a four-stage water curtailment plan that it will implement in the event of a water supply shortage that requires water curtailment. The four stages of curtailment increase in severity and are intended to be implemented in progressive steps. The curtailment stages include both voluntary and mandatory limitations. The potential initiating conditions (i.e. triggers) for the City's curtailment stages focus on supply capacity, but also include such conditions as drought, failure of a major system component, and source water contamination.

The curtailment plan identifies voluntary or mandatory actions under each stage of water curtailment, including:

- **Stage 1: Water Supply Shortage Warning**
  The City may request that its customers take the following voluntary actions:
  - Limit landscape watering between the hours of 10:00 am and 6:00 pm.
  - Comply with an alternate days system for landscape watering.
  - Implement other conservation measures, such as those suggested by the RWPC website and the RWPC brochures, *H20utdoor* and *H20 indoor.*

- **Stage 2: Moderate Water Supply Shortage**
  The City may impose such mandatory water restrictions as:
  - Watering landscapes prohibited between 10:00 am and 6:00 pm.
  - No water use to wash sidewalks, walkways, driveways, parking lots, tennis court, and other hard-surfaced outdoor areas.

- No water use for fountains or ponds for aesthetic or scenic purposes, except where necessary to support fish life.

- **Stage 3: Severe Water Supply Shortage**

  The City may impose such additional mandatory water restrictions as:
  - Prohibition on all outdoor watering (with a few exceptions)
  - No water use from hydrants for construction purposes (except on a case-by case basis), firefighting exercises, or any purpose other than firefighting.
  - Implement limitations on commercial uses of water as determined appropriate by the city manager.
- **Stage 4: Critical Water Supply Shortage**

  The City may impose the following additional mandatory water restrictions:
  - Limit residential water use to essential uses only, such as drinking, cooking, basic sanitation, and maintaining human health.
  - Prohibit all non-essential water uses by commercial/industrial customers

The City will issue a notice to customers describing the current water situation, the reason for the voluntary or mandatory conservation measures, and the RWPC website (www.conserveh2o.org), which contains conservation information and tips. The City may issue a similar notice through local media (newspaper, radio, or TV).

Section 4 further describes the initiating conditions and response actions for each curtailment stage.

Water Supply

WMCPs must provide 10-year and 20-year population and water demand projections. The City's projected population for its future water service area, which includes its current UGB and Urban Reserve Area, is 13,123 in 2025 and 16,769 in 2035. These population projections were prepared by Portland State University's Population Research Center (PRC) in October 2014 based on Metro's Buildable Land Inventory (BLI), household forecasts for areas called transportation analysis zones (TAZs) adopted by the Metro Council in 2012, data from the PRC, and data from the US Census Bureau.

To estimate the City's future water demands, the City's average annual water demand from 2006 through 2014 (395.8 MG) was apportioned among the City's customer categories based on the percentage of water that each customer category consumed in 2014. Average annual water demand for each customer category was divided by 365 days to calculate ADD per customer category.

The City then projected future Residential ADDs using an annual residential growth rate of 2.12 percent applied to the average Residential (single family + multi-family) ADD of 0.82 mgd, developed as described above. The projected future Commercial/Industrial ADD was estimated using the annual employment growth rate of 4.0 percent applied to the average Commercial/Industrial ADD of 0.24 mgd. Finally, the projected Wholesale ADD was developed assuming no growth (no additional wholesale customers and no increase from any population growth in the District and Skyview), resulting in the average Wholesale demand of 0.02 mgd continuing through 2035.

The City summed the projected Residential, Commercial/Industrial, and Wholesale ADDs for each year through 2035 then applied the maximum peaking factor (MDD:ADD) from 2006-2014 of 2.3 to obtain the projected MDD for each year through 2035.

Finally, the City determined the standard deviation of the MDDs from 2006 through 2014, which was 0.3 mgd (0.46 cfs), and added the 0.3 mgd "weather allowance" to the MDD projections to account for the potential effects of weather variations on MDD.

Exhibit ES-2 presents the City's MDD projections with and without the weather allowance. The City's projected MDDs with the weather allowance are 3.6 mgd (5.5 cfs) in 2025 and 4.5 mgd (7.0 cfs) in 2035.

Exhibit ES-2. Projected Maximum Day Demand (MDD) With and Without a Weather Allowance.

Year	MDD		MDD with Weather Allowance (mgd)	MDD with Weather Allowance (cfs)
	(mgd)	(cfs)		
2025	3.3	5.1	3.6	5.5
2035	4.2	6.6	4.5	7.0

The City presently relies principally on its Alder Creek and Brownell Springs water supply, and PWB water is a supplemental water supply. To meet its future demands, the City intends to fully utilize its Alder Creek and Brownell Springs water rights in order to minimize its reliance on the water it purchases from the PWB, which is particularly important in the event of a disruption in the PWB water supply.

The City's analysis of the water supply reliability of its sources indicates that the City can reliably use 4.0 cfs from Alder Creek and 0.2 cfs from Brownell Springs plus 0.77 cfs from the PWB for a total reliable water supply of 4.97 cfs (3.21 mgd). The City's projected MDD with a weather allowance shows that in less than 10 years (by 2021) the City will need the entire reliable supply of 4.97 cfs.

In the coming years, the City will evaluate the best approach to meet its projected water demands through at least 2035. The City is considering three options:

1) Begin to develop the City's Salmon River water supply,
2) Purchase additional wholesale water from the PWB, or
3) Pursue a combination of options 1 and 2.

Section 5 describes the City's future service area, population and demand projections, and water supply strategies in further detail.

SECTION 1

Municipal Water Supplier Plan

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

This rule requires a list of affected local governments to whom the plan was made available, and a proposed date for submittal of an updated plan.

Introduction

The City of Sandy (City), once the site of a trading post on the Oregon Trail, is a growing community in the western foothills of Mt. Hood. The City recognizes the importance of properly managing the natural resources that its community members depend on, and as a result, has been implementing numerous water management and conservation measures.

The purpose of this Water Management and Conservation Plan (WMCP) is to guide development and implementation of water management and conservation programs that promote sustainable water use and to consider the City's future water needs. This WMCP is intended to be a working document that will aid future water planning.

Plan Requirement

This WMCP is an update of the City's first WMCP, which the Oregon Water Resources Department (OWRD) approved in a Final Order issued on September 27, 2007. The WMCP Final Order included the requirement that the City submit an "updated" WMCP within 10 years and no later than January 31, 2016. The Final Order also required a WMCP Progress Report by January 31, 2011, which was submitted and acknowledged by OWRD.

On November 16, 2012, OWRD issued a Final Order approving an extension of time on the City's water right Permit S-48451 for use of water from the Salmon River. The extension of time Final Order included the requirement that the City submit a WMCP by November 16, 2015. This date was later extended by OWRD to January 29, 2016.

The City is submitting this updated WMCP to meet the requirements of both of the Final Orders described above. This WMCP meets all of the requirements of the Oregon Administrative Rules (OAR) adopted by the Water Resources Commission in November 2002 (OAR Chapter 690, Division 86) regarding WMCPs.

Plan Organization

The WMCP is organized into the following sections, each addressing specific sections of OAR Chapter 690, Division 86. Section 2 is a self-evaluation of the City's water supply, water use, water rights, and water system. The information developed for Section 2 is the foundation for the sections that follow. The later sections use this information to consider how the City can improve its water conservation and water supply planning efforts. The WMCP also includes appendices with supporting information.

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

The City has relied on information from the following sources in preparing this plan:

- City of Sandy 2007 WMCP [Approved September 27, 2007]
- City of Sandy Public Works staff
- Portland State University Population Research Center
- Oregon Water Resources Department (OWRD)

Affected Governments
OAR 690-086-0125(5)

The following local governments may be affected by this WMCP:

- City of Sandy
- Clackamas County

Thirty days before submitting this WMCP to OWRD, the City made the draft WMCP 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. The letters requesting comment are in **Appendix A.** No comments were received.

In addition, the City provided Alder Creek Barlow Water District and Skyview Acres Water Company with a copy of the plan as a courtesy.

Plan Update Schedule
OAR 690-086-0125(6)

The City anticipates submitting an update of this WMCP within 10 years of the final order approving this WMCP, or upon the approval of the pending permit extension application for Permit S-36601 As required by OAR Chapter 690, Division 86, and a progress report will be submitted within 5 years of the final order.

Time Extension
OAR 690-086-0125(7)

The City is not requesting additional time to implement metering or a previous benchmark.

SECTION 2

Water Supplier Description

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

This rule requires descriptions of the City's water sources, water delivery area and population, water rights, and adequacy and reliability of the existing water supply. The rule also requires descriptions of the City's customers and their water use, the water system, interconnections with other water suppliers, and quantification of system leakage.

Water Sources

OAR 690-086-0140(1)

The City's water supply currently comes from three sources: Alder Creek (a tributary of the Sandy River), Brownell Springs, (a tributary of Beaver Creek), and the City of Portland's Portland Water Bureau (PWB), which provides the City water from its Bull Run surface water supply.

The Alder Creek diversion is approximately 7 miles east of the City. The City has a raw water intake located along the creek, approximately one mile upstream from its confluence with the Sandy River.

Brownell Springs consists of a group of eight natural springs approximately 6 miles southeast of the City, on the north slope of Lenhart Butte. Brownell Springs is located at the headwaters of Beaver Creek, a tributary of Cedar Creek, which flows into the Sandy River.

The City also purchases wholesale water from the PWB as a supplemental water supply and to provide water supply redundancy in the event of an emergency.

Finally, the City also holds a permit for use of water from the Salmon River, but does not currently use that water source.

Interconnections with Other Systems

OAR 690-086-0140(7)

The City has a new interconnection with the PWB, which was placed into service in April 2014. PWB water supplements the City's Brownell Springs and Alder Creek sources, reduces the City's reliance on the single transmission line along Hwy 26 for its entire water supply, and provides redundancy in case of emergencies. The City does not have the ability to convey water back to the PWB through this interconnection.

The City serves wholesale water to the Alder Creek Barlow Water District (District), which is Public Water System Identification (PWS ID) Number 4100630. The City is the District's only water supply source. The District has no ability to supply water to the City. The two systems are connected through a 4-inch main at one location.

In 2014, the City began serving wholesale water to Skyview Acres Water Company (Skyview), which is PWS ID Number 4100786. The City is Skyview's primary water supply source and the PWB is an emergency water supply source. Skyview has no ability to supply water to the City.

Intergovernmental Agreements

OAR 690-086-0140(1)

The City has a wholesale water supply agreement with the City of Portland. The term of the agreement is from November 2008 until June 30, 2028. The agreement allows the City to obtain a minimum of 0.5 million gallons per day (mgd) and up to a maximum of 3 mgd from the City of Portland's Bull Run source. The City is required to pay for at least 0.5 mgd regardless of the amount used. If the average of the 3 highest usage days in any calendar year exceeds the minimum purchase amount (0.5 mgd), then that 3-day average becomes the new minimum purchase amount for subsequent years. The City of Portland is responsible for maintaining and calibrating the master meter at the water system connection and includes the cost of maintenance in the established water rate. The agreement requires the City to submit a Water Conservation Plan to the City of Portland every 5 years that describes the City's water management and conservation programs. WMCPs approved by OWRD meet this agreement requirement. If the City of Portland declares a water shortage, the City is required to implement curtailment measures that meet the requirements of the mutually agreed-upon curtailment plan.

The City has had a water supply agreement with Alder Creek Barlow Water District since 1984. The agreement requires a 6-month notification period before a change to the agreement is implemented, and as of 2004, the agreement automatically renews every two years unless either party wishes to terminate the agreement. The agreement does not specify a maximum amount of water that the City will supply. The District is responsible for operating and maintaining its water system to minimize water "losses, leakage, and overuse" of water. The City agreed to test and calibrate the master meter biannually and the District agreed to pay the associated costs. The agreement also discusses how water will be curtailed in times of water shortage.

The City also has a water supply agreement with Skyview that became effective July 1, 2014 and will remain in effect until June 30, 2034. The agreement will then be renewed every 5-years unless either party terminates the agreement. The agreement states that the City will initially supply a maximum demand of 60,000 gallons per day and a maximum flow rate of 200 gallons per minute, and the City may revise the maximum day demand and maximum flow rate in the future. The City will pay costs associated with bi-annual testing and calibration of the master meter. Skyview and its water users are subject to the water use regulations, water conservation practices, and curtailment measures applicable to the City's other wholesale and retail customers under its WMCP, Section 13.0 4.220 of the Sandy Municipal Code, and/or its water purchase agreement with the City of Portland. Skyview is responsible for operating and maintaining its water distribution system in a manner that minimizes water "losses, leakage, and overuse" of water.

Service Area Description and Population

OAR 690-086-0140(2)

The City's 2014 estimated population is 10,387, which was calculated by adding the City's population (10,170) to the estimated number of people served outside the City limits (217). The City's 2014 estimated population was obtained from Portland State University's Population Research Center. The population served outside the City limits was estimated by multiplying the number of residential connections outside the city limits in 2014 (81), according to City records, by the City's estimated persons per household (2.68), according to the US Census 2010.

Exhibit 2-1 shows the City's current service area, which consists of the area within city limits plus the approximately 81 residential connections served outside of city limits, primarily east of the city limits along Highway 26.

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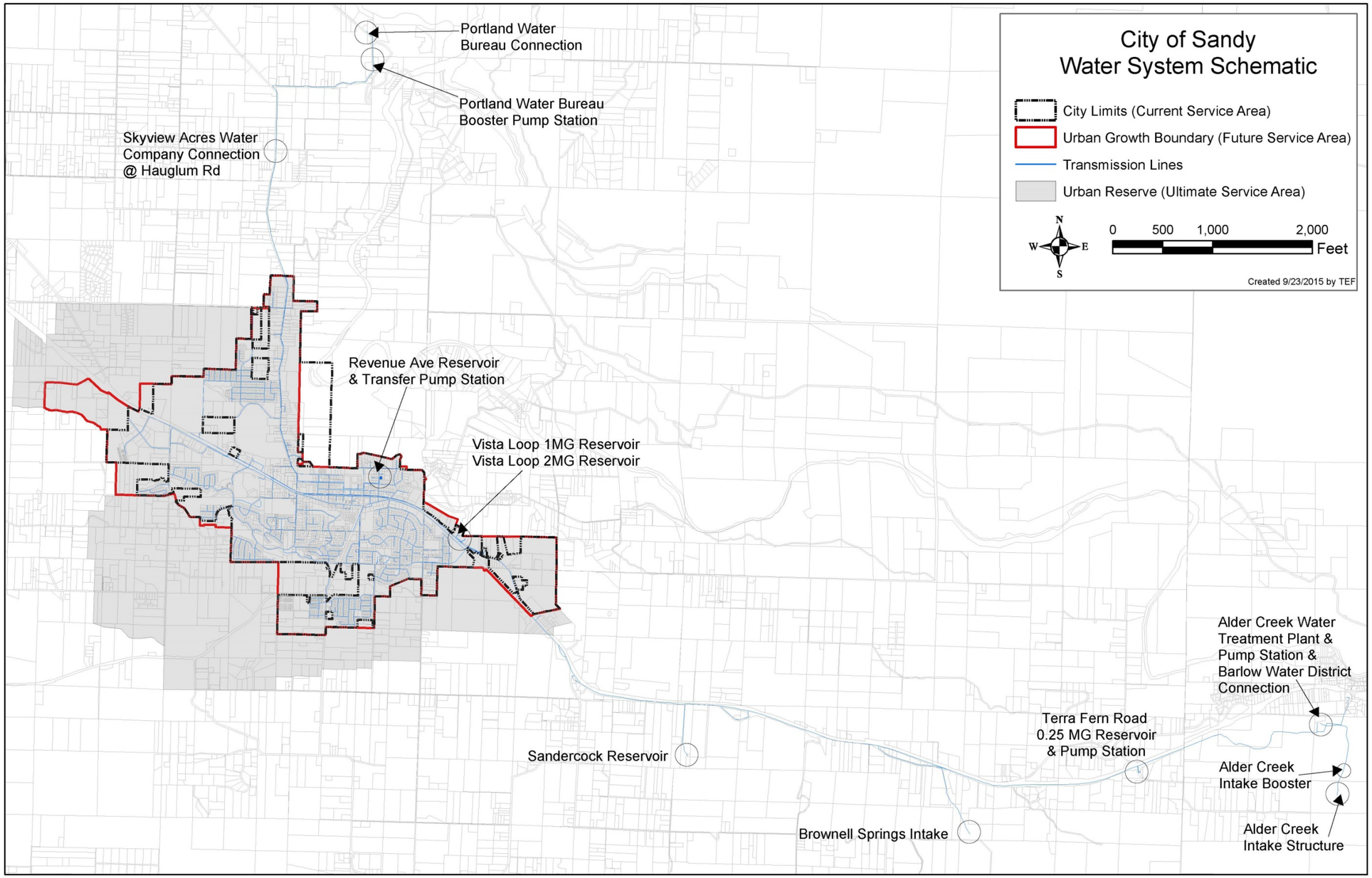
Exhibit 2-1. Service Area Map and System Schematic.



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Records of Water Use

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

Terminology

For this WMCP, demand refers to the quantity of finished water delivered to the City's water distribution system. This includes the Alder Creek water pumped to the Terra Fern Reservoir from the Alder Creek Water Treatment Plant (WTP), the water diverted from Brownell Springs that is chlorinated then blended with the Terra Fern Reservoir water, and wholesale water from the PWB. The finished water is used through metered consumption, unmetered uses, and water lost to leakage. For the purposes of this WMCP, the terms demand and production are synonymous. Consumption refers to the portion of water use that is metered.

Generally, demand 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, a quantity of water is typically reported in million gallons (MG).

This WMCP uses the following terms to describe specific values of system demands:

- Average day demand (ADD) equals the total annual system input (demand) divided by the number of days in the year (typically 365 days).
- Maximum day demand (MDD) equals the highest system demand that occurs on any single day during a calendar year.
- Maximum monthly demand (MMD) in MG equals the highest total monthly demand of the 12 months of a calendar year. MMD in mgd equals the average day demand of the month with the highest total demand within 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

Annual and Daily Demands

The City's water demands from 2006 through 2014 are summarized in **Exhibit 2-2**.

Exhibit 2-2. Historical Annual Water Demand, Average Day Demand (ADD), Maximum Day Demand (MDD), Peaking Factor, and Maximum Month Demand (MMD), 2006-2014.

Year	Annual Demand (MG)	ADD (mgd)	MDD (mgd)	MDD: ADD Peaking Factor	MMD (MG)	MMD (mgd)
2006	450.8	1.24	2.20	1.8	55.7	1.80
2007	428.1	1.17	2.36	2.0	50.7	1.63
2008	403.5	1.10	2.41	2.2	53.2	1.72
2009	383.5	1.05	2.46	2.3	53.6	1.73
2010	404.3	1.11	2.19	2.0	51.9	1.68
2011	378.4	1.04	2.17	2.1	47.4	1.53
2012	391.7	1.07	2.19	2.0	51.5	1.66
2013[1]	365.7	1.00	1.69	1.7	47.9	1.54
2014	356.0	0.98	1.72	1.8	49.6	1.60
Average	395.8	1.08	2.15	2.0	51.3	1.65
Maximum	450.8	1.24	2.46	2.3	55.7	1.80

[1] Brownell Springs demand data was lost for June and July 2013. Average demands for June and July from 2006 through 2012 and 2014 were used to estimate demands during those months in 2013.

Annual demand decreased by nearly 100 MG from 2006 to 2014, as shown in **Exhibit 2-2** and **Exhibit 2-3**. The City attributes this decreasing trend to in-filling in the City's single-family and low-density zones, implementation of higher water rates, the City's water conservation efforts, and to a lesser degree, the economic downturn. **Exhibit 2-2** and **Exhibit 2-4** show that ADD also had a decreasing trend during that time period, decreasing from a high of 1.24 mgd in 2006 to 0.98 mgd in 2014. The City's MDD dropped markedly in 2013 and 2014, which could reflect milder summer weather during those years.

Exhibit 2-3. Annual Demand, 2006-2014.

