

# Water Management and Conservation Plan

Joint Water Commission

FEBRUARY 2021

Joint Water Commission



Hillsboro  
•  
Forest Grove  
•  
Beaverton  
•  
Tualatin Valley  
Water District



*Prepared by:*

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# Oregon

Kate Brown, Governor

## Water Resources Department

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[www.Oregon.gov/OWRD](http://www.Oregon.gov/OWRD)

February 24, 2021

Joint Water Commission  
Attn: Jessica Dorsey, Water Resources Manager  
150 E. Main St. 3<sup>rd</sup> Floor  
Hillsboro, OR 97123

Subject: Water Management and Conservation Plan

Dear Ms. Dorsey:

Enclosed; please find the final order approving your Water Management and Conservation Plan and authorizing the diversion of up to **44.0 cfs** of water under **Permit S-54737**.

The attached final order specifies that the Joint Water Commission's (JWC) plan shall remain in effect until **February 24, 2031**. Additionally, the JWC is required to submit a progress report to the Department by **February 24, 2026**, detailing progress made toward the implementation of conservation benchmarks scheduled in the plan. Finally, the JWC must submit an updated Water Management and Conservation Plan to the Department by **August 24, 2030**.

***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 JWC 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@oregon.gov](mailto:Kerri.H.Cope@oregon.gov) if you have any questions.

Sincerely,

Kerri Cope  
Water Management and Conservation Analyst  
Water Right Services Division

Enclosure

cc: WMCP File  
Application #S-69637 (Permit #S-54737)  
District 18 Watermaster, Jake Constans (via email)  
GSI Water Solutions, Inc. Attn: Suzanne De Szoek (via email)





**BEFORE THE WATER RESOURCES DEPARTMENT  
OF THE  
STATE OF OREGON**

In the Matter of the Proposed Water	)	FINAL ORDER APPROVING A
Management and Conservation Plan for	)	WATER MANAGEMENT AND
Joint Water Commission, Washington	)	CONSERVATION PLAN
County		

**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. An approved water management and conservation plan may authorize the diversion and use of water under a permit extended pursuant to OAR Chapter 690, Division 315.

**Findings of Fact**

1. The Joint Water Commission (JWC) submitted a Water Management and Conservation Plan (plan) and required statutory fee for review of the plan to the Water Resources Department (Department) on September 11, 2020. The plan was required by a condition set forth under the JWC's previously approved plan (Sp. Or. Vol. 81, Pgs. 871 – 875) issued on September 14, 2010. The JWC is made up of four member agencies, which includes the Cities of Hillsboro, Forest Grove, and Beaverton, and Tualatin Valley Water District (TVWD).
2. The Department published notice of receipt of the plan on September 22, 2020, as required under OAR Chapter 690, Division 086. No public comments were received.
3. The Department provided written comments on the plan to the JWC on November 24, 2020. In response, the JWC submitted a revised plan on January 19, 2021.
4. The Department reviewed the revised plan and finds that it contains all of the elements required under OAR 690-086-0125 and OAR 690-086-0130.
5. The projections of future water needs in the plan demonstrate a need for an additional **18.0 cfs** of water (for a total of 44.0cfs) available under **Permit S-54737** (formerly S-50879) to help meet overall projected 20-year demands. These projections are reasonable and consistent with the JWC's land use plan.

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.

6. The **City of Hillsboro's** system is fully metered and the rate structure includes a base rate and volumetric charge. Water loss is estimated at 0.7%
7. The plan includes 5-year benchmarks for continuation and/or implementation of the following benchmarks specific to the **City of Hillsboro**:
  - a. Annual Water Audits, and integration of an AWWA M36 water loss analysis into its water auditing practices; system-wide metering; a meter testing and maintenance program; a water rate structure based in part on the volume of water consumed to encourage conservation; leak detection surveys and inspections; budgeting specifically for replacement of high priority aging infrastructure; a public education program that focuses on water conservation; technical and financial assistance program; rebates to customers for replacement of high water use fixtures and/or devices and free water saving devices; actively seeking opportunities for water reuse and recycling; and continue membership in the Regional Water Providers Consortium, the Alliance for Water Efficiency, and the Conservation Committee of the Pacific Northwest Section of the AWWA.
8. The City of **Forest Grove's** system is fully metered and the rate structure includes a base rate and volumetric charge. Water loss is estimated at 15%
9. The plan includes 5-year benchmarks for continuation and/or implementation of programs specific to the **City of Forest Grove**:
  - a. Annual Water Audits; replacement of two master meters; explore switching the City to an Advanced Metering Infrastructure (AMI) system; regular meter testing and maintenance program; a water rate structure based in part on the volume of water consumed to encourage conservation; a public education program; evaluate the expansion of the current home energy audit program to include more water conservation consultation; continue a rebate program for low-water-use washing machines, dishwashers, and toilets and explore the feasibility of implementing a rebate program for weather based irrigation controllers; and continue to recycle backwash water and seek non-potable water use opportunities.
  - b. Because the City of Forest Grove's water loss is above 10%, they have set the following benchmarks:
    - i. Within two years of approval of this WMCP, the City shall provide the Department a description and analysis identifying potential factors for the water loss and selected actions for remedy.
    - ii. If the selected actions do not reduce water loss to less than 10 percent within five years of approval of the WMCP, the City will either develop and implement a regularly scheduled and systematic program to detect and repair leaks in the transmission and distribution system or develop and implement a water loss program consistent with AWWA standards.



10. The **City of Beaverton's** system is fully metered and the rate structure includes a base rate and volumetric charge. Water loss is estimated at 6.7%
11. The plan includes 5-year benchmarks for continuation and/or implementation of programs specific to the **City of Beaverton**:
  - a. Annual Water Audits; system-wide metering, and conversion of all meters to an AMI system over the next seven years; a meter testing and maintenance program; a water rate structure based in part on the volume of water consumed to encourage conservation, and continued assessment of the City's water rate structure to adequately fund the operation and maintenance of the City's water system; leak detection surveys and inspections; budgeting specifically for replacement of high priority aging infrastructure; a public education program that focuses on water conservation; a technical and financial assistance program, and exploring the possibility of a free irrigation audit program for multi-family customers; a supplier financed rebate and incentive program to replace or retrofit inefficient fixtures; continued development and testing of a stormwater capture project and a purple pipe project; and continuing to be a member of the Regional Water Provider Consortium.
12. The **TVWD's** system is fully metered and the rate structure includes a base rate and volumetric charge. Water loss is estimated at 4.4%
13. The plan includes 5-year benchmarks for continuation and/or implementation of programs specific to the **TVWD**:
  - a. Annual Water Audits; system-wide metering and installing Automatic Meter Reading in all new meter installations or as metering devices fail; continue to evaluate the use of AMI for consideration in the development of a long-term meter reading strategy; a meter testing and maintenance program; a rate structure based in part on the volume of water used that encourages conservation; regular leak detection surveys and inspections; a public education program; a technical and financial assistance program; a rebate program for replacement of inefficient fixtures, equipment, and processes; continued support for regional efforts in developing methods for water reuse; continue to facilitate and engage customer participation in water conservation efforts; continue to market the use of advanced irrigation technology in landscape irrigation and promote water efficient landscaping practices using the Water Efficient Demonstration Garden.
14. The plan identifies the surface water rights held by the JWC and its members from the Tualatin, Trask and Willamette River Basins. Ground water sources, including aquifer storage and recovery (ASR) wells, are also identified in the plan. The plan also accurately and completely describes, for each surface water source, the appropriate listed fish species and water quality limitations in the Tualatin, Trask and Willamette River Basins. It also accurately describes that several of the JWC member agency ground water rights are within the boundaries of a designated critical ground water area (CGWA), being the Cooper Mountain-Bull Mountain CGWA.