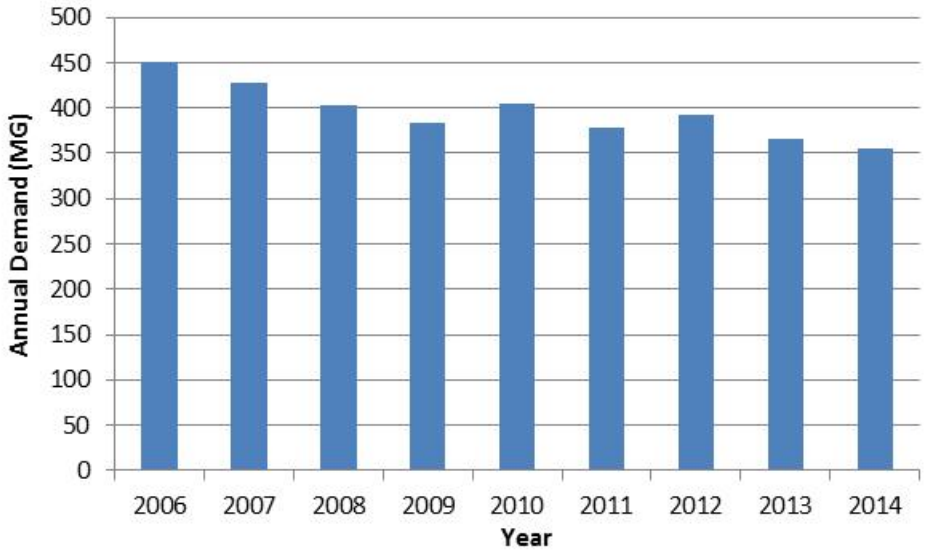
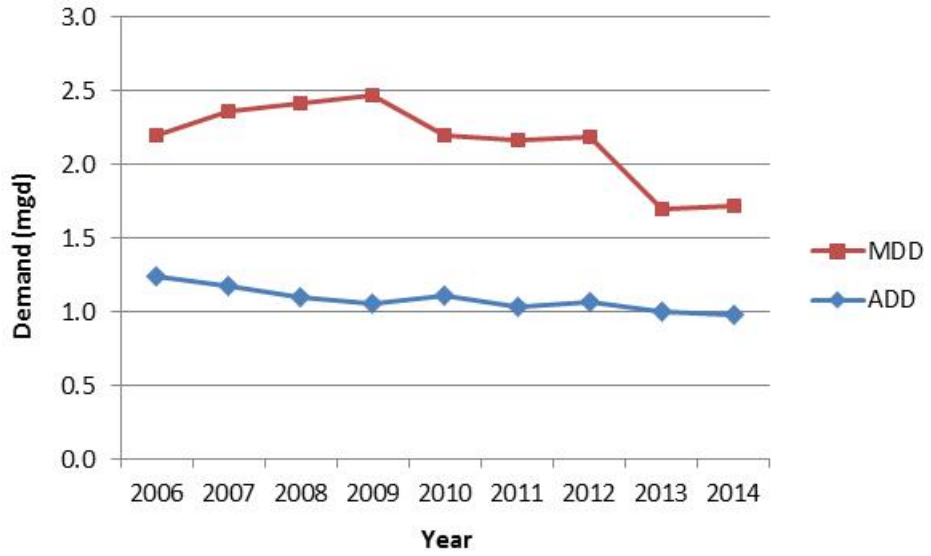


Exhibit 2-4. Average Day Demand (ADD) and Maximum Day Demand (MDD), 2006-2014.



For the purposes of this WMCP, MDD from 2006 through 2013 was calculated by adding the MDD at the Alder Creek WTP to the ADD at Brownell Springs for the month when the MDD at the Alder Creek WTP occurred (Demand at Brownell Springs is only recorded monthly due to the City's relatively consistent daily water diversions). MDD in 2014 was calculated using the same methodology, but also adding the PWB demand on the same day as the MDD at the Alder Creek WTP.

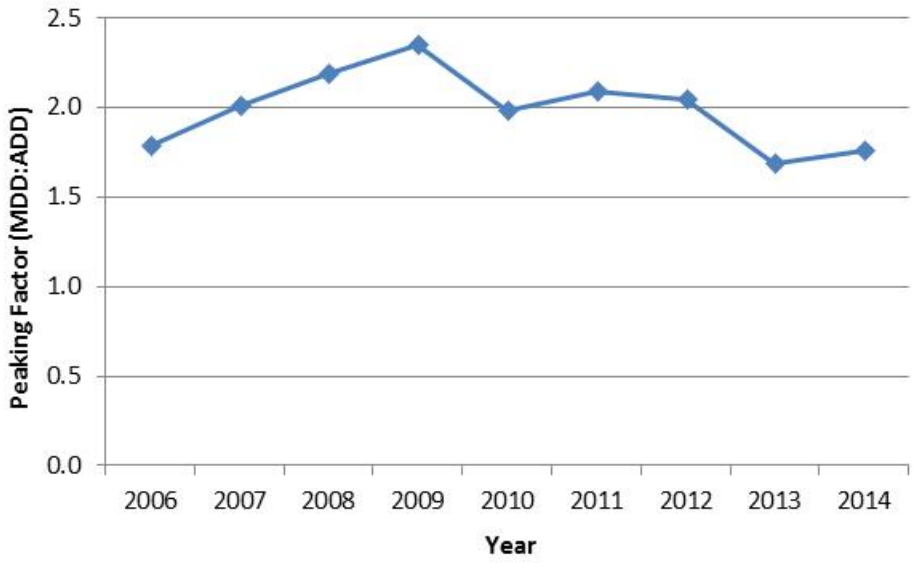
MDD is an important value for water system planning. Water rights and supply facilities (e.g. treatment plants, pipelines, and reservoirs) must be capable of meeting a city's MDD. If the MDD exceeds the combined supply capacity on any given day, finished water storage levels will be reduced, and if the MDD exceeds combined supply capacity on several consecutive days, a water shortage may occur.

Weather patterns and the economy strongly influence MDD. Weather patterns that can cause fluctuations in MDD from year to year include: maximum temperatures, the number of consecutive days with high temperatures, when high temperatures occur in the summer, overall rainfall levels during the summer, and consecutive days without rainfall. Unusually hot and/or dry weather results in more outdoor irrigation, which increases the MDD. The economy can affect MDD by influencing: customer spending on irrigation, the number of new homes with landscapes needing intense irrigation for plant establishment, and the opening or closing of facilities that use water in their operations.

Peaking Factors

From 2006 through 2014, the City's MDD to ADD peaking factor averaged 2.0. This peaking factor is within the range of other water utilities in the Portland area, such as the City of Lake Oswego (averaged 2.3 from 2001 to 2008; *City of Lake Oswego July 2010 WMCP*) and the City of Gresham and Rockwood Water People's Utility District, which averaged 1.8 and 1.6 from 2000 to 2006, respectively (*Rockwood Water People's Utility District and City of Gresham 2013 WMCP*). A peaking factor can be an important tool used in demand forecasting and in developing targeted water conservation measures.

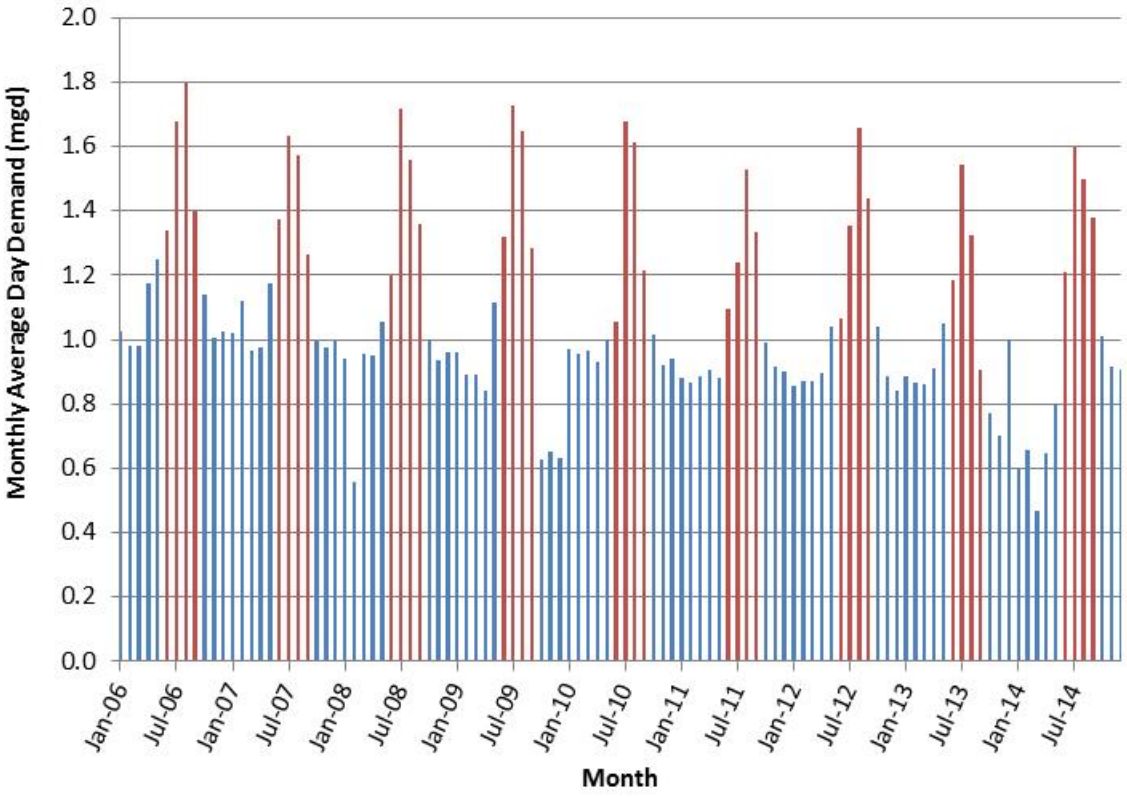
Exhibit 2-5. Peaking Factors (MDD: ADD), 2006-2014.



Monthly Demand

The City's average maximum month demand (MMD) volume from 2006 through 2014 was 51.3 MG. During those maximum-demand months, the City's ADD averaged 1.65 mgd. **Exhibit 2-6** shows monthly ADD, with the peak season months of June through September in red. The highest monthly ADD of 1.80 mgd occurred in July 2006, and the months with the greatest ADD were consistently July and August.

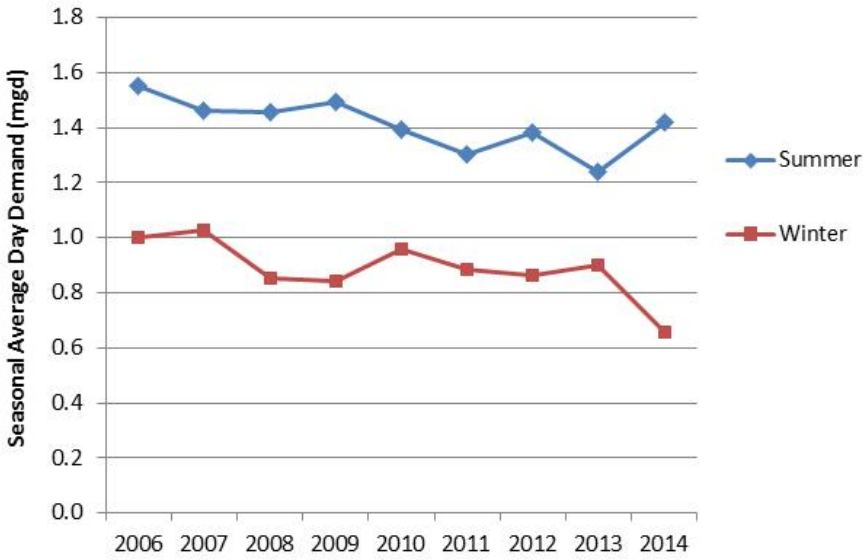
Exhibit 2-6. Monthly Average Day Demand, 2006-2014. Red indicates peak season months (June through September) while blue indicates non-peak season months.



Seasonal Demand

Exhibit 2-7 shows that from 2006 through 2014, Summer (June through September) ADD ranged from 1.30 mgd to 1.55 mgd (the data point of 1.24 mgd in 2013 has been disregarded for this analysis due to the missing Brownell Springs summertime data in this year) and Winter (December through March) ADD ranged from 0.66 mgd to 1.03 mgd. During this period, the average of the City's ADD in the summer was 1.6 times greater than the average of the City's ADD in winter. The difference between seasons is largely attributable to water demand for irrigation during the summer months.

Exhibit 2-7. Historical Seasonal Average Day Demand, 2014. Summer = June to September. Winter = December to March.



Authorized Consumption

Authorized consumption is equal to the metered and certain unmetered water uses within the system.

Customer Characteristics and Use Patterns

OAR 690-086-0140(6)

Customer Description

The City has four customer categories: single family residential, multi-family residential, commercial/industrial, and wholesale. As previously described, the City's wholesale customers are Alder Creek Barlow Water District and Skyview. **Exhibit 2-8** presents the number of accounts by customer category from 2006 through 2014. The number of single-family residential accounts steadily increased during this period while the number of accounts for the other customer categories remained relatively stable. The commercial/industrial customer category is broken down by meter size to provide further details about these customers. Small commercial accounts use a ¾-inch or smaller meter and would include businesses such as real estate offices, stores, and some restaurants. Large

commercial accounts use a meter larger than ¾-inch and would include laundries, manufacturers, and light industrial companies.

Exhibit 2-8. Number of Accounts by Customer Category, 2006-2014.

Year	Single Family Residential	Multi-Family Residential	Commercial/Industrial			Wholesale	Total
			Small (3/4-inch meters)	Large (>3/4-inch meters)	Total Commercial /Industrial		
2006	2,479	88	134	105	239	1	3,046
2007	2,744	81	133	113	246	1	3,318
2008	2,841	87	133	136	269	1	3,467
2009	2,916	87	131	114	245	1	3,494
2010	2,973	86	128	117	245	1	3,550
2011	2,998	87	125	118	243	1	3,572
2012	3,039	88	123	120	243	1	3,614
2013	3,067	88	123	123	246	1	3,648
2014	3,196	87	124	124	248	2	3,781

Annual Consumption

As shown in **Exhibit 2-9**, total annual consumption fluctuated from 2006 through 2014. The greatest consumption of 322.6 MG occurred in 2006 and the lowest consumption of 287.1 MG occurred in 2011. The average total annual consumption during this period was 306.0 MG. Metered consumption does not follow a decreasing trend similar to demand, which likely reflects improvements in customer meter accuracy. The City believes that customer meters were reading low, so that more of the water produced was actually recorded as consumed following meter replacement. This underreporting of customer consumption likely contributed substantially to the high unaccounted-for water recorded in 2006 and 2007.

Exhibit 2-9. Annual Consumption, 2006-2014.

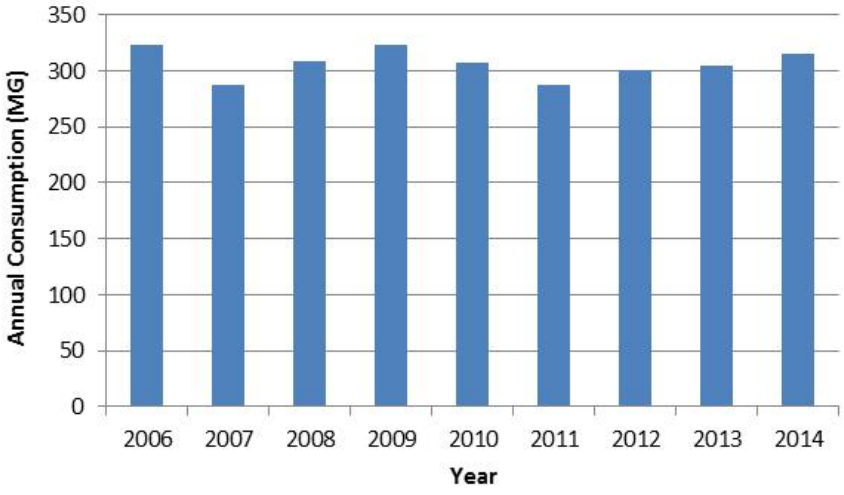


Exhibit 2-10 presents annual consumption by customer category from 2006 through 2014. Single-family residential consumption fluctuated during this period and peaked in 2014 with 203.8 MG. Multi-family residential and wholesale consumption experienced minor fluctuations from 2006 through 2014 while commercial/industrial consumption decreased from 2006 through 2011 and has since been rebounding.

Exhibit 2-10. Annual Consumption by Customer Category, 2006-2014.

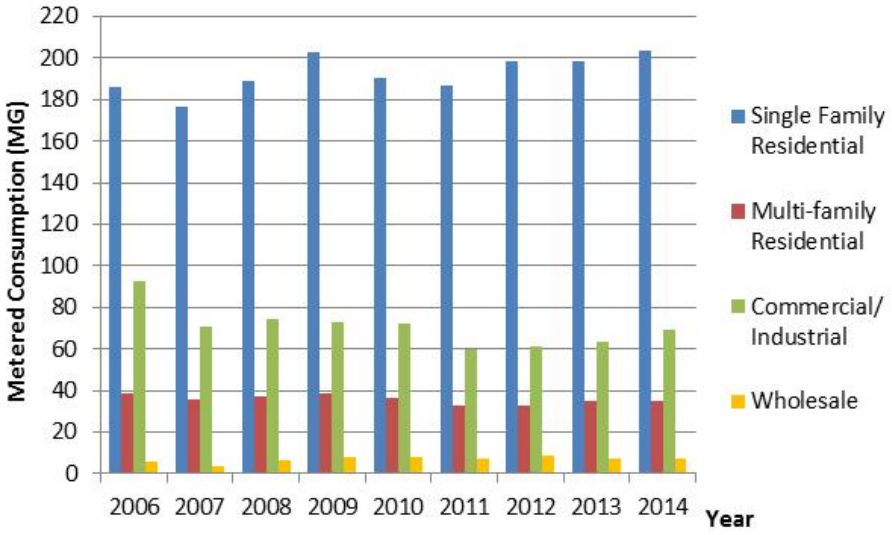
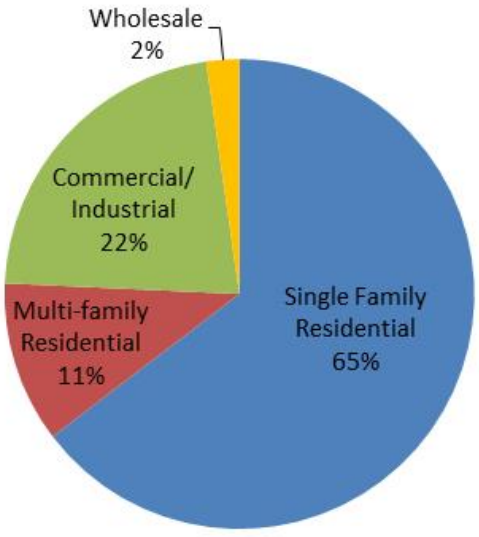


Exhibit 2-11 shows that single-family residential and the commercial/industrial customer categories represented 65 percent and 22 percent of total consumption in 2014, respectively. Water conservation efforts targeting all customer categories would be beneficial, but particularly targeting single family residential customers could be most cost-effective given that this customer category represented 65 percent of total water consumption in 2014.

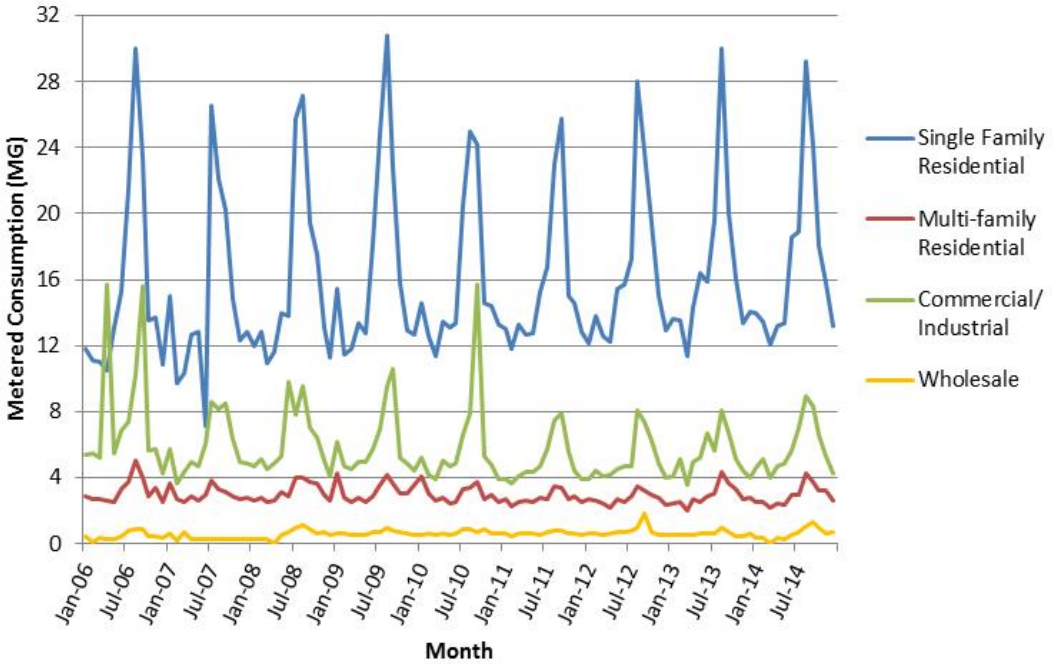
Exhibit 2-11. Percent of Annual Consumption by Customer Category, 2014.



Monthly Consumption

Exhibit 2-12 presents monthly consumption by customer category from 2006 through 2014. Consumption generally peaked during the summer months for each customer category. However, multi-family residential consumption also peaked on a few occasions in the winter. Wholesale consumption remained flat for much of 2007.

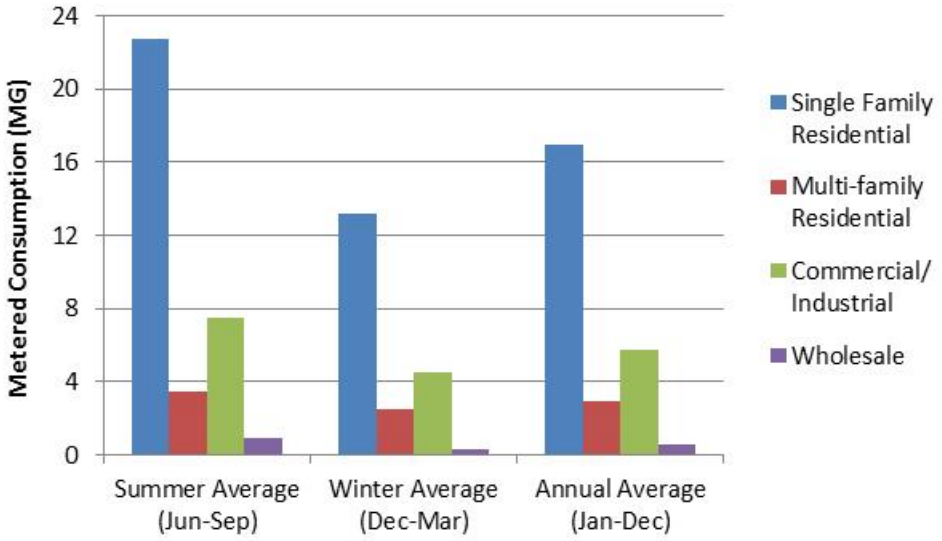
Exhibit 2-12. Monthly Consumption by Customer Category, 2006-2014.



Seasonal Consumption

Exhibit 2-13 shows average monthly consumption by season and customer category in 2014. Single-family residential average summer consumption was 22.69 MG compared to its average winter consumption of 13.15 MG, which makes average summer consumption approximately 1.7 times greater than average winter consumption. The differences in seasonal consumption were slightly less pronounced in the commercial/industrial and multi-family residential customer categories. Wholesale summer consumption was approximately 2.64 times greater than its total winter consumption, but wholesale represented only 2 percent of total consumption in 2014.

Exhibit 2-13. Seasonal Consumption by Customer Category, 2014.



Average Day Per Capita Demand and Residential Per Capita Consumption

The Regional Water Providers Consortium (RWPC) completed an analysis of water use trends for its member agencies in 2015 (See **Appendix B** for the full RWPC analysis). The RWPC is a coordinating organization created to improve the planning and management of municipal water supplies in the greater Portland, Oregon metropolitan. The RWPC currently is made up of 20 member agencies, including the City of Sandy, and the regional government Metro. The City of Sandy has been a member of the RWPC since 1997. The RWPC analysis found the following:

- During the summer months (June through September), the City's average day per capita demand (i.e. water demand per person) averaged from 2004 through 2013 was 145.9 gallons per capita per day (gpcd), which was in the lower end of the range among RWPC members. Gallons per capita per day is calculated by dividing demand for the specified time period by the total service area population during that period.

- On a peak day (day when maximum demand occurs), average day per capita demand averaged from 2004 through 2013 was 222.2 gpcd, which was in the mid-range among RWPC members.
- For the entire year, average day per capita demand averaged from 2004 through 2013 was 115.8 gpcd, which was in the lower end of the range among RWPC members.
- The City's per capita summer and annual demand showed significant declines from 2004 through 2013.

The RWPC suggests that the reduction in summer demand could be due to the mild summers that the region experienced during the study period.

The RWPC analysis also looked at per capita consumption by customer class. According to the study the City's average day per capita consumption from 2004 through 2013 averaged 64.9 gpcd for residential customers and 86.0 gpcd for all customer classes combined. The City had the second lowest average day per capita consumption for residential customers of the RWPC member agencies and the lowest average day per capita consumption for all customer classes. The City's average day per capita consumption had a significant decreasing trend during the study period.

Unaccounted-for Water

OAR 690-086-0140(9)

For the purposes of this WMCP, unaccounted-for water is the difference between demand and metered water consumption. Thus, unaccounted-for water represents system leakage and unmetered water usage. System leakage is water lost due to deteriorating pipe, compromised pipe joints, service connections, valves, etc. Unmetered water usage could include unmetered or unauthorized connections, unmetered water for operations and maintenance uses (street cleaning), and unmetered water for firefighting, reservoir overflows, and data collection /metering errors. With proper record keeping and metering of water, the percentage of unaccounted-for water should approach the net volume lost to actual leakage.

As shown in **Exhibit 2-14**, the City's unaccounted-for water was 11.5 percent in 2014 and averaged 22.3 from 2006 through 2014, both of which are a substantial improvement from the 1999 through 2005 annual average unaccounted-for water of 31 percent reported in the City's 2007 WMCP. The City attributes its reduction of unaccounted-for water in recent years to several factors. First, demand decreased due to in-filling in the City's single-family and low-density zones, implementation of higher water rates, the City's water conservation efforts, and the economic downturn. Meanwhile, consumption remained relatively steady instead of similarly decreasing due to installation of meters at some unmetered connections and meter accuracy improvements as older meters were replaced with more accurate meters. The City believes that customer meters were reading low, so that more of the water produced was actually recorded as consumed following meter replacement. Finally, the City made water demand and consumption accounting improvements, further reducing unaccounted-for water. Based on the relative newness of the City's customer meters and the

lack of substantial leaks detected in previous leak detection studies, the City believes that its unaccounted-for water in recent years is primarily the result of accounting errors.

Exhibit 2-14. Unaccounted-for Water, 2006-2014.

Year	Demand (MG)	Metered Consumption (MG)	Unaccounted-for Water (MG)	Unaccounted-for Water (%)
2006	450.8	322.6	128.2	28.4
2007	428.1	287.2	140.9	32.9
2008	403.5	308.0	95.5	23.7
2009	383.5	322.2	61.2	16.0
2010	404.3	306.6	97.7	24.2
2011	378.4	287.1	91.3	24.1
2012	391.7	300.9	90.7	23.2
2013	365.7	303.9	61.8	16.9
2014	356.0	315.3	40.8	11.5
Average				22.3

Water Rights

OAR 690-086-0140(5)

Exhibit 2-15 provides detailed information about the City's municipal water rights. Following is a summary of those water rights.

The City holds three water right certificates for the use of water from Brownell Springs. Certificate 5427 is for the use of up to 0.2 cfs, Certificate 26132 is for the use of up to 0.7 cfs, and Certificate 91156 is for the use of up to 0.3 cfs from Brownell Springs for municipal purposes. .

The City holds Certificate 91176 for the use of up to 3.0 cfs from Alder Creek. The City also holds Permit S-36601 for the use of 1.0 cfs from Alder Creek (pending extension of time).

Finally, the City also holds Permit S-48451 for the use of up to 25.0 cfs from the Salmon River. On November 16, 2012, OWRD issued a Final Order approving an extension of time for Permit S-48451, which extended the time to apply water to full beneficial use to October 1, 2069.

Exhibit 2-16 provides information about the City's non-municipal water right, Certificate 41492, which is for the use of up to 0.01 cfs of water from a spring for domestic use for one family. The City does not deliver water through its municipal distribution system for municipal customer supply under this water right.

Exhibit 2-15. City of Sandy Water Rights.

Source	Application	Permit	Certificate	Priority Date	Type of Beneficial Use	Authorized Rate (cfs) or Volume (AF)	Authorized Date for Completion	Maximum Rate or Volume of Withdrawal to Date		2014 Average Withdrawal		Five-Year (2010-2014) Average Withdrawal		Comments
								Instantaneous (cfs or annual volume (AF)	Annual (MG)	Monthly (MG)	Daily (mgd)	Monthly (MG)	Daily (mgd)	
Brownell Springs, *tributary of Beaver Creek*	S-9669	S-6597	5427	7/11/1924	Municipal	0.2	N/A	0.2	151.6	8.3	0.3	11.3	0.4	
	S-27810	S-21879	26132	11/10/1952	Municipal	0.7	N/A	0.7						
	S-47254	S-35394	91156	7/23/1970	Municipal	0.3	N/A	0.3						Certificate issued January 20, 2016.
Alder Creek, *tributary of Sandy River*	S-48840	S-36601	91176	11/11/1971	Municipal	3.0	N/A	3.0	306.2	12.1	0.4	18.4	0.6	Certificate issued January 28, 2016.
		S-36601	--			1.0	10/1/1996							Extension of time pending.
Salmon River	S-65051	S-48451	--	4/28/1983	Municipal	25.0	10/1/2069	0	0	0	0	0	0	Recently extended to 10/1/2069.

Exhibit 2-16. City of Sandy Non-Municipal Water Rights.

Source	Application	Permit	Certificate	Priority Date	Type of Beneficial Use	Authorized Rate (cfs)
A spring, *tributary of Cedar Creek*	S-47255	S-35395	41492	7/23/1970	Domestic use for one family	0.01

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Aquatic Resource Concerns

OAR 690-086-140(5) requires municipal water suppliers to identify the following for each of its water sources: 1) any listing of the source as water quality limited (and the water quality parameters for which the source was listed); 2) any streamflow-dependent species listed by a state or federal agency as sensitive threatened or endangered that are present in the source; and 3) any designation of the source as being in a critical groundwater area.

Water Quality

The City's sources of supply authorized by its water rights are Alder Creek, Brownell Springs, and the Salmon River. Alder Creek and Brownell Springs have been the City's sources of drinking water for decades.

Every two years, Oregon Department of Environmental Quality's (DEQ) is required to assess water quality and report to EPA on the condition of Oregon's waters. The Clean Water Act Section 303(d) requires the DEQ to identify waters that do not meet water quality standards and where a Total Maximum Daily Load (TMDL) pollutant load limit needs to be developed. Water quality parameters may be removed from the 303(d) list when TMDLs or other control measures have been established that are expected to improve water quality, when data show water quality has improved, and in some cases when water quality standards are revised.

Alder Creek and the Salmon River are listed as water quality limited streams according to DEQ due to certain parameters not meeting water quality criteria. The Brownell Springs points of diversion are located at the headwaters of Beaver Creek, a tributary of Cedar Creek, which flows into the Sandy River. Beaver Creek is also listed as a water quality limited stream according to DEQ.

The City's point of diversion (POD) on Alder Creek is at approximately River Mile (RM) 1. Alder Creek is listed as water quality limited between RM 0 and RM 2 for temperature from August 15 through June 15, and a Total Maximum Daily Load (TMDL) has been approved for that parameter. Alder Creek is also listed as water quality limited between RM 0 and RM 5.5 for flow modification, but TMDL's are not established to address flow modification.

The City's POD on the Salmon River is at approximately RM 7.5. The Salmon River, is water quality limited between RM 0 and RM 13.3 for temperature (August 15-June 15) and a TMDL has been approved for that parameter. The Salmon River is water quality limited between RM 0 and RM 33.9 for temperature (year around, non-spawning) and a TMDL has been approved for that parameter, as well. In that same stretch, the Salmon River is water quality limited for biological criteria (year around) and habitat modification. A TMDL has not been approved for the biological criteria parameter and is not required for the habitat modification parameter.

Beaver Creek is listed as water quality limited between RM 0 and RM 8.4 for biological criteria and temperature year around. Beaver Creek is listed as water quality limited between RM 0 to RM 8.3 for *E. coli* in the summer, and for flow modification. A TMDL is needed for the biological criteria parameter, TMDLs were approved for the temperature and *E. coli* parameters, and a TMDL is not needed for flow modification.

The list of water quality limiting parameters for these water bodies can be found in DEQ's Water Quality Assessment – Oregon's 2010 Integrated Report Assessment Database at http://www.deq.state.or.us/wq/assessment/rpt2010/search.asp

Listed Streamflow-Dependent Species

Exhibit 2-17 shows the fish species listed under the state and federal endangered species acts in the lower Columbia River, Sandy River, and Salmon River drainages (Hydrologic Unit Code 17080001 subbasin).

Exhibit 2-17. Listed Fish Species in the Lower Columbia River, Sandy River, and Salmon River Drainages[1].

Species	Common Name	Evolutionarily Significant Unit (ESU) (if applicable)	Federal Listing	State Listing
Oncorhynchus tshawytscha	Chinook	Lower Columbia River ESU (fall and spring runs)	Threatened	Sensitive "Critical"
Oncorhynchus mykiss	Steelhead	Lower Columbia River ESU, (winter run)	Threatened	Sensitive "Critical"
Oncorhynchus keta	Chum	Columbia River – Oregon ESU	Threatened	Sensitive "Critical"
Oncorhynchus clarkii	Coastal Cutthroat Trout	Southwestern Washington/Columbia River ESU	--	Sensitive "Vulnerable"
Oncorhynchus kisutch	Coho	Lower Columbia River ESU	Threatened	Endangered
Lampetra richardsoni	Western Brook Lamprey	--	--	Sensitive "Vulnerable"
Lampetra tridentate	Pacific Lamprey	--	Petitioned for listing	Sensitive "Vulnerable"
Thaleichthys pacificus	Pacific Eulachon	Southern DPS, including the Columbia River system	Threatened	--

[1] The fish species listed in this exhibit are from all of the sources combined, such that not all of the species listed are found in each source.

Sources:
Federal ESA listed species (T&E), from NOAA Fisheries Office of Protected Resources:
http://www.nmfs.noaa.gov/pr/species/esa/fish.htm
and http://www.westcoast.fisheries.noaa.gov/maps_data/species_population_boundaries.html
Federal Sensitive species, from the Interagency Special Status/Sensitive Species Program for Oregon and Washington State:
http://www.fs.fed.us/r6/sfpnw/issssp/agency-policy/
Oregon State ESA listed species, from the Oregon Department of Fish & Wildlife:
http://www.dfw.state.or.us/wildlife/diversity/species/threatened_endangered_candidate_list.asp
Oregon State Sensitive Species, from the Oregon Department of Fish & Wildlife:
http://www.dfw.state.or.us/wildlife/diversity/species/sensitive_species.asp
Federal Species of Concern, from the U.S. Fish & Wildlife Service, Oregon Fish & Wildlife Office:
http://www.fws.gov/oregonfwo/Species/Data/PacificLamprey/default.asp
ODFW's Division 315 Evaluation of Fish Persistence for Municipal Extension City of Sandy Application Number S-65051

Critical Groundwater Area

The City does not have a groundwater right that would require identification of whether its location is in a critical groundwater area. Nonetheless, the City is included in the Sandy/Boring Groundwater Limited Area.

Evaluation of Water Rights/Supply
OAR 690-086-0140(3)

As previously described, the City's sources of water supply are Alder Creek, Brownell Springs, and PWB wholesale water. Following is an analysis of the adequacy and reliability of these water sources.

Alder Creek and Brownell Springs

The City's Alder Creek water rights are for the use of up to 4.0 cfs and its Brownell Springs water rights are for the use of up to 1.2 cfs, for a total of 5.2 cfs (3.37 mgd). However, the City's ability to divert the full 5.2 cfs is limited by streamflows and water rights senior to those held by the City.

Source Reliability

There are no long-term streamflow records available for Alder Creek, but as part of the City's water supply investigation for the Alder Creek Basin, the City measured fairly consistent streamflows of approximately 5.1 cfs on Alder Creek approximately 0.5 miles above the Mt. Hood Loop Highway in August and September of 1971 and 1973. According to the City's WTP operators, however, there are periods when streamflows may not support the City's entire 4.0 cfs water right. Brownell Springs reliably produces only approximately 0.77 cfs (0.5 mgd), making the reliable supply from the two sources approximately 4.77 cfs (3.09 mgd).

Regulatory Reliability

The City's Alder Creek water rights (Certificate 91176 and Permit S-36601), which have a priority date of November 11, 1971, are junior in priority date to four surface water rights that name Alder Creek as the authorized source. Of the four water rights, two are small domestic use water rights (0.01 and 0.005 cfs, respectively). One water right is a non-consumptive power water right downstream of the City's POD. The fourth water right is a domestic use water right for 1.0 cfs that is in the name of Alder Creek Water Company but is now held by the Alder Creek Barlow Water District (District). The City has provided water to the District since 1984, and the District has not been using its water right on Alder Creek. There is no history of water use regulation on Alder Creek. The City's Certificate 91176 and Permit S-36601 (pending time extension) are senior to instream water right Certificate 72636, which have a 1991 priority date and protects flows in the reach from RM 2.0 to the mouth of Alder Creek. The City's permit is also senior to instream water rights Certificate 73015 and Certificate 75992 on the lower Sandy River, which have 1991 and 1992 priority dates, respectively. Based on this information, the City can only rely on 4.0 cfs from Alder Creek to meet maximum day demands.[1]

[1] The City understands that water use limitations may be added to Permit S-36601 as a result of an approved extension of time. At this time, the potential conditions are unknown.

The City's three water rights on Brownell Springs have priority dates of 1924, 1952 and 1970. According to OWRD's web-based water rights database, there are no other water rights for use of Brownell Springs and no senior water rights for "a spring" that is a tributary to Beaver Creek. In addition, the City's 1924 priority water right for 0.2 cfs is the most senior right on the Beaver Creek and Cedar Creek system. The City's 1952 water right for 0.7 cfs is junior in priority to two small water rights on Beaver Creek (0.01 and 0.26 cfs respectively) and to two small water rights on Cedar Creek (0.03 cfs and 0.01 cfs respectively). However, the City's 1952 water right for 0.7 cfs and 1970 water right for 0.3 cfs are junior to the Oregon Department of Fish and Wildlife's (ODFW) 25.0 cfs water right for fish propagation (hatchery) with a priority date of 1949. In the past, most recently in 2015, the State of Oregon Watermaster has curtailed the City's use of Brownell Springs to its senior water right of 0.2 cfs in favor of ODFW's water right. The Brownell Springs water rights are senior to instream water right Certificate 72630, which protects instream flows in the reach from Cedar Creek's confluence with Beaver Creek to the mouth of Cedar Creek. The Brownell Springs water rights are also senior to instream water right Certificate 73015 and Certificate 75992 on the lower Sandy River. Based on this information, the City can only rely on 0.2 cfs from Brownell Springs to meet maximum day demands.

Salmon River

The City holds Permit S-48451 for use of up to 25.0 cfs from the Salmon River, which is currently undeveloped and has an extension of time to October 1, 2069. The Salmon River is designated as a federal Wild and Scenic River managed by the Bureau of Land Management and the U.S. Forest Service. Management standards for the wild and scenic river are detailed in the *Salmon National Wild and Scenic River Management Plan* (USFS, 1993). This water right is intended to provide a long-term water supply to accommodate the City's growth. In the *Agreement for Instream Conversion* (executed October 24, 2002) associated with Portland General Electric's decommissioning of Marmot Dam (Agreement), the City voluntarily agreed to reduce this permit from 25.0 cfs to 16.3 cfs when the flow available in the Sandy River near Marmot, OR is 600 cfs or less, but can still divert up to 25.0 cfs when the flow available is more than 600 cfs. No gage is currently operating near Marmot, OR to provide a picture of the flow regime in the Sandy River at that location, but the City understands that 600 cfs will be frequently not be met.

In addition, as part of the extension of time for Permit S-48451, there are two sets of conditions placed on the permit. "Condition A" pertains to any POD upstream from the confluence of the Salmon River and Boulder Creek. Under "Condition A," the City cannot divert water between August 16 and October 31; diversions between March 1 through August 15 are subject to the Agreement; and diversions from November 1 through February 29 will be reduced if the target flows of 129 cfs or the average flow for the previous October, whichever is less, is not met. Diversions from November 1 through February 29 are also subject to the Agreement. "Condition B" pertains to any POD downstream from the confluence with Boulder Creek. Under "Condition B," the City's diversions are only subject to the Agreement. Under "Condition A" and "Condition B," the City also must provide OWRD an executed agreement between the City and ODFW setting out specific fish passage requirements that ensure adequate upstream and downstream passage for fish

The Salmon River water right is junior to several very small domestic water rights ranging from 0.005 cfs to 0.1 cfs, but streamflow records from a U.S. Geological Survey gage in the

vicinity (14135500) with a period of record from 1936 to 1952 show that the lowest streamflows met or exceeded 50 percent of the time is 97 cfs. Permit S-48451 is senior to instream water right certificates 72636 and 72637, which have priority dates of 1991 and protect water instream in the reach of the Salmon River from RM 16.3 to the mouth. Permit S-48451 is also senior to the two instream water rights on the lower Sandy River. Based on existing data and considering other senior water rights it appears that the Salmon River source would be reliable for meeting the City's long-term supply needs to accommodate growth. However, until the City determines where it will locate the POD, the reliability of water under Permit S-48451 is unclear with respect to the required permit conditions.

PWB

The City uses its PWB water (currently 0.5 mgd, but the City is allowed to use up to 3 mgd) as a supplemental water supply, particularly when its use of Brownell Springs is regulated back or when needed to meet peak demands. The PWB water also provides water supply redundancy in the event that the City's water sources become unavailable. PWB's Bull Run water supply is generally reliable, but occasionally experiences high-turbidity events as a result of being unfiltered. A wildfire, earthquake, or volcanic event in the Bull Run watershed could also affect the PWB water supply. The reliability of the PWB water is described in detail in the City of Portland's WMCP. The contract with the City of Portland expires on June 30, 2028 and the City has the option to renew it.

System Description

OAR 690-086-140(8)

Exhibit 2-1 presents a schematic of the City's water sources, WTP, and water distribution facilities. The City's POD on Alder Creek is located approximately 7 miles east of the City and 1 mile upstream from its confluence with the Sandy River. The concrete intake structure has a fish screen to prevent fish entrapment and water quality monitoring equipment (for measurement of water temperature, turbidity, conductivity, and flow rates). Water diverted from Alder Creek is pumped by low-lift pumps to the Alder Creek WTP, which is located approximately 4,000 feet downstream of the POD. The Alder Creek WTP is a filtration treatment plant with a capacity of 2.6 mgd that was built in 1979 and upgraded in 2001. After filtration and chlorination at the WTP, the water is pumped to Terra Fern Road Reservoir (0.25 MG).