15. The water curtailment element included in the plan for the JWC and its member agencies satisfactorily promotes water curtailment practices. The water curtailment element also includes a list of four (4) stages of alert with concurrent curtailment actions for the JWC, City of Hillsboro In-Town System and City of Hillsboro Upper System, City of Forest Grove, and Tualatin Valley Water District, and a list of five (5) stages of alert with concurrent curtailment actions for the City of Beaverton.
16. The diversion of water under Permit S-54737 will be increased during the next 20 years and is consistent with OAR 690-086-0130(7), as follows:
  - a. As evidenced by the 5-year benchmarks described in Findings of Fact #7 through #13, the revised plan includes a schedule for the continuation and/or implementation of conservation measures that would provide water at a cost that is equal to or lower than the cost of other identified sources;
  - b. Considering that water savings alone from identified conservation measures cannot fully meet the JWC's water demand projections, and that the JWC's current water sources cannot adequately meet the JWC's water demand projections, access to increased diversion of water under existing Permit S-54737 is the most feasible and appropriate alternative available to the JWC.
  - c. The JWC and its member agencies are not required to provide mitigation under Permit S-54737. There are, however, conditions in Permit S-54737 requiring the maintenance of seasonal bypass flows in Scoggins Creek from Scoggins Dam to the mouth.

### **Conclusion of Law**

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

**Now, therefore, it is ORDERED:**

### **Duration of Plan Approval:**

1. The JWC Water Management and Conservation Plan is approved and shall remain in effect until **February 24, 2031** unless this approval is rescinded pursuant to OAR 690-086-0920.

### **Development Limitation:**

2. The limitation of the diversion of water under **Permit S-54737** (formerly Permit S-50879) established by the extension of time approved on September 9, 2010 and the subsequent WMCP Final Order dated September 14, 2010, is modified and, subject to other limitations or conditions of the permit, the JWC is authorized to divert up to **44.0 cfs (out of the total permitted 75.0 cfs)** under **Permit S-54737**.
3. Failure to meet the conservation benchmarks listed below may result in the reduction of the quantity of water authorized for diversion under **Permit S-54737** during review of the JWC's next plan update.
  - a. Water Loss Analysis (Finding of Fact # (9.b.i.))
  - b. Water Loss Analysis (Finding of Fact # (9.b.ii.))

**Plan Update Schedule:**

4. The JWC shall submit an updated plan meeting the requirements of OAR Chapter 690, Division 086 (effective December 23, 2018) within **10 years** and no later than **August 24, 2030**.

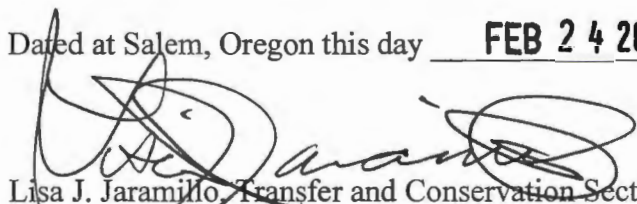
**Progress Report Schedule:**

5. The JWC shall submit a progress report containing the information required under OAR 690-086-0120(4) by **February 24, 2026**.

**Other Requirements for Plan Submittal:**

6. 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 JWC 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 day **FEB 24 2021**

  
Lisa J. Jaramillo, Transfer and Conservation Section Manager for  
THOMAS M. BYLER, DIRECTOR  
Oregon Water Resources

**FEB 25 2021**

Mailing date: \_\_\_\_\_

**Notice Regarding Service Members:** Active duty service members have a right to stay these proceedings under the federal service members Civil Relief Act. For more information, contact the Oregon State Bar at 800-452-8260, the Oregon Military Department at 503-584-3571 or the nearest United States Armed Forces Legal Assistance Office through <http://legalassistance.law.af.mil>. The Oregon Military Department does not have a toll free telephone number.