Water is diverted from Brownell Springs using open bottom concrete boxes that are built into the slope of the butte and water in these boxes is gravity-fed to a common holding tank. Water diverted from Brownell Springs is then chlorinated and blended with water pumped from the Terra Fern Road Reservoir. The blended water is conveyed to Sandercock Lane Reservoir (0.5 MG) and the two Vista Loop Road Reservoirs (2.0 MG and 1.0 MG), at which point it flows by gravity to the majority of the City's water distribution system.

The City connects to the PWB system at the Hudson Road Intertie site. About 1,000 feet southeast of the connection on Hudson Road, the City has a booster pump station that pumps the PWB water through approximately 27,000 feet of 18-inch and 24-inch diameter pipe to a 1.0 MG reservoir on Revenue Avenue in the City of Sandy. Another pump station then pumps water from the 1.0 MG reservoir up to the Vista Loop Reservoirs.

Exhibit 2-18 and **Exhibit 2-19** provide more details about the City's five reservoirs and five pump stations, respectively. The City's water system has approximately 78.3 miles of pipeline, as shown in **Exhibit 2-20**.

Exhibit 2-18. Summary of System Reservoirs.

Reservoir	Volume (MG)	Overflow Elevation (feet)	Material	Completion Date
Terra Fern Road	0.25	1,231.5	Steel	1978
Sandercock Lane	0.50	1,384.5	Steel	1966
Vista Loop Road	2.00	1,135.0	Concrete	2001
Vista Loop Road	1.00	1,135.0	Steel	1975
Revenue Avenue	1.00	995.0	Concrete	2014
Total	4.75			

Exhibit 2-19. Summary of System Pump Station.

Name	Location	Pumps (#)	Firm Capacity (gpm)	
Intake Booster	Near the Alder Creek point of diversion	2	1,500	per pump
Alder Creek WTP	At the Alder Creek WTP	4	1,800	Total
Terra Fern	At Terra Fern Road Reservoir	5	1,750	Total
PWB Booster PS	Hudson Road	3	3,300	Total
PWB Transfer PS	At Revenue Ave. Reservoir	2	1,500	Total

Exhibit 2-20. Summary of System Pipelines.

Pipe Diameter (inches)	Total Length (feet)	Total Length (miles)	Percent of Total Pipeline (%)
2	332	0.1	0.1
4	6,677	1.3	1.6
6	163,983	31.1	39.7
8	83,191	15.8	20.1
10	6,908	1.3	1.7
12	71,409	13.5	17.3
16	51,891	9.8	12.6
18	15,729	3.0	3.8
24	13,254	2.5	3.2
	413,374	78.3	100.0

SECTION 3

Water Management and Conservation

This section addresses the requirements of OAR 690-086-0150(1) – (6).

This rule requires a description of specific required conservation measures and benchmarks, and additional conservation measures implemented by the City.

Current Conservation Measures

OAR 690-086-0150(1) and (3)

Progress Report

This is the City's second WMCP. OWRD approved the City's first WMCP on September 27, 2007. Since approval of its 2007 WMCP, the City has been striving to meet its conservation benchmarks. **Exhibit 3-1** shows the water conservation benchmarks established in the 2007 WMCP and the progress that the City has made to meet those benchmarks.

Other Conservation Measures

In addition to the accomplishments listed in the progress report of the City's conservation benchmarks in **Exhibit 3-1**, the City implemented the following water conservation measures within the past 10 years.

- The City has significantly increased water rates over the past few years to increase revenue for water system projects and to encourage water conservation.
- The City gives all new homeowners a welcome packet containing information on indoor and outdoor conservation measures.
- The City developed a display that was used at the City's Earth Day/Arbor Day events in 2010, 2011, and 2012 describing a xeriscaping project that the City's Planning Director completed at his personal residence in 2010.

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Exhibit 3-1. Water Conservation Progress Report.

Requirement	2007 Benchmarks	2015 Benchmark Status
Annual water audit	The City will continue to conduct annual water audits to measure unaccounted-for water and estimate leakage rates.	The City continues to track and analyze water production data against water sales data annually to determine unaccounted-for water totals.
System metering	The City will install meters on three unmetered connections along the Brownell Spring's transmission line by September 27, 2008.	These connections are now metered and all new connections are metered.
Meter testing and maintenance	The City will implement a program for routine testing of production meters at Alder Creek and Brownell Springs.	All production flowmeters are tested and calibrated annually. The production meter at Brownell Springs was replaced with an ultrasonic flowmeter in 2008.
	The City will routinely test large meters (ex. Meters serving the school district and Mt. Hood cleaners, and the meter at the interconnection with Alder Creek Water District) to evaluate flow rates and to determine if any meters should be replaced.	The City aims to test all meters 2-inches and larger on an annual basis, which has been achieved most years. Decisions on meter replacement and repair are made based on test results. The City tests both wholesale customer meters every other year.
	The City will develop a program to routinely repair, test, and calibrate hydrant meters for construction contractor use.	The City re-evaluated whether to develop this program and decided that the program would not be cost effective given that bulk water sales from hydrants are a small portion of overall sales (less than 0.2% in 2011).
	The City will track the performance of new meters installed and maintain records on meters removed from service.	The City tracks the performance of newly installed meters using the AMR metering system. Records on meters removed from service are maintained in the City's utility billing system software.
	The City will develop a sampling program for residential meters to assess their accuracy and age.	The City assesses accuracy of new residential meters using the AMR metering system. Given that most meters are relatively new, the City will track meter records of older meters to monitor for failure rather than develop a sampling plan for older meters.
	The City will conduct a meter repair and replacement program.	The City recently implemented a fixed-base radio AMR metering system for all new service connections. Over time, the City would like to outfit all residential meters with AMR and to use the AMR data to track meter performances. The City is investigating whether increased meter accuracy from replacement of all non-AMR meters (approximately 90% of installed meters) will increase revenue enough to cover the debt service for the meter replacement project. If the full-scale meter replacement project does not proceed, the City intends to replace 100 existing residential meters with AMR meters each biennium.
Rate structure based on the quantity of water metered and billing practices that encourage water conservation	The City will continue to use its current billing rate structure that bases customer bills on the amount of water that they use. Customers are billed monthly.	Customers continue to be billed based on the amount of water consumed. The City continues to bill its customers monthly to provide timely feedback about water consumption. Customers with AMR meters (about 360 currently) can be quickly notified of excessive or unusual water use instead of waiting for the next utility bill to discover excessive or unusual water use. Customers with AMR may also contact the City on any work day to find out their water consumption.
Leak detection and leak repair or line replacement	The City will conduct a baseline leak survey of the water system using the sampling plan described in the 2000 water audit (targeted assessment of certain high-value and/or old lines and random sampling of the remaining system).	The baseline leak survey has not yet been performed. Previous leak surveys were inconclusive or only turned up a few small leaks. Consequently, the City does not believe that the unaccounted-for water is attributable to leaks and has decided to invest resources in other water conservation efforts.
	The City will target the following for segments for leak detection: o The 6-inch transmission line between the Brownell Springs meter and its intersection with the Alder Creek 16-inch line o The 16-inch transmission line from Alder Creek and Sandercock Storage Tank o The 2-inch and 4-inch transmission lines supplying the Alder Creek and Special Water Service Districts	The 6-inch transmission main between the Brownell Springs meter and the 16-inch transmission main is located on very difficult to access and inaccessible terrain. With the exception of difficult to access portions of the transmission lines, the City performs a visual inspection of the pipelines every summer. In addition, this line is metered so excessive water loss would be simple to detect. The 16" transmission main between the Alder Creek WTP and Sandercock Reservoir is located in the shoulder of Hwy 26. Acoustic leak detection methods are not effective due to heavy traffic noise, so the City relies on visual inspection for this transition main. The 2-inch and 4-inch transmission lines supplying the Alder Creek Barlow Water Districts are both metered and all customer service connections are metered. Excessive water loss would be simple to detect and would be reported by the wholesale customer.
	The City will perform leak detection at 36 randomly selected pipe sections throughout the system to determine a statistically significant estimate of leakage rates.	This sampling has not yet been performed. Previous leak surveys were inconclusive or only turned up a few small leaks. Consequently, the City does not believe that the unaccounted-for water is attributable to leaks and has decided to invest resources in other water conservation efforts.
	The City will maintain records of repaired and reported leaks including the cause of leaks, the age and type of pipe, and other information.	All repaired and reported leaks have been recorded to include these factors.
	The City will annually survey approx. 10% of the water system for leaks in order to survey the entire system every 10 years.	The annual survey has not yet been performed. Previous leak surveys were inconclusive or only turned up a few small leaks. Consequently, the City does not believe that the unaccounted-for water is attributable to leaks and has decided to invest resources in other water conservation efforts.
	The City will strive to, within available resources, reduce the unaccounted-for water rate to 10 percent or less by 2010.	The City reduced its unaccounted-for water from 28 percent in 2005 to 11.5 percent in 2014. The City will continue to strive to reduce its unaccounted-for water.
	The City will conduct annual leak detection surveys and repairs.	See responses above.

Exhibit 3-1. Water Conservation Progress Report Continued.

Requirement	2007 Benchmark	2015 Benchmark Status
Public education program to encourage water conservation	The City will continue to be a member of Regional Water Providers Consortium (RWPC) and benefit from RWPC's services (public education).	The City remains a member of the RWPC and continues to benefit from the RWPC's outreach and public education programs.
	The City will continue to make conservation kits available.	The City makes indoor and outdoor conservation kits available to all customers and passes out these kits at the City's Earth Day event, a rotating neighborhood-specific event in the Fall, and at additional neighborhood fairs/block parties upon request.
	Additional public education activities will be employed as new conservation programs are implemented.	The City participates in the RWPC conservation and public education programs. The City joined in the EPA "Water Sense" program in 2012 and participated in the WaterSense "Fix a Leak Week" in 2013 (See Appendix C for "Fix a Leak Week" press releases.)
	The City will initiate an open-house workshop where all conservation measures should be promoted.	This function is performed annually at the City's Earth Day event and at least once each year at neighborhood fairs and block parties.
Technical and financial assistance programs to encourage water conservation	The City will conduct sample water audits for commercial/tourist facilities.	These audits have not been implemented to date. The City will need to hire a consultant to conduct these audits due to lack of staff availability. The City intends to have this activity funded within the next five years.
Supplier financed retrofitting or replacement of existing inefficient water using fixtures	The City will distribute low-flow showerheads in conservation kits or with a low-flow toilet rebate program.	The City has distributed approximately 500 indoor conservation kits with 2.5 gpm low flow showerheads and faucet aerators. The City continues to make water conservation kits available at no charge to any customer requesting one.
	The City will implement a low-flow toilet rebate program, mainly targeting residential customers, but also available to commercial and tourist-related facilities.	Due to the City having mostly new homes that contain low-flow toilets, the City has decided to direct funds to other water conservation programs instead.
Water reuse, recycling, and non-potable water opportunities; and	Not specified.	The City has distributed approximately 126 downspout rain barrels to utility customers.
Any other conservation measures identified by the water supplier that would improve water use efficiency.	Not specified.	The City finalized and implemented a xeriscaping outreach program in 2013, which provides technical advice and printed materials. The City has not received responses to its xeriscaping outreach thus far.

Use and Reporting Program

OAR 690-086-0150(2)

The City's water measurement and reporting program complies with the measurement and reporting standards in OAR Chapter 690, Division 85.

The City currently measures water demand using four ultrasonic master meters. These master meters are located at the Alder Creek WTP, Brownell Springs diversion, Hudson Road pump station, and Revenue Avenue pump station.

The City submits monthly water use measurements to OWRD on an annual basis. Reporting is for the previous water year (October 1 to September 30). The City's water use records can be found at http://apps.wrd.state.or.us/apps/wr/wateruse_report/

Required Conservation Programs

OAR 690-086-0150(4)

OAR 690-086-0150(4) requires that all water suppliers establish five-year benchmarks for implementing the following water management and conservation measures:

1. Annual water audit
2. System-wide metering
3. Meter testing and maintenance
4. Unit-based billing
5. Leak detection and repair (if system leakage exceeds 10 percent)
6. Public education

Five-Year Benchmarks for Required Conservation Measures

During the next five years, the City plans to initiate, continue, or expand the following conservation measures that are required of all municipal water suppliers when a condition of a water use permit, permit extension, or another order or rule requires a WMCP:

1. **Annual Water Audit.**

   OWRD defines a water audit as an analysis of the water system that includes a thorough accounting of all water entering and leaving the system to identify leaks in the system, and authorized and unauthorized water uses, metered or estimated. The water audit also includes analysis of the water supplier's own water use.

   The City conducts an annual water audit based on records of total demand (volume of finished water that enters the water distribution system), and total consumption (volume of water consumed through metered service connections). The City's unaccounted-for water was 11.5 percent in 2014.

   Given the relative newness of the City's customer meters (installed in 2002 or more recently) and the lack of substantial leaks detected in previous leak detection studies, both of which are described later in Section 3, the City believes that its unaccounted-for water is primarily the result of accounting errors related to its billing software or its non-AMR meters.

Five-Year Benchmarks: The City will continue to conduct an annual water audit. In the next two years, the City will investigate its billing software for potential sources of accounting errors.

2. System-wide Metering.

The City's water system is fully metered. The City installs meters on all new connections. Since January 2006, the City has installed over 800 new meters at new connections.

The City implemented a fixed-based radio Automatic Meter Reading (AMR) metering system for all new service connections in December 2011. Since then, the City has installed approximately 360 AMR meters, which represents approximately 10 percent of the City's customer meters. **Exhibit 3-2** presents a breakdown of the City's meters by age.

Exhibit 3-2. Number of New and Existing Meters Installed.

Year Installed	Number of Meters	Age (Years)
pre-1991	756	
1991	7	24
1992	18	23
1993	54	22
1994	66	21
1995	31	20
1996	80	19
1997	54	18
1998	82	17
1999	133	16
2000	171	15
2001	195	14
2002	213	13
2003	174	12
2004	159	11
2005	185	10
2006	269	9
2007	185	8
2008	160	7
2009	108	6
2010	77	5
2011	55	4
2012	77	3
2013	59	2
2014	122	1
2015	71	0
Unknown	53	
Total	**3,614**	

The City is investigating whether increased meter accuracy from replacement of all non-AMR meters (approximately 90 percent of installed meters) in the near future will increase revenue enough to cover the debt service for the meter replacement project. If the full-scale meter replacement project does not proceed, the City intends to replace 100 existing residential meters with AMR meters each biennium.

Five-Year Benchmarks: The City will continue to install AMR meters on all new connections. In the next five years, the City will complete a cost-benefit analysis of replacing all non-AMR meters with AMR meters and will decide how to proceed with meter replacement.

3. Meter Testing and Maintenance.

The City has a meter testing and maintenance program. All production meters are tested and calibrated annually. The City strives to test all meters two-inches and larger on an annual basis, and achieves that goal most years. The City replaces or repairs these meters based on test results. The City tests both wholesale customer meters every other year. The performance of AMR meters can be tracked by analyzing AMR meter records. For non-AMR meters, the City will track meter records for signs of failure and will replace the meters with AMR meters when deemed necessary. The City also tests meters in response to customer inquiries. The City maintains records of meters removed from service in its utility billing system software. The City has replaced up to approximately 20 meters per year at existing connections. The failed existing meters have been replaced with AMR meters since December 2011.

Five-Year Benchmarks: The City will continue its meter testing and maintenance program. In the next five years, the City will begin to track the number of meters that it replaces at existing connections. In the next five years, the City will complete a cost-benefit analysis of replacing all non-AMR meters with AMR meters and will decide how to proceed with meter replacement.

4. Water Rate Structure.

The City has a uniform rate structure consisting of a monthly base charge (to cover fixed costs, such as meter reading, billing, and debt service), a meter charge (the larger the meter, the greater the charge), and a volume charge that is based on the quantity of water metered at the connection. Tiered water rates are currently considered unnecessary given that high water rates already encourage water conservation and that most water customers have small lots and do not maintain green lawns in the summer. As shown in **Exhibit 3-3**, the City has significantly increased single-family residential water rates over the past few years to increase revenue for water system projects and to encourage water conservation. The rates for the other customer categories have similarly increased

Exhibit 3-3 shows the single-family residential customer charges from 2008 through 2014 inside and outside the City. **Appendix D** details water rates for multi-family residential customers, commercial and industrial customers, wholesale customers, and Skyview.

Exhibit 3-3. Single Family Residential Monthly Base, Monthly Meter, and Volume Charges, as of 2014.

Year	Monthly Base Charge Inside City	Monthly Base Charge Outside City	Monthly Meter Charge (5/8" x 3/4" meter) Inside City	Monthly Meter Charge (5/8" x 3/4" meter) Outside City	Volume Charge per CCF Inside City	Volume Charge per CCF Outside City
2008	$4.80	$7.20	$0.17	$0.26	$1.91	$2.86
2010	$4.99	$7.49	$0.18	$0.27	$1.99	$2.97
2011	$5.29	$7.94	$0.19	$0.28	$2.11	$3.15
2012	$5.60	$8.42	$0.20	$0.30	$2.24	$3.34
2013	$5.94	$8.93	$0.21	$0.32	$2.37	$3.54
2014 (current)	$6.18	$9.29	$0.22	$0.33	$2.46	$3.68

Five-Year Benchmarks: The City will continue to bill customers based on the quantity of water metered at the service connection.

5. Leak Detection and Repair.

The City has a leak detection and repair program to minimize system leakage. Leak detection studies that the City conducted in the past were inconclusive or only turned up a small number of minor leaks, which leads the City to believe that leaks are not a major contributor to unaccounted-for water. Consequently, the City currently monitors for leaks on a regular basis using visual inspections where possible. The City also maintains records of repaired and reported leaks on a continuous basis, including the cause of leaks, the age and type of pipe, and other information. Since 2006, the City has replaced 3,200 linear feet of existing pipeline since 2006.

Five-Year Benchmarks: The City will continue to conduct its leak detection and repair program.

6. Public Education.

The City provides public education about water conservation through a combination of internal efforts and membership in the Regional Water Providers Consortium (RWPC).

The City gives all new homeowners a welcome packet containing information on indoor and outdoor conservation measures, such as repairing leaky faucets, avoiding over-watering of outdoor plants, and limiting outdoor water use for cleaning sidewalks and driveways. The City also makes indoor and outdoor water conservation kits available to all existing customers, which it distributes at the City's Earth Day event, a rotating neighborhood-specific event in the fall, and at additional neighborhood fairs/block parties upon request. The City staffs a booth at the Earth Day event to promote water conservation. In addition, the City occasionally includes water conservation messages in its monthly newsletter, which is on the back of the utility bill. **Appendix E** shows the water conservation message in the July 2015 newsletter.

The City is a member of the RWPC. (Membership currently costs the City $5,502 per year.) The benefit of membership is that the RWPC has a variety of water conservation public outreach efforts that become available to the City and its water customers. For example, the RWPC provides workshops for developers and landscapers that focus on water–efficient landscape design and installation and using water-efficient irrigation equipment. The RWPC also develops conservation displays available to members for use at local events, and produces brochures containing conservation information. In addition, the RWPC sponsors a summer water conservation media campaign that includes TV and radio advertisements and news interviews on local stations, conducts outreach at large regional events (e.g. Yard, Garden, and Patio Show and the Salmon Festival), and maintains a Web site (www.conserveh2o.org) that has indoor and outdoor water conservation information and suggestions. The City and the RWPC also sponsored annual water conservation education presentations at local elementary schools in 2010, 2013, 2014, and 2015 (See Appendix F for the announcements of these presentations). Presentations did not occur in 2011 and 2012 due to lack of interest from local elementary schools.

The City joined in the EPA "Water Sense" program in 2012 and participated in the WaterSense "Fix a Leak Week" in 2013 (See Appendix C for "Fix a Leak Week" press releases.)

Five-Year Benchmarks: The City will continue to be a member of the RWPC. The City will continue to promote water conservation at the City's Earth Day event and neighborhood events.

Additional Conservation Measures

OAR 690-086-0150(6)

OAR 690-086-0150(6) requires municipal water suppliers that serve a population greater than 1,000 and propose to expand or initiate the diversion of water under an extended permit for which resource issues have been identified, or if the population served is greater than 7,500, to provide a description of the specific activities, along with a five-year schedule to implement several additional conservation measures., The City served a population of 10,387 in 2014,therefore, the City is required to address the following additional conservation measures.

1. **Leak Repair or Line Replacement Program**

   Under this rule requirement, the City is required to implement a system-wide leak repair program or line replacement program to reduce system leakage to 15 percent, and if feasible to 10 percent. As previously described, the City's unaccounted-for water was 11.5 percent in 2014. The City has a leak detection and repair program to minimize system leakage. Leak detection studies that the City conducted in the past were inconclusive or only turned up a small number of minor leaks, such that the City believes that leaks are not a major contributor to unaccounted-for water. Consequently, the City currently monitors for leaks on a regular basis using visual inspections. The City maintains records of repaired and reported leaks on a

continuous basis, including the cause of leaks, the age and type of pipe, and other information.

Five-Year Benchmarks: The City will continue to conduct its leak detection and repair program.

2. Technical and Financial Assistance Programs

As mentioned under Public Education, the City makes indoor and outdoor water conservation kits available to all existing customers. The indoor water conservation kits include a shower timer and toilet tank dye tablets. The outdoor water conservation kits include the RWPC outdoor conservation brochure, Water Efficient Plants of the Willamette Valley booklets, and watering/irrigation gauge.

In 2013, the City funded an intern to implement activities associated with the EPA's National Fix a Leak Week, which included leak detection information on the City's website and Facebook page, as well as a question and answer session at City Hall with a local plumber to address customer questions about leak detection and repair (See Appendix C).

The City's Planning Director did a xeriscaping project at his personal residence in 2010 that both KATU News (http://www.katu.com/about/green/126381243.html) and the RWPC website featured in 2011. The Planning Director also had a display describing his project at the City's Earth Day/Arbor Day events in 2010, 2011, and 2012. In 2013, the City implemented a xeriscaping outreach program, which consists of technical advice and printed materials. The City has not received questions or requests for materials provided in response to the xeriscaping outreach program thus far.

Five-Year Benchmarks: In the next five years, the City will investigate ways to increase interest in the xeriscaping outreach program materials by reviewing how other cities are implementing xeriscaping programs, and will then implement changes to the program.

3. Supplier Financed Retrofit or Replacement of Inefficient Fixtures

As previously mentioned, the City makes indoor and outdoor water conservation kits available to all existing customers. The indoor water conservation kits include a low-flow showerhead and faucet aerators. To date, the City has distributed approximately 500 indoor conservation kits with low-flow (2.5 gpm) showerheads and faucet aerators.

Five-Year Benchmarks: The City will continue to make water conservation kits available at no charge to any customer requesting one.

4. Rate Structure and Billing Practices that Encourage Conservation

The City bills its customers monthly to provide timely feedback about water consumption. In addition, customers with AMR may contact the City on any work day to find out their water consumption, which the AMR system metering enables. The City periodically includes water conservation messages in utility bills, as well. **Appendix E** contains the most recent water conservation message in its monthly newsletter, which was on the back of the July 2015 utility bill.

Five-Year Benchmarks: The City will continue to bill its customers monthly and to periodically include water conservation messages in utility bills.

5. Water Reuse, Recycling, and Non-potable Water Opportunities

The City makes downspout rain barrels available to water customers to reduce demand for finished water for outdoor watering. Since April 2008, the City has distributed approximately 126 downspout rain barrels to utility customers.

The City partnered with Iseli Nursery in August 2012 to implement a water reuse project at the nursery. From May 1 to October 31, the City is providing up to 2.90 cfs of reclaimed water to Iseli Nursery for nursery uses and for irrigation of approximately 348 acres currently, and potentially up to 614 acres. Treated wastewater is delivered to Iseli Nursery through approximately 8,000 feet of 14-inch diameter pipe. Reclaimed water is blended with other water in storage ponds at the nursery.

Five-Year Benchmarks: The City will continue to make downspout rain barrels available to water customers to reduce demand for finished water for residential irrigation. The City will continue the water reuse project with Iseli Nursery. In the next five years, the City will contact at least two commercial/industrial customers to discuss the potential for water reuse, recycling, or non-potable water use opportunities.

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SECTION 4

Water Curtailment Plan

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

This rule requires a description of past supply deficiencies and current capacity limitation. It also requires inclusion of stages of alert and the associated triggers and curtailment actions for each stage.

Introduction

Water curtailment plans outline proactive measures that water suppliers may take to reduce demand and to find alternative supply during short-term water supply shortages. The intent of water curtailment plans is to minimize the impacts of water supply shortages and to ensure water supply for public health and safety.

The curtailment plan presented in this section is based on the City's ordinance 13.04.220 Regulations Pertaining to Inadequate Supply or Shortages of Water contained in **Appendix G**, but has been updated to comply with Division 86 requirements. The City's existing ordinance outlines three stages of alert for dealing with potential water shortages. Stage 1 calls for voluntary reductions in water use, Stage 2 implements compulsory restrictions, and Stage 3 prohibits certain water uses. The ordinance also allows the city council to temporarily raise water rates, and describes enforcement provisions including fines and disconnection of service. While the city manager is authorized to trigger a Stage 1 alert level, under the city's existing ordinance, only the city council can declare higher curtailment stages. The existing ordinance does not describe the "pre-determined levels of severity of shortage or water service difficulties that will trigger the curtailment actions" as required by Division 86. In addition, the existing ordinance does not provide for a Stage 4 curtailment response to an interruption of water service because of some type of catastrophic event. The curtailment plan presented in this section modifies the City's current plan (ordinance) by adding a Stage 4, identifying objective measures that will trigger the curtailment stages, and increasing the level of response triggered at Stages 2 and 3.

History of System Curtailment Episodes

OAR-690-086-0160(1)

The City has only implemented water curtailment measures once during the past 10 years. The City activated Stage 1 voluntary curtailment on July 27, 2009 in response to the combination of record high air temperatures that increased water demands and record low stream flow levels in Alder Creek that affected the City's ability to divert water. The City changed its diversion dam and intake structure to enable the City to provide more water to the WTP at that time. The City lifted Stage 1 curtailment on July 31 in response to decreased temperatures.

Since then, the City has not activated any curtailment stages and has taken action to reduce the likelihood of the need for water curtailment in the future by securing a redundant water supply. In 2014, the City began utilizing a new interconnection with the PWB. This interconnection provides additional water supply from PWB's Bull Run water supply source to meet peak demands and provides the City with water supply redundancy in the

event that the City's water sources (i.e. Alder Creek and Brownell Springs) are impacted by a long-term drought, contamination, or system failure that results in a water shortage. The addition of the PWB water source increased the City's production capacity to approximately 5 mgd, which is more than double the City's MDD. Consequently, the City expects to maintain water delivery during most long-term water shortages.

Currently, the City's water system infrastructure is sufficient to meet water demands in the near future.

Curtailment Event Triggers and Stages

OAR-690-086-0160(2) and (3)

The City's water curtailment plan as presented in this WMCP has four stages that increase in severity and are intended to be implemented in progressive steps. The curtailment stages include both voluntary and mandatory limitations and the type of limitations will depend on the cause, severity, and anticipated duration of the water shortage.

The City's four curtailment stages and their potential initiating conditions (i.e. triggers) are presented in **Exhibit 4-1**. The City's initiating conditions focus on supply capacity, but include other supply shortage initiating conditions, as well.

Exhibit 4-1. Curtailment Stages 1 through 4.

Curtailment Stages	Potential Initiating Conditions
Stage 1: Water Alert	General recognition of drought conditions in Clackamas County, or Demand reaches 80 percent of supply capacity for 3 or more consecutive days, or Water storage is approaching the minimum required for fire protection or other essential needs as determined by the City
Stage 2: Serious Shortage	Demand reaches 90 percent of supply capacity for 3 or more consecutive days.
Stage 3: Critical Shortage	Demand is 100 percent or more of supply capacity for 3 or more consecutive days.
Stage 4: Emergency	System failure, such as a main break or treatment plant interruption. Chemical spill, malevolent attack on the system or other event introduces a contaminant at some point in the system.

Curtailment Plan Implementation

OAR-690-086-0160(4)

Stage 1: Water Alert

Stage 1 will activate a program to inform customers of the potential for drought and/or water shortages, and reasons to voluntarily conserve water. Stage 1 will be activated by the city manager and will be triggered when any of the following conditions exist:

1. General recognition of drought conditions in Clackamas County.
2. Demand reaches 80 percent of water supply capacity as determined by the city manager for a period of 3 or more consecutive days.
3. Water storage approaches the minimum required for fire protection or other essential needs as determined by the city manager.

Under Stage 1, the City will issue a notice requesting voluntary reduction in water use by all customers. The notice will include a description of the current water situation, the reason for the requested conservation measures, and a warning that mandatory restrictions will be implemented if voluntary measures are not sufficient to achieve water use reduction goals. The notice also will direct customers to the RWPC website (www.conserveh2o.org) for conservation information and tips. A similar notice could be issued through local media (newspaper, radio, or TV) if a regional drought has not already triggered media coverage of water shortage concerns.

When Stage 1 is triggered, the City will ask customers to voluntarily take one or more of the following actions:

- Limit landscape watering between the hours of 10:00 am and 6:00 pm, the period of highest water loss due to evaporation.
- Comply with an alternate days system for landscape watering (i.e. even numbered addresses water on even numbered days and odd numbered addresses water on odd numbered days).
- Implement other conservation measures, such as those suggested by the RWPC website and the RWPC brochures, *H20utdoor* and *H20 indoor.*

Stage 2: Serious Water Shortage

Stage 2 is similar to Stage 1 except that the voluntary measures regarding outdoor water use will be made compulsory by the city council, and additional non-essential water use will be prohibited. Stage 2 will be activated by the city council when demand on the water system reaches 90 percent of the supply capacity for 3 days or more.

Under Stage 2, the City will issue a notice describing the current water situation, the need for mandatory conservation measures, and the mandatory water conservation actions imposed. The notice also will direct customers to the RWPC website (www.conserveh2o.org) for conservation information and tips. A similar notice could be issued through local media (newspaper, radio, or TV).

When Stage 2 is triggered, the City will impose one or more of the following mandatory water restrictions:

1. Watering landscapes prohibited between 10:00 am and 6:00 pm.
2. Comply with the alternate day system for landscape watering (i.e. even numbered addresses water on even numbered days and odd numbered addresses on odd numbered days).
3. No water use for washing motorbikes, motor vehicles, boat trailers, or other vehicles except at a commercial washing facility that practices wash water recycling. (Exceptions include vehicles that must be cleaned to maintain public health and welfare such as food carriers and solid waste transfer vehicles.)
4. No water use to wash sidewalks, walkways, driveways, parking lots, tennis court, and other hard-surfaced outdoor areas.
5. No water use to wash buildings and structures, except as needed for painting or construction.
6. No water use for a fountain or pond for aesthetic or scenic purposes, except where necessary to support fish life.
7. Discourage serving water to customers in restaurants unless water is requested by the customer. (This action does not provide significant water savings, but is useful for generating awareness of the need to curtail use.)
8. Water only tees and greens and not other golf course areas.
9. No water use for dust control unless absolutely necessary, as determined by the City Council.
10. No water use for gutter cleaning.

Stage 3: Critical Water Shortage

Stage 3 will be activated by the city council when demand on the water system is 100 percent or more of available supply capacity for 3 days or more. The City will issue public service announcements to notify customers of the severity of the conditions.

Under Stage 3, the City will issue a notice describing the severity of the current water situation and the additional mandatory water conservation actions imposed. The notice also will direct customers to the RWPC website (www.conserveh2o.org) for conservation information and tips. A similar notice could be issued through local media (newspaper, radio, or TV).

When Stage 3 is triggered, the City will impose one or more of the following mandatory water restrictions (in addition to water restrictions that may have been imposed under Stage 1 or Stage 2):

1. Replace the restriction of alternate days system for landscape watering from Stage 2 with a prohibition on all outdoor watering (Exceptions include new lawn, grass or turf planted after March 1st of the calendar year in which restrictions are imposed, sod farms, high-use athletic fields, golf tees and greens, or park and recreation areas specifically designated by the city council.)

2. No water use to fill, refill, or add to any indoor or outdoor swimming pools or hot tubs, except if one of the following conditions is met: the pool is used for a neighborhood fire control supply, the pool has a recycling water system, the pool has an evaporative cover, or the pool's use is required by a medical doctor's prescription.
3. No water use from hydrants for construction purposes (except on a case-by case basis), fire drills, or any purpose other than firefighting.
4. Implement limitations on commercial uses of water as determined appropriate by the city manager.

Stage 4: Emergency Water Shortage

Stage 4 will be activated when failure of a system component or non-drought emergency conditions results in an immediate shortage of water. Examples include failure of the main transmission line from the Terra Fern Road Reservoir to the City, failure of the intake or water treatment plant, a chemical spill on Alder Creek upstream of the intake or in the PWB's Bull Run water supply upstream of the point of diversion, or a malevolent attack on the system that introduces a contaminant at some point in the system.

If water in the system is unsafe to drink or an emergency shortage exists from a failure in the water system, the city manager will direct staff to notify customers as quickly as possible to inform them about the emergency water shortage and the necessary mandatory water curtailment measures. (This scenario assumes that a decision to implement Stage 4 will need to happen immediately and that approval from the entire city council will not be expeditious enough.)

When Stage 4 is triggered, the City will impose one or more of the following mandatory water restrictions (in addition to water restrictions that may have been imposed under Stage 2 or Stage 3):

1. Limit residential water use to essential uses only, such as drinking, cooking, basic sanitation, and maintaining human health.
2. Prohibit all non-essential water uses by commercial/industrial customers.

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 responding to the problem.
2. Notify the local news media, if appropriate, to ask for their assistance in notifying customers.
3. Call an emergency city council meeting
4. Contact the Oregon State Police and Clackamas County Sheriff to obtain help in contacting customers.

The City will continue to investigate and develop specific back-up plans for a Stage 4 emergency. These plans may include renting a water hauling truck and purchasing water from neighboring communities, sending customers to a pre-designated water distribution location, and supplying bottled water.

Conservation Water Rate Schedule

In addition to the above measures, the City shall retain ordinance provisions regarding the adoption of temporary conservation water rate schedules and enforcement.

Enforcement

The city code includes the following enforcement provisions for violations of the regulations related to water curtailment. (13.04.220(E)):

1. The City shall personally deliver a notice of violation to the occupant of the premises. If the occupant is not present, the City may post a notice on the premises advising the user of the violation and warning the user of what specific sanctions may be imposed if the violations continue. The City shall also mail the notice of violation by regular mail to the occupant at the address of the subject premises where the violation has occurred.
2. The following penalties may be imposed if violations continue:
    - Second violation: $100.00 Fine
    - Third violation: $300.00 Fine
    - Fourth and subsequent violations: $500.00 Fine

In the case of continuing violations, the City also has the authority to discontinue water service. (Ord. 12-92 §1, 1992: Ord. 10-73 § 23, 1973.)

SECTION 5

Water Supply

This section satisfies the requirements of OAR 690-086-0170.

This rule requires descriptions of the City's current and future water delivery areas and population projections, demand projections for 10 and 20 years, and the schedule for when the City expects to fully exercise its water rights. The rule also requires comparison of the City's projected water needs and the available sources of supply, an analysis of alternative sources of water, and a description of required mitigation actions.

Delineation of Service Areas

OAR 690-086-0170(1)

Exhibit 2-1 shows the City's urban growth boundary and its urban reserve area, which together represent the City's future service area.

Population Projections

OAR 690-086-0170(1)

The City's projected population for its future water service area, which includes its current UGB and Urban Reserve Area, is 13,123 in 2025 and 16,769 in 2035, as shown in **Exhibit 5-1**. These population projections were prepared by Portland State University's Population Research Center (PRC) in October 2014. The projections are based on household forecasts for areas called transportation analysis zones (TAZs) adopted by the Metro Council in 2012, Metro's Buildable Land Inventory (BLI), data from the US Census Bureau, and data from the PRC. **Appendix B** pages 5 and 6 are part of the report detailing the methods and the data sources used for the population projections. The population projections do not include areas served by the Alder Creek Barlow Water District or Skyview Acres Water Company.

Exhibit 5-1. Projected Water Service Area Population.

Year	Population[1]
2010[2]	10,863
2013	11,290
2014	11,447
2015	11,606
2016	11,761
2017	11,916
2018	12,073
2019	12,225
2020	12,384
2021	12,532
2022	12,680
2023	12,826
2024	12,976
2025	13,123
2026	13,470
2027	13,823
2028	14,178
2029	14,539
2030	14,909
2031	15,271
2032	15,638
2033	16,012
2034	16,390
2035	16,769

[1]All population projections presented above are for the City water service area and do not include areas served by the Alder Creek Barlow Water District and Skyview Acres Water Company.

[2]April 1, 2010 census data used. All other years use July 1 (2013 estimates and 2014-2045 forecasts).

Demand Forecast

OAR 690-086-0170(3)

The City developed its demand forecasts using the following steps. First, the City's average annual water demand from 2006 through 2014 (395.8 MG) was apportioned among the City's customer categories based on the percentage of water that each customer category consumed in 2014, as shown in **Exhibit 5-2**. Average annual water demand was divided by 365 days for each customer category to calculate ADD by customer category. Average annual water demand from 2006 through 2014 was used instead of annual demand for 2014 to provide a historically representative annual water demand. (The City's 2014 annual water demand was the lowest during the period 2006 through 2014.) The year 2014 was used instead of an average from 2006 through 2014 for the percentage of water that each customer category consumed to represent the most current distribution of water usage by customer category.

Exhibit 5-2. Average Annual Water Demand and Average Day Demand (ADD) by Customer Category.

Customer Category	Percentage of Annual Consumption in 2014 (%)	Average Annual Water Demand from 2006-2014 (MG)	ADD Averaged from 2006-2014 (mgd)
Single Family Residential	65	257.2	0.70
Multi-family Residential	11	43.5	0.12
Commercial/ Industrial	22	87.1	0.24
Wholesale	2	7.9	0.02
Total	100%	395.8	1.08

To project demand through 2035, the City then took the following steps:

- **Projected Residential ADD** -- An annual residential growth rate of 2.12 percent, based on the PRC Population Projections for the years 2015 through 2035, was applied to Residential (single family + multi-family) ADD averaged from 2006 through 2014 of 0.82 mgd (0.70 mgd + 0.12 mgd = 0.82 mgd).
- **Projected Commercial/Industrial ADD** -- The annual employment growth rate of 4.0 percent, based on the Metro Transportation Plan for the years 2010 through 2014, was applied to the Commercial/Industrial ADD averaged from 2006 through 2014 of 0.24 mgd.
- **Projected Wholesale ADD** -- The annual wholesale growth rate was assumed to be 0 percent based on the assumptions that the City will have no additional wholesale customers and the District and Skyview will not have an increase in population over the next 20 years that would increase their demand, resulting in the Wholesale demand of 0.02 mgd continuing through 2035.

The City summed the projected Residential, Commercial/Industrial, and Wholesale ADDs for each year through 2035 then applied the maximum peaking factor (MDD:ADD) from 2006-2014 of 2.3 to obtain the projected MDD for each year through 2035.

Exhibit 5-3 presents the City's MDD projections that were developed using the above described methodology. The demand projections estimate that the City's MDD will reach 3.3 mgd (5.1 cfs) by 2025 and 4.2 mgd (6.6 cfs) by 2035. These initial MDD projections do not, however, consider the variability in demand based on climactic conditions (weather). To account for the effects of weather variations on MDD, the City determined the standard deviation of the MDDs from 2006 through 2014, which was 0.3 mgd (0.46 cfs). The City added the 0.3 mgd "weather allowance" to the MDD projections. **Exhibit 5-3** shows the City's projected MDD with the weather allowance, which is estimated to be 3.6 mgd (5.5 cfs) in 2025 and 4.5 mgd (7.0 cfs) in 2035.

Exhibit 5-3. Projected Maximum Day Demand (MDD) With and Without a Weather Allowance.