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# Executive Summary

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The Joint Water Commission (JWC) is the primary drinking water supplier in Washington County, Oregon. The JWC consists of four member agencies (the Cities of Hillsboro, Forest Grove, and Beaverton, and Tualatin Valley Water District) that have varying levels of ownership in the JWC's water supply and water infrastructure, as well as manage their individually-owned water supply and water infrastructure. This Water Management and Conservation Plan (WMCP) describes how the JWC and JWC Member Agencies manage their water supplies and encourage water conservation, as well as how they plan to meet water supply needs in the future.

The drivers for developing this WMCP include:

- Complying with Oregon Water Resources Department (OWRD) Final Order (dated September 14, 2010) approving the JWC's WMCP and requiring submittal of an updated plan by September 14, 2020;
- Complying with the conditions in the extension of time for JWC's Permit S-54737;
- Requesting access from OWRD for up to 44 cfs under JWC's Permit S-54737 to meet projected demands within the next 20 years (referred to as seeking "greenlight water"); and
- Documenting and describing the JWC and JWC Member Agencies' water stewardship and planning activities.

Criteria outlined in administrative rules under OAR Chapter 690, Division 86 must be met to receive WMCP approval from OWRD. The JWC has met each of the criteria for approval in this WMCP as outlined below.

- The WMCP includes the requirements under OAR 690-086-0125.
  - Descriptions of the water supplier, water conservation measures and 5-year water conservation benchmarks, a water curtailment plan, and projected water supply needs.
  - A list of affected local governments to whom the JWC sent its draft WMCP, as well as any comments received by the affected local governments.
  - The JWC's proposed date for submitting an updated WMCP: within 10 years of the final order approving this WMCP. As required by OAR Chapter 690, Division 86, a progress report will be submitted to OWRD within 5 years of the final order.
  - A statement that the JWC is not requesting additional time to implement metering or a previous benchmark.
- The WMCP includes projections of future water needs.
  - The JWC water supply year has two seasons, the peak season (May-October) and the non-peak season (November-April), with different demands and available sources of supply during each season. Consequently, the JWC developed two



separate demand projections: maximum day demand (MDD) projections that represent the greatest demands anticipated in the peak season and average day demand (ADD) projections that represent typical demands anticipated in the non-peak season.

- Non-peak Season:
  - The JWC's projected ADD in 2040 is 178.79 cfs (115.57 mgd), which is based on the combination of the ADDs of the individual JWC Member Agencies and wholesale customers and several other factors described in Section 5 of the WMCP.
  - The JWC only has natural flow surface water rights available in the non-peak season that allow the use of up to 119.46 cfs. To meet projected non-peak season ADD in 2040, the JWC is seeking access to 44 cfs under Permit S-54737 (referred to as "greenlight water"), which is the difference between the estimated expanded JWC Water Treatment Plant capacity of 163 cfs and the 119.46 cfs of JWC natural flow surface water rights available in the non-peak season.
- Peak Season:
  - The JWC's projected MDD in 2040 is 237.94 cfs (153.8 mgd), which is the combined total of the MDDs of the individual JWC Member Agencies and wholesale customers.
  - The JWC has 248.8 cfs (160.8 mgd) of water rights and ASR limited license authorizations that can be used and developed to meet the projected MDD in 2040.
- The JWC's demand projections are reasonable and consistent with land use plans of affected local governments, and demonstrate the need for water to be diverted during the next 20 years under Permit S-54737.
- The WMCP describes the need for additional water supply under a permit ("greenlight water").
  - This WMCP describes the JWC's need for access to up to 44 cfs of water under Permit S-54737 in the non-peak season during the next 20 years.
  - The JWC determined that water savings from additional conservation measures cannot eliminate the JWC's need for additional water supply under Permit S-54737 to meet its future demands in the non-peak season within its entire service area. In addition, existing infrastructure is capable of diverting and distributing this additional supply; therefore, conservation measures would not provide water at a cost equal to or lower than the cost of using water under the permit.
  - The JWC has water supply agreements between multiple water supply systems, exemplifying regional cooperation. JWC Member Agencies are interconnected and have cooperative water management agreements that allow a given