Year	MDD		MDD with weather allowance (mgd)	MDD with weather allowance (cfs)
	(mgd)	(cfs)		
2014	2.5	3.9	2.8	4.3
2015	2.6	4.0	2.9	4.4
2016	2.6	4.1	2.9	4.5
2017	2.7	4.2	3.0	4.6
2018	2.8	4.3	3.1	4.7
2019	2.8	4.4	3.1	4.8
2020	2.9	4.5	3.2	4.9
2021	3.0	4.6	3.3	5.1
2022	3.0	4.7	3.3	5.2
2023	3.1	4.8	3.4	5.3
2024	3.2	5.0	3.5	5.4
2025	3.3	5.1	3.6	5.5
2026	3.4	5.2	3.7	5.7
2027	3.5	5.3	3.8	5.8
2028	3.5	5.5	3.8	5.9
2029	3.6	5.6	3.9	6.1
2030	3.7	5.8	4.0	6.2
2031	3.8	5.9	4.1	6.4
2032	3.9	6.1	4.2	6.5
2033	4.0	6.2	4.3	6.7
2034	4.1	6.4	4.4	6.9
2035	4.2	6.6	4.5	7.0

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

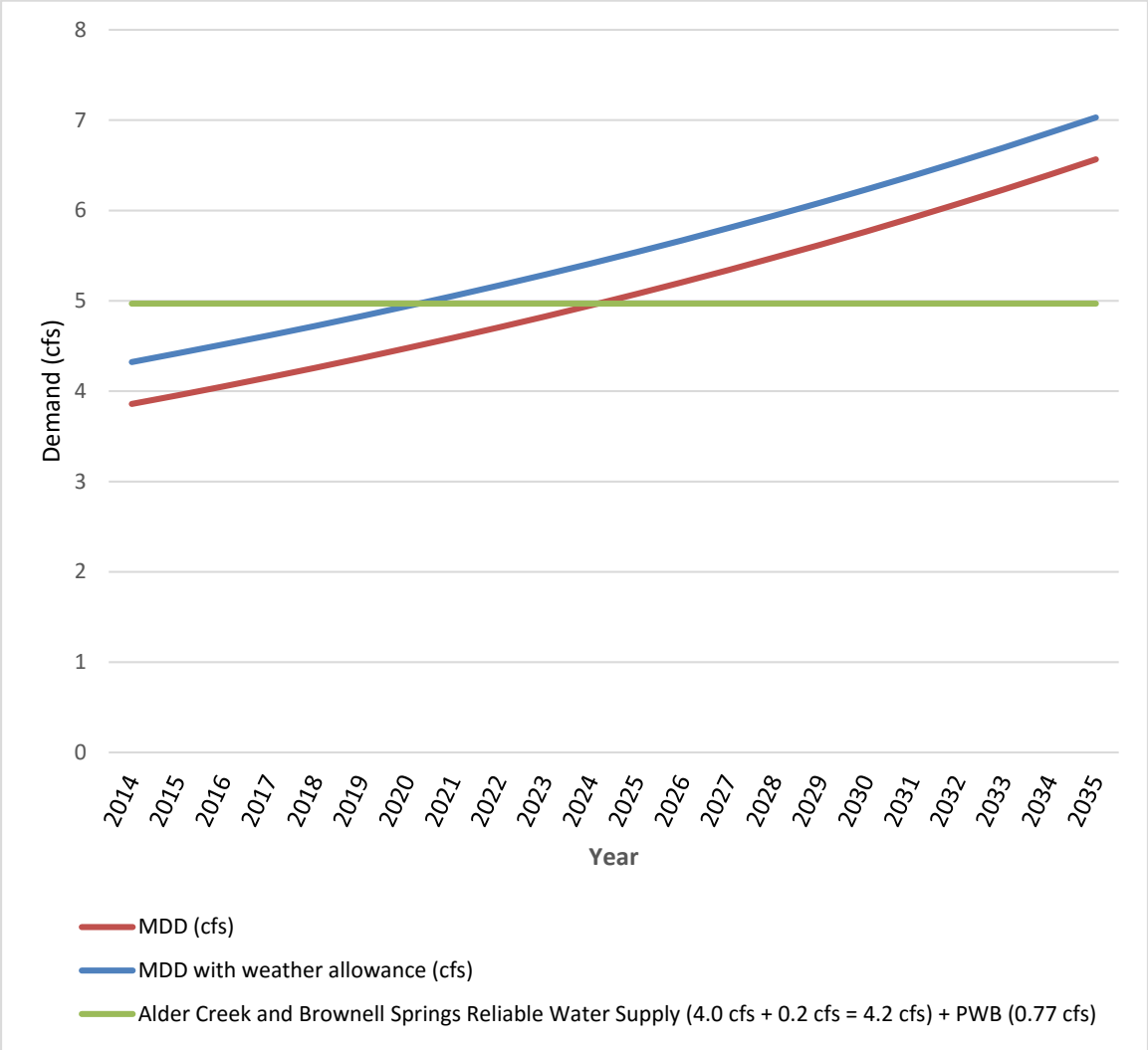
OAR 690-086-0170(2) and (4)

As described in Section 2, the City currently relies principally on its Alder Creek and Brownell Springs water rights to supply water to its customers, and PWB water is a supplemental water supply. The City currently is authorized to use up to 5.2cfs under its Alder Creek water rights and Brownell Springs water rights (4.0 cfs under Certificate 91176 and Permit S-36601 and 1.2 cfs under its Brownell Springs water rights). The water supply reliability of the City's Alder Creek water rights (4.0 cfs)[2] and Brownell Springs water rights (0.2 cfs) plus the PWB water (0.77 cfs) totals 4.97 cfs (3.21 mgd).

The City's projected MDD with a weather allowance shows that the City needs 4.97 cfs in less than 10 years (by 2021). (See **Exhibit 5-3** and **Exhibit 5-4).** The City intends to fully utilize its Alder Creek and Brownell Springs water rights to minimize its reliance on the water it purchases from the PWB, which is particularly important in the event of a disruption in the PWB Bull Run water supply.

[2] As previously described, City understands that water use limitations may be added to Permit S-36601 as a result of an approved extension of time. At this time, the potential conditions are unknown.

Exhibit 5-4. Projected Maximum Day Demand (MDD) and Water Supply Sources.



Over the next few years, the City will evaluate the best approach to meet its projected water demands through at least 2035. The City is considering three options: 1) begin to develop the City's Salmon River water supply, 2) purchase additional wholesale water from the PWB (purchase of up to 3.0 mgd is allowed under the current contract, which is in effect until June 30, 2028), or 3) pursue a combination of options 1 and 2. The City will provide an update on its evaluation of the best approach to use to meet its projected water demands through 2035 in the 10-year update of this WMCP.

Alternative Sources
OAR 690-086-0170(5)

OAR 690-086-0170(5) requires an analysis of alternative sources of water if any expansion or initial diversion of water allocated under existing permits is necessary to meet future water demand. The City is not seeking expansion or initial diversion of water under its existing permits; therefore, this provision is not applicable.

Quantification of Projected Maximum Rate and Monthly Volume
OAR 690-086-0170(6)

OAR 690-086-0170(6) requires a quantification of the maximum rate of withdrawal and maximum monthly use if any expansion or initial diversion of water allocated under an existing permit is necessary to meet demands in the 20-year planning horizon. The City is not seeking expansion or initial diversion of water under its existing permits; therefore, this provision is not applicable.

Mitigation Actions under State and Federal Law
OAR 690-086-0170(7)

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

The City currently is not required to take any mitigation actions under state or federal law. The final order approving an extension of time for the City's Permit S-48451 (use of water from Salmon River) did, however, include "fish persistence" conditions. These conditions were included to maintain the persistence of fish species listed under the Endangered Species Act in portions of the river affected by the water user under the permit. The City is fully aware of these conditions, and upon initiating use of Permit S-48451, the City will monitor streamflows and use as needed to comply with its permit requirements. The City is also aware that fish persistence conditions may be added to Permit S-36601 upon approval of the pending permit extension.

New Water Rights
OAR 690-086-0170(8)

Under OAR 690-086-0170(8), if a municipal water supplier finds it necessary to acquire new water rights within the next 20 years in order to meet its projected demand, an analysis of alternative sources of the additional water is required. The analysis must consider availability, reliability, feasibility and likely environmental impacts and a schedule for development of the new sources of water. The City does not intend to acquire new water rights to meet demands within the next 20 years, so the provisions of this section are not applicable.

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Appendix A

Letters to Local Governments

GSI
Water Solutions, Inc.

December 21, 2015

Tracy Brown, Director
Planning and Development Department
City of Sandy
39250 Pioneer Blvd.
Sandy, OR 97055

Subject: Water Management and Conservation Plan for the City of Sandy

Dear Mr. Brown:

The City of Sandy has developed a draft Water Management and Conservation Plan (WMCP) to fulfill the requirements of Oregon Administrative Rule Chapter 690, Division 86 of the Oregon Water Resources Department.

Under these rules, the water supplier shall make its draft WMCP available for review by affected local governments and seek comments relating to consistency with the local governments' comprehensive land use plans. Enclosed is a CD containing the City of Sandy's draft WMCP for your review.

Please provide comments to me within 30 days from the date of this letter. If the plan appears consistent with your agency's Comprehensive Land Use Plan, a letter response to that effect would be appreciated. You may send your comment to me at the address on this letterhead or e-mail them to me directly at: asussman@gsiws.com.

If you have any questions, please feel free to contact me at 541-257-9001. Thank you for your interest.

Sincerely,
GSI Water Solutions Inc.

Adam Sussman
Principal Water Resources Consultant

Enclosure

1600 SW Western Blvd., Suite 240 Corvallis, OR 97333 P: 541.753.0745 F: 541.754.4211 info@gsiws.com www.gsiws.com

GSI
Water Solutions, Inc.

December 21, 2015

Clackamas County - Planning and Zoning Division
Development Services Building
150 Beavercreek Rd.
Oregon City, OR 97045

Subject: Water Management and Conservation Plan for the City of Sandy

Dear Sir or Madam:

The City of Sandy has developed a draft Water Management and Conservation Plan (WMCP) to fulfill the requirements of Oregon Administrative Rule Chapter 690, Division 86 of the Oregon Water Resources Department.

Under these rules, the water supplier shall make its draft WMCP available for review by affected local governments and seek comments relating to consistency with the local governments' comprehensive land use plans. Enclosed is a CD containing the City of Sandy's draft WMCP for your review.

Please provide comments to me within 30 days from the date of this letter. If the plan appears consistent with your agency's Comprehensive Land Use Plan, a letter response to that effect would be appreciated. You may send your comment to me at the address on this letterhead or e-mail them to me directly at: asussman@gsiws.com.

If you have any questions, please feel free to contact me at 541-257-9001. Thank you for your interest.

Sincerely,
GSI Water Solutions Inc.

Adam Sussman
Principal Water Resources Consultant

Enclosure

1600 SW Western Blvd., Suite 240 Corvallis, OR 97333 P: 541.753.0745 F: 541.754.4211 info@gsiws.com www.gsiws.com

GSI
Water Solutions, Inc.

December 21, 2015

Jeremy Tower
Alder Creek Barlow Water District
PO Box 542
Sandy, OR 97055

Subject: Water Management and Conservation Plan for the City of Sandy

Dear Mr. Tower:

The City of Sandy has developed a Draft Water Management and Conservation Plan (WMCP) to fulfill the requirements of Oregon Administrative Rule Chapter 690, Division 86 of the Oregon Water Resources Department. Under these rules, the water supplier shall make its Draft WMCP available for review by affected local governments and seek comments relating to consistency with the local governments' comprehensive land use plans.

As a courtesy, the City of Sandy is providing you a copy of the Draft WMCP. If you have any questions, please feel free to contact me at 541-257-9001.

Sincerely,
GSI Water Solutions Inc.

Adam Sussman
Principal Water Resources Consultant

Enclosure

1600 SW Western Blvd., Suite 240 Corvallis, OR 97333 P: 541.753.0745 F: 541.754.4211 info@gsiws.com www.gsiws.com

GSI
Water Solutions, Inc.

December 21, 2015

David Jacob
Skyview Acres Water Company
PO Box 2072
Sandy, OR 97055

Subject: Water Management and Conservation Plan for the City of Sandy

Dear Mr. Jacob:

The City of Sandy has developed a Draft Water Management and Conservation Plan (WMCP) to fulfill the requirements of Oregon Administrative Rule Chapter 690, Division 86 of the Oregon Water Resources Department. Under these rules, the water supplier shall make its Draft WMCP available for review by affected local governments and seek comments relating to consistency with the local governments' comprehensive land use plans.

As a courtesy, the City of Sandy is providing you a copy of the Draft WMCP. If you have any questions, please feel free to contact me at 541-257-9001.

Sincerely,
GSI Water Solutions Inc.

Adam Sussman
Principal Water Resources Consultant

Enclosure

1600 SW Western Blvd., Suite 240 Corvallis, OR 97333 P: 541.753.0745 F: 541.754.4211 info@gsiws.com www.gsiws.com

Appendix B

Regional Water Providers Consortium

Population, Housing Unit, and Household Forecasts

2014 to 2045

DRAFT

Regional Water Providers Consortium

Population, Housing Unit, and Household Forecasts

2014 to 2045

Portland State UNIVERSITY

Population Research Center

JUNE 2014

DRAFT

Regional Water Providers Consortium

Population, Housing Unit, and Household Forecasts

2014 to 2045

Prepared By

Population Research Center

Portland State University

Charles Rynerson, Research Associate, principal investigator
Kevin Rancik, Research Assistant

JUNE, 2014

Background

Water providers have an ongoing need for estimates and forecasts of the total population and the number of housing units and households within their service areas. While some of the water providers within Clackamas, Multnomah, and Washington counties have obtained this information periodically on an individual basis, a complete and systematic set of estimates and forecasts for all members of the Regional Water Providers Consortium has not been prepared for nearly 10 years.

The Portland Water Bureau (PWB), on behalf of the Regional Water Providers Consortium, requested that the Portland State University Population Research Center (PRC) update service area boundaries and prepare population, housing unit, and household estimates and forecasts for the water service areas of the municipalities and water districts in the Consortium, as well as the wholesale customers of the PWB that are not Consortium members.

This report includes a brief description of the procedures, methodologies, and data sources used to prepare forecasts for each year from 2014 to 2045. The appendix contains summaries of population and household forecasts for each service area for 2035 and 2045 and a detailed one page profile for each service area that includes annual estimates of population, household population, housing units, households, persons per household, and vacancy rates. *[Note: the detailed profiles in draft form are available on the ftp site, in the "PRC" subfolder under each provider's folder. They will be added to the appendix when the forecasts are final.]* A report issued in February 2014 described the process of collecting and reviewing boundaries for each provider and preparing estimates for each year from 1990 to 2013.

Service Area Boundaries

Forecasts for all years have been prepared based on 2013 boundaries for every water provider included in the study. Boundaries for many of the providers may change in the future, and tentative plans are to update the forecasts in five years.

Several providers submitted shapefiles or maps that included future expanded service areas, in addition to their current boundaries. For these providers, PRC prepared forecasts for current service areas and also for future service areas. However, please note that PRC made no attempt to predict when the expansion would occur. The detailed forecast profiles simply tabulate 2010 census, 2013 estimates, and 2014 to 2045 forecasts for the larger areas. Also, because forecasts from 2014 to 2024 were

interpolated from 2013 and 2025 figures, the results may imply that residential development in new urban areas will begin sooner than is likely. For example, an area slated for development of 1,000 housing units by 2025 may in reality remain undeveloped until 2022, but the interpolation procedure will place housing in the area beginning in 2014. These forecasts are intended to depict likely long range future growth scenarios, not to precisely depict growth in the short run. Annual updates of the estimates will be prepared for 2014, 2015, and so on, incorporating actual residential development that has occurred by the date of the estimates.

Forecast Model and Data Sources Overview

In November 2012 the Metro Council adopted household (HH) forecasts by jurisdiction.[1] These forecasts were also produced for smaller areas called transportation analysis zones (TAZs). There are 1,482 TAZs in Clackamas, Multnomah, and Washington counties, making TAZs ideal for aggregating to larger geographic areas such as the 35 water service areas for which these forecasts are produced. However, the imprecise geographic fit between TAZs and water provider boundaries and the need for housing unit (HU) and population (POP) estimates in addition to HH estimates requires additional data and a relatively complex model.

Metro prepares forecasts for HHs, which are occupied HUs. We also needed to prepare HU forecasts for water providers, so we derived HU growth forecasts at the TAZ level by dividing HH growth forecasts by occupancy rates. POP forecasts were not generated at the TAZ level, but were produced for water service areas after HH forecasts were aggregated to service areas.

Most water service areas are composed of partial TAZs as well as whole TAZs. Therefore, the forecasts for TAZs that are split among more than one water provider must be allocated based on shares of expected growth within each TAZ/provider part. All of the data inputs were prepared for whole TAZs and TAZ/provider pieces, and provider shares of whole TAZs were calculated as a means to allocate TAZ level forecasts to providers. Six sets of shares were derived — four categories of net residential capacity from Metro's Buildable Land Inventory (BLI) at the parcel level, an inventory of existing HUs on parcels not included in the BLI, and land area.

We used the shares to distribute HU and HH growth forecasts to TAZ/provider pieces in three increments: 2010 to 2025, 2010 to 2035, and 2010 to 2040. Most TAZs are entirely within a single

[1] Ordinance No. 12-1292A, Metro Council, November 29, 2012.

water service area; the location and timing of development within a TAZ would not matter in those cases. For TAZs that are split between more than one provider, the amount of net residential capacity in each piece as well as the type of capacity makes a difference in the allocation of growth to each service area. We used the simple assumptions that growth within each TAZ would initially occur on vacant land, followed by underdeveloped land with net capacity (most of the region's net residential capacity is on these parcels), followed by infill on existing developed multiple family parcels (this category accounts for relatively little capacity), followed by the remainder of the TAZ not included in the BLI.

An additional piece of TAZ level information from Metro's Metroscope model is "2045 HH Capacity"[2] For TAZs in which the 2045 HH capacity exceeds the 2010 to 2040 HH growth, we allocated the excess capacity to TAZ/provider pieces based on land area.

Household Forecasts

HH growth for the three increments and the remaining capacity for 2040 to 2045 were aggregated from the TAZ/provider pieces to water service areas. Initial HH forecasts for 2025, 2035, and 2040 were calculated by adding the growth increments to the 2010 census base. To ensure that the HH forecasts are consistent with regional control totals and the 2013 base year estimates for each water service area, service area shares of the regional HH totals (based on the sum of these initial forecasts) were computed for the benchmark years 2013, 2025, 2035, and 2040. These shares were then interpolated for the intermediate forecast years, and the shares for each year from 2014 to 2040 were applied to regional control totals to produce final HH forecasts by water service area.[3] The 2041 to 2045 HH forecasts were distributed from the regional control totals based on the service area's shares of regional excess capacity.

Housing Unit Forecasts

Once the TAZ/provider HU growth forecasts were generated, initial forecasts by water service area were prepared for 2025, 2035, and 2040 using the same method as the initial HH estimates. Growth increments for each service area were added to the 2010 base. The interpolation method differed, however. Rather than computing regional shares for the benchmark years, we computed occupancy rates (HH divided by HU) and interpolated those. Using the occupancy rates calculated for 2013, 2025,

[2] MetroScope Gamma 2035 TAZ Forecast, DRAFT 9/19/12.
[3] For a description of the regional control totals, see the "Preliminary county forecasts by age group" item in the Data Sources and Uses section of this report.

2035, and 2040, interpolations for intermediate years and extrapolations for 2041 to 2045, we derived final HU forecasts by multiplying occupancy rates by the final HH forecasts.

Group Quarters Forecasts

All persons are reported by the Census Bureau as living in either HHs (occupied HUs), or group quarters (GQs) such as dorms, prisons, and nursing homes.[4] The region's GQ population (GQPOP) grew faster than HH population (HHPOP) between 2000 and 2010, but it is difficult to predict the future rate or location of GQPOP growth. GQPOP is currently less than two percent of current total population, and would be barely over two percent even if its growth rate continued to outpace the HHPOP growth rate in a manner similar to the 2000 to 2010 period. Considering the small impact of GQPOP and the uncertainty of future GQ sites or GQPOP change at existing sites, the safest assumption is that GQPOP will grow at the same rate as total POP, and that GQPOP in each service area will grow at the same rate as the region.

Household Population Forecasts

We estimated the future distribution of single family (SF) and multifamily (MF) growth for each service area using shares of net capacity by HU type aggregated from Metro's BLI. We then multiplied the HH growth by persons per HH (PPH) — 2.75 for SF HHs and 1.97 for MF HHs, deriving initial estimates of annual HHPOP growth.[5] These were added to the 2013 base year HHPOP to produce initial annual estimates of HHPOP, which were finally adjusted to match the regional control totals.

Total Population

Total population is the sum of household population and group quarters population. Because HHPOP and GQPOP forecasts for each service area are consistent with the regional control totals, no additional adjustments to POP are required.

$$POP = HHPOP + GQPOP$$

[4] A more detailed definition of group quarters is included in the Glossary.

[5] These PPHs are from the Census Bureau's 2008-2012 American Community Survey 5 year estimates. Future PPHs are expected to decline significantly due to the aging of the population and declining fertility rates. Although the 2008-2012 PPHs are not adjusted in the model, the increasing share of multifamily homes and the regional HHPOP control result in declining future PPHs.

Data Sources and Uses

From Metro

Transportation Analysis Zone (TAZ) shapefile. Metro's regional forecast is allocated to zones within the metro area, including 1,482 TAZs within Clackamas, Multnomah, and Washington counties. The forecast model relies on TAZ data, so all data inputs must be summarized at the TAZ level.

Buildable Land Inventory (BLI). Residential capacity by taxlot within Metro's Urban Growth Boundary (UGB), shapefiles downloaded from Metro's ftp site. "Capacity is calculated from current zoning or current comprehensive plan data (and sometimes concept plans when there isn't any urban zoning or comp plan in place). The [BLI is] based on a 2008 vacant land survey data that was subsequently revised to represent 2010 capacity."[6]

Household forecasts by TAZ. 2010 base year and 2025, 2035, and 2040 forecasts.[7] Household forecasts were divided by occupancy rates for each TAZ to derive TAZ housing unit forecasts.

From U.S. Census Bureau

Census 2010, Summary File 1, Table H3. Housing unit and household counts were aggregated from census blocks to TAZs, in order to calculate initial occupancy rates for each TAZ. Some initial rates were adjusted to correct for extreme values in 2010, such as newly developing areas where homes were not yet occupied, or relatively unpopulated areas where a small number of existing homes were 100 percent occupied.

Census 2010, Summary File 1, Table H17. Householders by age were divided by age group population totals to derive age-specific headship rates. These rates are used to derive household forecasts, given population forecasts by age group.

From PSU Population Research Center

Regional water providers shapefile. PRC created a regional layer based on files submitted by individual water providers, finalized in January 2014, for use in the population, housing unit, and household estimates prepared in February 2014.[8] This shapefile and the TAZ shapefile were used to aggregate data to unique TAZ/provider geographies.

Water providers 2013 estimates. The 2013 estimates of population, housing units, households, and household population prepared in February 2014 are the base year data for the 2014 to 2045 forecasts.

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[6] *Regional Forecast Distribution Methodology & Assumptions. Population and Employment 2010-40 TAZ Forecast Distribution "Gamma Scenario"*. Metro, Attachment 6 (Staff Report to Ordinance no. 12-1292A), November 2012.

[7] Datasets and associated information are available at http://www.oregonmetro.gov/regional-2035-forecast-distribution.

[8] A more detailed description may be found in *Regional Water Providers Consortium, Population, Housing Unit, and Household Estimates, 1990 to 2013*. Portland State University Population Research Center, February 2014.

Housing unit inventory shapefile. PRC created a layer in GIS with a point representing each housing unit in Clackamas, Multnomah, and Washington counties. This layer, based on Metro's RLIS taxlot and multifamily housing inventory, was initially developed for the estimates prepared in February. In the forecast model it is used to allocate TAZ housing unit forecasts to water providers in areas outside of the UGB not covered by Metro's BLI, and within the UGB where the forecast exceeds net capacity.

Preliminary county forecasts by age group. PRC has recently initiated the Oregon Population Forecast Program (OPFP) and is currently refining county level forecasts.[9] Preliminary forecasts for the tri-county area in five year increments were interpolated to create annual forecast series and were used in the model as regional population and household control totals. These OPFP population forecasts will be revised after extensive review, but the preliminary figures at the regional level were applicable due to their comparability to forecasts from the Oregon Office of Economic Analysis' 2013 county forecast series as well as to Metro's 2012 TAZ allocation.[10]

[9] See OPFP description at http://www.pdx.edu/prc/opfp.
[10] See OEA forecast at http://www.oregon.gov/DAS/OEA/Pages/demographic.aspx and Metro's City and county profiles.

Glossary

The following definitions are furnished by the U.S. Census Bureau.[11]

Group Quarters	A group quarters is a place where people live or stay that is normally owned or managed by an entity or organization providing housing and/or services for the residents. These services may include custodial or medical care as well as other types of assistance, and residency is commonly restricted to those receiving these services. People living in group quarters are usually not related to each other. Group quarters include such places as college residence halls, residential treatment centers, skilled nursing facilities, group homes, military barracks, correctional facilities, workers' dormitories, and facilities for people experiencing homelessness.
Household	A person or group of people who occupy a housing unit as their usual place of residence. The number of households equals the number of occupied housing units in a census.
Housing unit	A single-family house, townhouse, mobile home or trailer, apartment, group of rooms, or single room that is occupied as a separate living quarters or, if vacant, is intended for occupancy as a separate living quarters (in which one or more occupants live separately from any other individual(s) in the building and have direct access to the living quarters without going through another living quarters, such as from outside the building or through a common hall. For vacant units, the criteria of separateness and direct access are applied to the intended occupants.)
Population	All people living in a geographic area.
Vacant Housing Unit	A housing unit in which no one is living on Census Day, unless its occupants are only temporarily absent. Units temporarily occupied at the time of enumeration by individuals who have a usual home elsewhere are classified as vacant. (Transient quarters, such as hotels, are housing units only if occupied. Thus, there are no vacant housing units at hotels and the like.) New units not yet occupied are classified as vacant housing units if construction has reached a point where all exterior windows and doors are installed and final usable floors are in place. Vacant units are excluded from the housing unit inventory if they are open to the elements, have a posted "condemned" sign, or are used entirely for nonresidential purposes (except storage of household furniture).

[11] U.S. Census Bureau, Decennial Management Division Glossary. Available at http://www.census.gov/dmd/www/glossary.html, last accessed on February 25, 2014.

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Population Forecast Summary

Cities (2013 Water Service Area)	2013 Population Estimate	2035 Population Forecast	2045 Population Forecast	'13 to '35 Numeric Pop. Chg.	'13 to '35 Percent Pop. Chg.
City of Beaverton Water Service Area	68,515	77,112	77,381	8,597	13%
City of Fairview Water Service Area	8,151	8,123	8,143	-28	0%
City of Forest Grove Water Service Area	22,518	27,409	29,523	4,891	22%
City of Gladstone Water Service Area	11,137	11,918	12,236	781	7%
City of Gresham Water Service Area	71,654	91,368	97,473	19,714	28%
City of Hillsboro Water Service Area	81,310	91,292	93,634	9,982	12%
Cherry Grove (City of Hillsboro) Water Service Area	1,456	1,637	1,650	181	12%
City of Lake Oswego Water Service Area	35,145	39,592	43,489	4,447	13%
City of Milwaukie Water Service Area	19,430	21,296	21,325	1,866	10%
Portland Water Bureau Service Area	575,365	767,341	827,080	191,976	33%
City of Sandy Water Service Area	10,337	15,161	18,713	4,824	47%
City of Sherwood Water Service Area	18,575	19,147	19,688	572	3%
City of Tigard Water Service Area	60,236	76,571	79,174	16,335	27%
City of Tualatin Water Service Area	26,510	26,172	26,604	-338	-1%
City of Wilsonville Water Service Area	21,550	26,468	27,177	4,918	23%
Districts (2013 Water Service Area)					
Clackamas River Water District*	44,271	59,892	65,825	15,621	35%
Clackamas River Water/Oregon City Overlap	10,396	13,925	13,971	3,529	34%
Oak Lodge Water District	27,417	29,546	29,591	2,129	8%
Raleigh Water District	4,142	4,260	4,385	118	3%
Rockwood Water PUD	61,514	71,893	76,008	10,379	17%
South Fork Water Board (Oregon City Part*)	23,944	28,352	30,046	4,408	18%
Clackamas River Water/Oregon City Overlap	10,396	13,925	13,971	3,529	34%
South Fork Water Board (West Linn Part)	25,529	27,901	29,450	2,372	9%
Sunrise Water Authority	46,228	67,003	74,310	20,775	45%
Tualatin Valley Water District (Total)	211,361	257,440	268,842	46,079	22%
TVWD (Metzger sub-area)	*20,160*	*23,992*	*25,111*	*3,832*	*19%*
TVWD (Wolf Creek sub-area)	*191,201*	*233,448*	*243,731*	*42,247*	*22%*
West Slope Water District	10,245	11,706	12,145	1,461	14%

**Does not include CRW/Oregon City overlap area*

Population Research Center, Portland State University, May 2014 www.pdx.edu/prc

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Population Forecast Summary

PWB Wholesale Customers (2013 Water Service Area)	2013 Population Estimate	2035 Population Forecast	2045 Population Forecast	'13 to '35 Numeric Pop. Chg.	'13 to '35 Percent Pop. Chg.
Burlington Water District	280	333	332	53	19%
GNR Water Company	48	54	54	6	13%
Green Valley Water Company	7	9	9	2	29%
Hideaway Hills Water Company	52	57	56	5	10%
Lake Grove Water District	2,881	3,281	3,445	400	14%
Lorna Water Company	249	277	288	28	11%
Lusted Water District	1,069	1,085	6,000	16	1%
Palatine Hill Water District	1,531	1,874	1,925	343	22%
Pleasant Home Water District	1,462	1,417	3,815	-45	-3%
Skyview Acres Water Company	35	39	39	4	11%
Two Rivers Water Association	14	15	15	1	7%
Valley View Water District	900	1,099	1,110	199	22%
Future Water Service Areas*					
City of Beaverton Water Service Area	68,617	80,499	82,930	11,882	17%
City of Hillsboro Water Service Area	81,481	106,676	111,887	25,195	31%
South Fork Water Board (Oregon City Part**)	24,206	29,340	31,113	5,134	21%
City of Sandy Water Service Area	11,290	16,769	20,878	5,479	49%
City of Sherwood Water Service Area	18,752	21,767	22,883	3,015	16%
Tualatin Valley Water District (Total)	211,556	262,276	274,458	50,720	24%
TVWD (Wolf Creek sub-area)	*191,396*	*238,284*	*249,347*	*46,888*	*24%*

**For water providers that provided current and future service areas, these estimates and forecasts include expanded service area boundaries, with no attempt to predict when expansion might occur .*

The City of Hillsboro includes South Hillsboro; South Fork - Oregon City includes areas witin the UGB but not in the CRW overlap area; City of Sandy includes the Urban Reserve Area; TVWD includes North Bethany and Bonny Slope.

***Does not include CRW/Oregon City overlap area*

Population Research Center, Portland State University, May 2014 www.pdx.edu/prc

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Household Forecast Summary

Cities (2013 Water Service Area)	2013 Household Estimate	2035 Household Forecast	2045 Household Forecast	'13 to '35 Numeric HH Chg.	'13 to '35 Percent HH Chg.
City of Beaverton Water Service Area	27,793	33,913	34,481	6,120	22%
City of Fairview Water Service Area	3,282	3,512	3,571	230	7%
City of Forest Grove Water Service Area	7,821	10,448	11,491	2,627	34%
City of Gladstone Water Service Area	4,418	5,080	5,292	662	15%
City of Gresham Water Service Area	26,755	37,810	41,161	11,055	41%
City of Hillsboro Water Service Area	27,871	34,577	36,126	6,706	24%
Cherry Grove (City of Hillsboro) Water Service Area	526	631	644	105	20%
City of Lake Oswego Water Service Area	15,325	18,137	20,036	2,812	18%
City of Milwaukie Water Service Area	8,248	9,506	9,619	1,258	15%
Portland Water Bureau Service Area	245,837	360,194	395,290	114,357	47%
City of Sandy Water Service Area	3,830	6,081	7,642	2,251	59%
City of Sherwood Water Service Area	6,492	7,256	7,605	764	12%
City of Tigard Water Service Area	24,277	32,646	34,148	8,369	34%
City of Tualatin Water Service Area	10,212	10,753	11,071	541	5%
City of Wilsonville Water Service Area	8,657	11,210	11,584	2,553	29%
Districts (2013 Water Service Area)					
Clackamas River Water District*	17,607	25,297	28,132	7,690	44%
Clackamas River Water/Oregon City Overlap	3,596	5,272	5,355	1,676	47%
Oak Lodge Water District	11,335	12,850	13,004	1,515	13%
Raleigh Water District	2,038	2,189	2,262	151	7%
Rockwood Water PUD	21,162	28,211	30,730	7,049	33%
South Fork Water Board (Oregon City Part*)	9,231	11,917	12,861	2,686	29%
Clackamas River Water/Oregon City Overlap	3,596	5,272	5,355	1,676	47%
South Fork Water Board (West Linn Part)	9,728	11,300	12,064	1,572	16%
Sunrise Water Authority	16,292	26,588	30,184	10,296	63%
Tualatin Valley Water District (Total)	79,837	106,267	112,865	26,430	33%
TVWD (Metzger sub-area)	*8,476*	*10,750*	*11,387*	*2,274*	*27%*
TVWD (Wolf Creek sub-area)	*71,361*	*95,517*	*101,478*	*24,156*	*34%*
West Slope Water District	4,429	5,305	5,552	876	20%

**Does not include CRW/Oregon City overlap area*

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Household Forecast Summary

PWB Wholesale Customers (2013 Water Service Area)	2013 Household Estimate	2035 Household Forecast	2045 Household Forecast	'13 to '35 Numeric HH Chg.	'13 to '35 Percent HH Chg.
Burlington Water District	134	170	172	36	27%
GNR Water Company	19	23	23	4	21%
Green Valley Water Company	3	4	4	1	33%
Hideaway Hills Water Company	18	21	21	3	17%
Lake Grove Water District	1,257	1,496	1,582	239	19%
Lorna Water Company	99	122	130	23	23%
Lusted Water District	384	415	2,345	31	8%
Palatine Hill Water District	525	686	714	161	31%
Pleasant Home Water District	523	540	1,480	17	3%
Skyview Acres Water Company	15	18	18	3	20%
Two Rivers Water Association	7	8	8	1	14%
Valley View Water District	359	468	479	109	30%
Future Water Service Areas*					
City of Beaverton Water Service Area	27,832	35,492	37,105	7,660	28%
City of Hillsboro Water Service Area	27,935	41,975	45,028	14,040	50%
South Fork Water Board (Oregon City Part**)	9,350	12,372	13,358	3,022	32%
City of Sandy Water Service Area	4,187	6,724	8,519	2,537	61%
City of Sherwood Water Service Area	6,555	8,329	8,932	1,774	27%
Tualatin Valley Water District (Total)	79,911	108,438	115,421	28,527	36%
TVWD (Wolf Creek sub-area)	*71,435*	*97,688*	*104,034*	*26,253*	*37%*

**For water providers that provided current and future service areas, these estimates and forecasts include expanded service area boundaries, with no attempt to predict when expansion might occur .*

The City of Hillsboro includes South Hillsboro; South Fork - Oregon City includes areas witin the UGB but not in the CRW overlap area; City of Sandy includes the Urban Reserve Area; TVWD includes North Bethany and Bonny Slope.

***Does not include CRW/Oregon City overlap area*

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Household Size Forecast Summary

Cities (2013 Water Service Area)	2013 Household Size Estimate	2035 Household Size Forecast	2045 Household Size Forecast	'13 to '35 Numeric PPHH Chg.	'13 to '35 Percent PPHH Chg.
City of Beaverton Water Service Area	2.44	2.24	2.21	-0.19	-8%
City of Fairview Water Service Area	2.48	2.31	2.28	-0.17	-7%
City of Forest Grove Water Service Area	2.71	2.46	2.41	-0.25	-9%
City of Gladstone Water Service Area	2.50	2.32	2.29	-0.18	-7%
City of Gresham Water Service Area	2.64	2.38	2.33	-0.26	-10%
City of Hillsboro Water Service Area	2.87	2.59	2.54	-0.28	-10%
Cherry Grove (City of Hillsboro) Water Service Area	2.75	2.58	2.55	-0.17	-6%
City of Lake Oswego Water Service Area	2.27	2.16	2.14	-0.11	-5%
City of Milwaukie Water Service Area	2.32	2.20	2.17	-0.12	-5%
Portland Water Bureau Service Area	2.27	2.07	2.03	-0.20	-9%
City of Sandy Water Service Area	2.69	2.49	2.44	-0.20	-8%
City of Sherwood Water Service Area	2.86	2.64	2.59	-0.22	-8%
City of Tigard Water Service Area	2.47	2.33	2.30	-0.14	-5%
City of Tualatin Water Service Area	2.59	2.42	2.39	-0.16	-6%
City of Wilsonville Water Service Area	2.29	2.16	2.14	-0.13	-6%
Districts (2013 Water Service Area)					
Clackamas River Water District*	2.49	2.35	2.32	-0.14	-6%
Clackamas River Water/Oregon City Overlap	2.84	2.60	2.56	-0.24	-9%
Oak Lodge Water District	2.38	2.26	2.23	-0.12	-5%
Raleigh Water District	2.01	1.92	1.91	-0.09	-5%
Rockwood Water PUD	2.86	2.50	2.43	-0.36	-12%
South Fork Water Board (Oregon City Part*)	2.54	2.33	2.28	-0.21	-8%
Clackamas River Water/Oregon City Overlap	2.84	2.60	2.56	-0.24	-9%
South Fork Water Board (West Linn Part)	2.61	2.46	2.43	-0.16	-6%
Sunrise Water Authority	2.83	2.52	2.46	-0.32	-11%
Tualatin Valley Water District (Total)					
TVWD (Metzger sub-area)	*2.32*	*2.18*	*2.15*	*-0.15*	*-6%*
TVWD (Wolf Creek sub-area)	*2.66*	*2.43*	*2.38*	*-0.23*	*-9%*
West Slope Water District	2.29	2.18	2.16	-0.11	-5%

**Does not include CRW/Oregon City overlap area*

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Household Size Forecast Summary

PWB Wholesale Customers (2013 Water Service Area)	2013 Household Size Estimate	2035 Household Size Forecast	2045 Household Size Forecast	'13 to '35 Numeric PPHH Chg.	'13 to '35 Percent PPHH Chg.
Burlington Water District	2.09	1.96	1.93	-0.13	-6%
GNR Water Company	2.53	2.35	2.35	-0.18	-7%
Green Valley Water Company	2.33	2.25	2.25	-0.08	-4%
Hideaway Hills Water Company	2.89	2.71	2.67	-0.17	-6%
Lake Grove Water District	2.28	2.18	2.17	-0.10	-4%
Lorna Water Company	2.51	2.26	2.21	-0.24	-10%
Lusted Water District	2.76	2.59	2.55	-0.17	-6%
Palatine Hill Water District	2.92	2.73	2.70	-0.18	-6%
Pleasant Home Water District	2.78	2.60	2.57	-0.18	-6%
Skyview Acres Water Company	2.33	2.17	2.17	-0.17	-7%
Two Rivers Water Association	2.00	1.88	1.88	-0.13	-6%
Valley View Water District	2.50	2.35	2.32	-0.16	-6%
Future Water Service Areas*					
City of Beaverton Water Service Area	2.44	2.24	2.20	-0.20	-8%
City of Hillsboro Water Service Area	2.87	2.50	2.44	-0.37	-13%
South Fork Water Board (Oregon City Part**)	2.54	2.32	2.28	-0.22	-9%
City of Sandy Water Service Area	2.69	2.49	2.45	-0.20	-7%
City of Sherwood Water Service Area	2.86	2.61	2.56	-0.25	-9%
TVWD (Wolf Creek sub-area)	*2.66*	*2.42*	*2.38*	*-0.24*	*-9%*

**For water providers that provided current and future service areas, these estimates and forecasts include expanded service area boundaries, with no attempt to predict when expansion might occur .*

The City of Hillsboro includes South Hillsboro; South Fork - Oregon City includes areas witin the UGB but not in the CRW overlap area; City of Sandy includes the Urban Reserve Area; TVWD includes North Bethany and Bonny Slope.

***Does not include CRW/Oregon City overlap area*

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DRAFT For Review

Vacancy Rate Forecast Summary

Cities (2013 Water Service Area)	2013 Vacancy Rate Estimate	2035 Vacancy Rate Forecast	2045 Vacancy Rate Forecast	'13 to '35 Numeric VAC Chg.	'13 to '35 Percent VAC Chg.
City of Beaverton Water Service Area	5.3%	5.4%	5.4%	0.2%	3%
City of Fairview Water Service Area	6.3%	6.2%	6.2%	0.0%	0%
City of Forest Grove Water Service Area	5.7%	5.9%	6.0%	0.2%	3%
City of Gladstone Water Service Area	5.1%	5.1%	5.2%	0.0%	1%
City of Gresham Water Service Area	5.4%	6.0%	6.0%	0.6%	11%
City of Hillsboro Water Service Area	5.0%	5.4%	5.4%	0.4%	7%
Cherry Grove (City of Hillsboro) Water Service Area	5.6%	5.8%	6.1%	0.3%	5%
City of Lake Oswego Water Service Area	6.5%	6.5%	6.7%	0.1%	1%
City of Milwaukie Water Service Area	5.0%	5.0%	5.0%	0.0%	1%
Portland Water Bureau Service Area	6.2%	6.9%	7.1%	0.7%	11%
City of Sandy Water Service Area	5.3%	5.5%	5.5%	0.2%	4%
City of Sherwood Water Service Area	3.8%	3.9%	3.8%	0.1%	3%
City of Tigard Water Service Area	4.5%	4.6%	4.7%	0.2%	3%
City of Tualatin Water Service Area	4.9%	5.0%	5.1%	0.1%	2%
City of Wilsonville Water Service Area	7.4%	8.2%	8.2%	0.8%	11%
Districts (2013 Water Service Area)					
Clackamas River Water District*	5.4%	5.1%	5.0%	-0.3%	-5%
Clackamas River Water/Oregon City Overlap	12.3%	9.3%	9.2%	-3.0%	-25%
Oak Lodge Water District	5.9%	5.9%	6.0%	0.0%	0%
Raleigh Water District	5.3%	5.7%	5.8%	0.4%	8%
Rockwood Water PUD	5.6%	5.9%	5.9%	0.3%	5%
South Fork Water Board (Oregon City Part*)	5.4%	5.8%	6.2%	0.5%	8%
Clackamas River Water/Oregon City Overlap	12.3%	9.3%	9.2%	-3.0%	-25%
South Fork Water Board (West Linn Part)	5.2%	5.3%	5.3%	0.1%	1%
Sunrise Water Authority	5.3%	5.2%	5.2%	-0.1%	-3%
Tualatin Valley Water District (Total)					
TVWD (Metzger sub-area)	*5.2%*	*5.3%*	*5.3%*	*0.1%*	*2%*
TVWD (Wolf Creek sub-area)	*5.4%*	*5.4%*	*5.3%*	*0.0%*	*0%*
West Slope Water District	5.3%	5.6%	5.7%	0.2%	5%

**Does not include CRW/Oregon City overlap area*

Population Research Center, Portland State University, May 2014 www.pdx.edu/prc

DRAFT For Review

Vacancy Rate Forecast Summary

PWB Wholesale Customers (2013 Water Service Area)	2013 Vacancy Rate Estimate	2035 Vacancy Rate Forecast	2045 Vacancy Rate Forecast	'13 to '35 Numeric VAC Chg.	'13 to '35 Percent VAC Chg.
Burlington Water District	10.7%	10.5%	10.4%	-0.1%	-1%
GNR Water Company	5.0%	4.2%	4.2%	-0.8%	-17%
Green Valley Water Company	0.0%	0.0%	0.0%	0.0%	
Hideaway Hills Water Company	5.3%	4.5%	4.5%	-0.7%	-14%
Lake Grove Water District	5.3%	5.6%	5.7%	0.2%	4%
Lorna Water Company	5.7%	4.7%	5.8%	-1.0%	-18%
Lusted Water District	5.7%	5.9%	3.9%	0.2%	4%
Palatine Hill Water District	10.1%	10.4%	10.3%	0.3%	3%
Pleasant Home Water District	6.4%	6.6%	8.2%	0.1%	2%
Skyview Acres Water Company	11.8%	10.0%	10.0%	-1.8%	-15%
Two Rivers Water Association	0.0%	0.0%	0.0%	0.0%	
Valley View Water District	5.5%	5.3%	5.5%	-0.3%	-5%
Future Water Service Areas*					
City of Beaverton Water Service Area	5.3%	5.4%	5.3%	0.1%	1%
City of Hillsboro Water Service Area	5.0%	5.4%	5.4%	0.4%	7%
South Fork Water Board (Oregon City Part**)	5.4%	5.8%	6.2%	0.5%	8%
City of Sandy Water Service Area	5.2%	5.4%	5.4%	0.2%	4%
City of Sherwood Water Service Area	3.8%	3.8%	3.8%	0.1%	2%
TVWD (Wolf Creek sub-area)	5.4%	5.4%	5.3%	0.0%	0%

**For water providers that provided current and future service areas, these estimates and forecasts include expanded service area boundaries, with no attempt to predict when expansion might occur .*

The City of Hillsboro includes South Hillsboro; South Fork - Oregon City includes areas witin the UGB but not in the CRW overlap area; City of Sandy includes the Urban Reserve Area; TVWD includes North Bethany and Bonny Slope.

***Does not include CRW/Oregon City overlap area*

Population Research Center, Portland State University, May 2014 www.pdx.edu/prc

Appendix C

WaterSense Fix a Leak Week
Press Release

Newsroom

News Releases - Partnerships and Stewardship

Stop the Drops! EPA's National "Fix-a-Leak Week" Kicks Off in Metro Portland

Release Date: 03/19/2013
Contact Information: Bevin Horn, EPA/Seattle, 206-553-1566, horn.bevin@epa.gov

(Portland, OR – March 18, 2013) Every year, more than 1 trillion gallons of water leak from U.S. homes nationwide. That's equivalent to the total annual water use of Los Angeles, Chicago, and Miami combined! Experts estimate that leaks in almost 10 percent of American homes drip away almost 90 gallons of water a day. The usual culprits: leaky toilets, faucets and showerheads.

The U.S Environmental Protection Agency's WaterSense program is again teaming up with local partners to promote the fifth annual **National Fix a Leak Week, March 18-24, 2013**.

In cities like Portland, that can mean up to $200 per year in utility charges literally going down the drain. Finding and fixing leaks is easier than most people think. Most replacement parts can be installed by do-it-yourselfers and quickly pay for themselves. Don't waste money AND natural resources, fix your drips and leaks and make your wallet watertight!

Here are some ways people can get involved in the **Portland** Area:

Fix-a-Leak Week Photo/Video Contest - The Regional Water Providers Consortium is inviting customers to join "Drippy Drew" - the leak detection gnome - in celebrating Fix A Leak Week (March 18-24, 2013) by participating in their first-ever Fix a Leak Week Contest. Contestants are invited to submit photo or video entries(by Midnight, March 20th) that depict themselves or others finding & fixing leaks around their homes with the chance to win a $500, $300, or $200 Lowe's gift card!! **Contact**: RWPCinfo@portlandoregon.gov

RWPC website: http://www.conserveh2o.org/Fix-Leak-Week-Contest

Follow the RWPC and Drippy Drew on Facebook at: https://www.facebook.com/RegionalWaterProvidersConsortium

"Everything You Ever Wanted to Know About Fixing Leaks…but Were Afraid to Ask! - City of Sandy, OR, is sponsoring a "Do It Yourself" Fix-a-Leak presentation and Q&A with a local plumber at 6 pm, March 20th in the council chambers at Sandy City Hall. There will be more information about the City's partnership with WaterSense program and tips, tricks & trade secrets will be offered for saving water and money by fixing even minor leaks. Also: Toilet leak dye tablets are available (attached to the WaterSense Dye Tablet Card) at the City Hall's Water Billing counter. **Contact:** Liz Storn, City of Sandy (503) 489-2161, lstorn@ci.sandy.or.us

For more about EPA's WaterSense Program: http://www.epa.gov/watersense/

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View selected historical press releases from 1970 to 1998 in the EPA History website.

Recent additions

08/18/2015 Hoboken Mayor Dawn Zimmer named to National EPA Advisory Committee
08/13/2015 Tell EPA About Your Green Infrastructure Project
08/03/2015 FACT SHEET: PRESIDENT OBAMA TO ANNOUNCE HISTORIC CARBON POLLUTION STANDARDS FOR POWER PLANTS
07/30/2015 Galveston Bay Foundation Receives Second Place Gulf Guardian Award in the Civic/Non Profit Category
07/30/2015 Coastal and Marine Operators Group Receives Second-Place Gulf Guardian Award in Business and Industry Category

City of Sandy, Oregon – City Government

March 12, 2013 ·

WATERSENSE "FIX-A-LEAK" WEEK

Do you have a faucet that has an annoying drip? Do you have to jiggle the toilet handle or hear it run/fill when no one is in the bathroom? Chances are, you have a leak! (or 2, or 3...)

A leaky faucet that drips 30 times in one hour (that's 1 drip every other second) can really start to add up. That little drip can send over 1000 gallons down your drain over the space of a year. If your toilet is leaking, that can be up to 400 gallons in just one day!

March 18-24 is the WaterSense Fix a Leak Week, and Sandy is stepping up to help. WaterSense is a partnership program sponsored by the US Environmental Protection Agency, and seeks to protect the future of our nation's water supply by offering people a simple way to use less water with water-efficient products and services. On March 20th (6 – 7pm) at City Hall's Council Chambers, there will be a Q&A with a local plumber to help you DIY your leaks away. Keep an eye on the City's website and Facebook page for more details.

Appendix D

Water Rates by Customer Category

Multi-Family Residential Customer Water Rates

Inside City Limits

Year	Monthly Base Fee MF	Monthly Meter Charge (5/8" x 3/4" meter)	Monthly Meter Charge (1" meter)	Monthly Meter Charge (1.5" meter)	Monthly Meter Charge (2" meter)	Volume Charge per CCF
2014 (current)	$6.18	$0.22	$0.56	$1.08	$1.74	$2.31
2013	$5.94	$0.21	$0.54	$1.04	$1.67	$2.22
2012	$5.60	$0.20	$0.51	$0.98	$1.58	$2.09
2011	$5.29	$0.19	$0.48	$0.93	$1.49	$1.97
2010	$4.99	$0.18	$0.45	$0.88	$1.41	$1.86
2008	$4.80	$0.17	$0.43	$0.85	$1.36	$1.79

Outside City Limits

Year	Monthly Base Fee MF	Monthly Meter Charge (5/8" x 3/4" meter)	Monthly Meter Charge (1" meter)	Monthly Meter Charge (1.5" meter)	Monthly Meter Charge (2" meter)	Volume Charge per CCF
2014 (current)	$6.18	$0.33	$0.81	$1.66	$2.61	$2.31
2013	$5.94	$0.32	$0.84	$1.60	$2.51	$2.22
2012	$5.60	$0.30	$0.76	$1.50	$2.37	$2.09
2011	$5.29	$0.28	$0.72	$1.41	$2.24	$1.97
2010	$4.99	$0.27	$0.68	$1.33	$2.12	$1.86
2008	$4.80	$0.26	$0.65	$1.28	$2.04	$1.79

Commercial-Industrial Customer Water Rates

Inside City Limits

Year	Monthly Base Fee Comm.-Ind.	Monthly Meter Charge (5/8" x 3/4" meter)	Monthly Meter Charge (1" meter)	Monthly Meter Charge (1.5" meter)	Monthly Meter Charge (2" meter)	Volume Charge per CCF Inside
2014 (current)	$6.18	$0.22	$0.56	$1.08	$1.74	$2.12
2013	$5.94	$0.21	$0.54	$1.04	$1.67	$2.04
2012	$5.60	$0.20	$0.51	$0.98	$1.58	$1.92
2011	$5.29	$0.19	$0.48	$0.93	$1.49	$1.81
2010	$4.99	$0.18	$0.45	$0.88	$1.41	$1.71
2008	$4.80	$0.17	$0.43	$0.85	$1.36	$1.64

Outside City Limits

Year	Monthly Base Fee Comm.-Ind.	Monthly Meter Charge (5/8" x 3/4" meter)	Monthly Meter Charge (1" meter)	Monthly Meter Charge (1.5" meter)	Monthly Meter Charge (2" meter)	Volume Charge per CCF
2014 (current)	$6.18	$0.33	$0.81	$1.66	$2.61	$3.29
2013	$5.94	$0.32	$0.84	$1.60	$2.51	$3.16
2012	$5.60	$0.30	$0.76	$1.50	$2.37	$2.98
2011	$5.29	$0.28	$0.72	$1.41	$2.24	$2.81
2010	$4.99	$0.27	$0.68	$1.33	$2.12	$2.65
2008	$4.80	$0.26	$0.65	$1.28	$2.04	$2.55

Wholesale Customer Water Rates

Year	Monthly Base Fee Wholesale	Monthly Meter Charge (4" meter)	Volume Charge per CCF
2014 (current)	$7.40	$8.21	$2.59
2013	$7.12	$7.90	$2.49
2012	$6.72	$7.45	$2.35
2011	$6.34	$7.03	$2.22
2010	$5.98	$6.64	$2.10
2008	$5.75	$6.38	$2.02

Skyview Water Rates

Year	Monthly Base Fee Wholesale	Monthly Meter Charge (4" meter)	Volume Charge per CCF
2015 (current)	$7.90	$8.21	$0.597
2014	$7.40	$7.90	$0.48

NOTE: By agreement, Skyview's rate is reviewed and adjusted on a different schedule than other customers

Appendix E

"At Your Service" Monthly Newsletter – Water Conservation Message, July 2015

July 2015

City of Sandy
At Your Service

A Monthly Bulletin of Community News

Water Supply

With the recent warm, dry weather and all the media coverage of drought in Oregon we wanted to inform customers on Sandy's water supply situation. While last winter's snowfall was well below average, rainfall was at or near normal in western Oregon. Our water sources are located in low-elevation watersheds where most runoff comes from rainfall, not snowmelt. The outlook for municipal supplies is generally good in the metro region.

That being said, we still don't have enough water to waste. Please visit http://www.conserveh2o.org/ for tips on reducing indoor and outdoor water consumption and water conservation strategies.

If you live in a new home, make sure your irrigation timer is set properly. Builders often adjust the timer to keep new turf well watered in order to improve curb appeal, however they don't have to pay for it. You can sign up to receive an email with your weekly watering number at www.conserveh2o.org and adjust your irrigation timer to match weather conditions for Sandy.

2015 Sandy Summer Sounds & Starlight Cinema at Meinig Park

info online at www.cityofsandy.com or pick up a brochure at City Hall, Community/Senior Center or the Library

Sundays, 7/19-8/9 **Acoustic Series** 6:30pm

Wednesdays, 7/29-8/26 **Main Stage Music** 6:30 pm

(Hops & Blues Festival, 7/29 5:30-9:30pm)

Movies at dusk ***(Note: 8/22 Movie originally Cinderella, now Into the Woods)***

~Concessions available~

REMINDER

Please remember to register your dogs with Clackamas County http://www.clackamas.us/dogs/license.html

Appendix F

Announcements for Annual Water Conservation Education Presentations at Local Elementary Schools

What Do You Know About H2O?

Sponsored by the City of Sandy
Presented by Mad Science of Portland & Vancouver

Customer Details:

Organization:	Kelso Elementary	**Phone:**	503-668-8020
Address:	34651 SE Kelso Road Boring, OR 97009	**Fax:**	503-668-0883
Contact:	Katie Schweitzer		
Title:	Principal	**Email:**	katie.schweitzer@ortrail.k12.or.us
Directions:	Hwy 26 toward Sandy, after Swiss Village turn left onto Kelso Rd. On the left right after stop sign, set back from road.		

Event Details:

Instructor: TBD **Number of Kids Attending:**

Special Instructions: 4 classes - 135 Students

Event/Booth Topics	Date	Start Time	End Time	Grades/# kids
What Do You Know About H2O?	3/31/2014	9:00 AM	9:30 AM	3-5/135

Things you need to know

- Your Mad Scientist will arrive approximately 45 minutes before the event to set up.
- They will need one (1) **banquet size table** to set-up their equipment and **access to electricity and water**.
- This show requires a fair amount of water. We will need access to a deep sink to fill gallon bottles.
- If you have a PA system, please set it up for our Mad Scientist.
- If you have any questions call Mad Science at (503) 230-8040.

Mad Science of Portland & Vancouver
1522 N. Ainsworth St., Portland, OR 97217

portland.madscience.org • www.conserveh20.org

What Do You Know About H2O?

Sponsored by the Regional Water Providers Consortium
Presented by Mad Science of Portland & Vancouver

Customer Details:

Organization:	Sandy Elementary	**Phone:**	503-668-8065
Address:	38965 Pleasant Ave. Sandy, OR 97055	**Fax:**	503-668-6246
Contact:	Rachael George		
Title:	Principal	**Email:**	rachael.george@ortrail.k12.or.us
Directions:	I-84 east to Wood Village exit. Turn right and continue south. Turn left on Burnside, turns into Hwy 26. Continue into Sandy (about 10 miles). Turn left on Strauss. Right on Pleasant.		

Event Details:

Instructor: TBD
Number of Kids Attending: 90
Special Instructions: 3 Classrooms, 90 Students

Event/Booth Topics	Date	Start Time	End Time	Grades/# kids
What Do You Know About H2O?	4/2/2015	7:40 AM	8:10 AM	3-5/90

Things you need to know

- Your Mad Scientist will arrive approximately 45 minutes before the event to set up.
- They will need one (1) **banquet size table** to set-up their equipment and **access to electricity and water**.
- This show requires a fair amount of water. We will need access to a deep sink to fill gallon bottles.
- If you have a PA system, please set it up for our Mad Scientist.
- If you have any questions call Mad Science at (503) 230-8040.

Mad Science of Portland & Vancouver
1522 N. Ainsworth St., Portland, OR 97217

portland.madscience.org • www.conserveh2o.org

What Do You Know about H2O?

Sponsored by the Regional Water Providers Consortium
Presented by Mad Science of Portland & Vancouver

Customer Details:

Organization: Firwood Elementary
Address: 42900 SE Trubel Road
Sandy, OR 97055
Contact: Susan Baysinger
Title: School Contact
Phone: 503-668-8005 **X:**
Fax: 503-668-3684
Email: baysings@ortrail.k12.or.us
Directions: Hwy 26 toward Mt. Hood. 2mi. East of the last stoplight in Sandy, turn right on Firwood Rd. (Landmark is 'Shorty's Corner'). Turn left on Firwood School Rd (This is actually Trubel Road, but the sign says "Firwood School Road").

Event Details:

Instructor: TBD
Number of Kids Attending: 225
Special Instructions: **Susan Baysinger booked the show. Instructor should check in at office then drive around back to unload at the Gym door. Susan will have a student available to fill jugs. 9 teachers**

Event/Booth Topics	Date	Start Time	End Time	Grades/# kids
What Do You know about H2O?	11/18/2010	10:00 AM	10:30 AM	3-5/225

Things you need to know

- Your Mad Scientist will arrive approximately 45 minutes before the event to set up.
- They will need a **banquet size table** to set-up their equipment and **access to electricity and water**.
- There is a fair amount of water required. We will need **access to a deep sink** to fill gallon bottles.
- If you have a PA system, please set it up for our Mad Scientist.
- If you have any questions call Mad Science at 503-230-8040.

Mad Science of Portland & Vancouver
1522 N. Ainsworth St., Portland, OR 97217

www.madscience.org/portland • www.conserveh20.org

What Do You Know about H2O?

Sponsored by the Regional Water Providers Consortium
Presented by Mad Science of Portland & Vancouver

Customer Details:

Organization: Firwood Elementary
Address: 42900 SE Trubel Road
Sandy, OR 97055
Contact: Deb Manley
Title: School Contact
Phone: 503-668-8005
Fax: 503-668-3684
Email: deb.manley@ortrail.k12.or.us
Directions: Hwy 26 toward Mt. Hood. 2 miles east of the last stoplight in Sandy, turn right on Firwood Rd. (Landmark is 'Shorty's Corner'). Turn left on Firwood School Rd (This is actually Trubel Road, but the sign says "Firwood School Road").

Event Details:

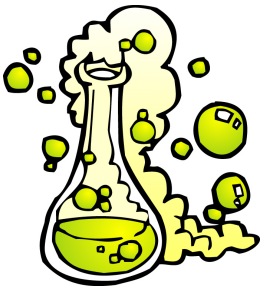
Instructor: TBD
Special Instructions:
Number of Kids Attending: 240

Event/Booth Topics	Date	Start Time	End Time	Grades/# kids
What Do You Know About H2O?	5/22/2013	1:30 PM	2:00 PM	3-5/240

Things you need to know

- Your Mad Scientist will arrive approximately 45 minutes before the event to set up.
- They will need a **banquet size table** to set-up their equipment and **access to electricity and water**.
- There is a fair amount of water required. We will need **access to a deep sink** to fill gallon bottles.
- If you have a PA system, please set it up for our Mad Scientist.
- If you have any questions call Mad Science at 503-230-8040.

Mad Science of Portland & Vancouver
1522 N. Ainsworth St., Portland, OR 97217



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Appendix G

Ordinance 13.04.220 - Regulations Pertaining to Inadequate Supply or Shortages of Water

13.04.220 Regulations pertaining to inadequate supply or shortages of water.
A. Upon determination that water consumption exceeds availability and/or water storage within the system is approaching the minimum required to meet fire protection and other essential requirements, as determined by the city manager, the city manager shall have authority to request voluntary reduction of water use by customers, including but not limited to the following specific actions:

1. Requesting patrons to limit landscape watering between the hours of 10:00 a.m. and 6:00 p.m.;

2. Requesting voluntary compliance with alternate day system for landscaping watering (i.e. even numbered addresses water on even numbered days, and odd numbered addresses on odd numbered days);

3. Requesting other voluntary measures on the part of city customers.

B. Upon determination of serious water shortages by the city council, the city council may declare an emergency restricting certain uses. Pursuant to such action the city council may impose the following measures:

1. Prohibiting landscape watering between the hours of 10:00 a.m. and 6:00 p.m.;

2. Requiring compliance with alternate day system for landscaping watering (i.e. even numbered addresses water on even numbered dates, and odd numbered addresses on odd numbered days.);

3. Restricting other outdoor uses as determined by the city council.

C. Upon determination of critical water shortages by the city council, the city council may declare an emergency prohibiting certain uses. Pursuant to such action by the city council it shall be expressly prohibited to:

1. Water, sprinkle or irrigate lawns, grass or turf unless:

a. It is new lawn, grass or turf that has been seeded or sodded after March 1st of the calendar year in which any restrictions are imposed, and in such cases it may be watered as necessary until established,

b. Lawn, grass or turf that is part of a commercial sod farm,

c. High use athletic fields that are used for organized play,

d. Golf tees and greens, and

e. Park and recreation areas deemed by the city council to be of a particular significance and value to the community that would allow exception to the prohibition;

2. Washing, wetting down, or sweeping with water, sidewalks, walkways, driveways, parking lots, open ground or other hard surfaced areas unless:

a. In the opinion of the city council there is a demonstrable need in order to meet public health, safety requirements including but not limited to alleviation of immediate fire or sanitation hazards, or 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;

3. Washing cars, trucks, trailers, tractors, or other land vehicles or boats or other water borne vehicles except by commercial establishments or fleet washing facilities which recycle or reuse the water in their washing processes or by bucket and hose with a shut-off mechanism unless the city council finds that the public health, safety and welfare is contingent upon frequent vehicle cleaning such as cleaning of solid waste transfer vehicles, vehicles that transport food and other perishables or otherwise required by law.

D. Upon determination that the restrictions and/or prohibitions permitted pursuant to this section have not reduced water consumption to the level necessary to eliminate emergency water conditions, the city council may as an additional conservation measure adopt a temporary conservation water rate schedule. The city council may do so by the passage of a resolution.

E. Any violation of the restrictions or prohibitions permitted by this section shall be enforced by the city as follows:

1. The city shall personally deliver a notice of violation to the occupant of the premises. If the occupant is not present, the city may post the same on the premises advising the user of the violation and warning the user of what specific sanctions may be imposed if the violations continue. The city shall also mail the notice of violation by regular mail to the occupant at the address of the subject premises where the violation has occurred.

2. The following penalties may be imposed if violations continue:

Second violation $100.00 Fine

Third violation $300.00 Fine

Fourth and subsequent violations $500.00 Fine
In the case of continuing violations, the city also has the authority to discontinue water service.
(Ord. 12-92 §1, 1992: Ord. 10-73 § 23, 1973.)