Member Agency to make use of another Member Agency's unused water supply. Some JWC Member Agencies (City of Hillsboro, City of Beaverton, and Tualatin Valley Water District) are also investing in development of the Willamette River as a water supply source through a partnership under the Willamette Water Supply Program. However, the JWC focused on evaluating its ability to meet the needs of its member agencies in the event their individual water supplies are not available, and in that circumstance, the JWC's interconnections and water supply agreements cannot satisfy its projected water needs. As a result, the JWC would need to rely on Permit S-54737 to meet water demands.

- The WMCP correctly describes that the JWC currently is not required to take any mitigation actions to comply with legal requirements of the Endangered Species Act, Clean Water Act, and other applicable state or federal environmental regulations.
- The WMCP includes a summary of water management and conservation measures.
  - This WMCP describes the water management and conservation programs of JWC Member Agencies, each of which include water conservation measures required under OAR 690-086-0150(4 and 5), as well as 5-year benchmarks for implementation of conservation measures. A few examples of current programs/measures are highlighted below; the full descriptions can be found in Section 3 of the WMCP.
    - The JWC has an Events and Education Committee and is a member of the Regional Water Providers Consortium, both of which conduct water conservation outreach throughout the JWC service area.
    - JWC Member Agency customers can access an extensive amount of water conservation information through a JWC website, a Regional Water Providers Consortium website, and the websites of each JWC Member Agency.
    - Each JWC Member Agency has a rebate program that encourages customers to replace inefficient water fixtures.
    - The customer water rate structures of each JWC Member Agency are based, in part, on the quantity of water consumed. Several JWC Member Agencies also have a tiered water rate structure for some of their customer categories to provide an additional economic incentive to reduce water use.
    - In addition to being fully metered, JWC Member Agencies have installed meters that improve consumption tracking, leak detection, and meter maintenance efforts. Each JWC Member Agency is utilizing Automated Meter Reading or Automated Metering Infrastructure meters to some degree.

- The WMCP describes water quality and fish resource listings.
  - Based on the surface water sources used by JWC and JWC Member Agencies, the WMCP describes water quality listings and the fish species with state or federal protections in the Tualatin River watershed, Trask River watershed, and the Willamette River (at approximately River Mile 39).
  - The WMCP correctly identifies that the City of Beaverton and TVWD's native groundwater rights for municipal water supply are within the Cooper Mountain-Bull Mountain Critical Groundwater Area.
- The WMCP includes a curtailment plan with specific triggers and actions.
  - The JWC has a water curtailment plan that consists of four curtailment stages. For each stage, the JWC describes the potential triggers (i.e. initiating conditions) and its water use curtailment actions for each curtailment stage. The JWC requires that each JWC Member Agency and wholesale customers have a curtailment plan that meets the same requirements. The individual water curtailment plans of each JWC Member Agency are included in the Appendix.

# 1. Municipal Water Supplier Plan Elements

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

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

## 1.1. Overview

The Joint Water Commission (JWC) is the primary drinking water supplier in Washington County, Oregon. The JWC is made up of four member agencies: the Cities of Hillsboro, Forest Grove, Beaverton, and the Tualatin Valley Water District (TVWD). Each member agency has individually-owned water facilities plus varying levels of ownership in the JWC and its water supply, water treatment plant, storage reservoirs, and transmission facilities.

**Water supply:** The JWC water supply comes from two surface water sources: the Tualatin River including its tributaries Sain Creek and Scoggins Creek, and the Middle Fork of the North Fork of the Trask River. In addition to diverting water directly from these sources (“direct diversion” or “natural flow”), in the summer months the JWC uses water from storage supplies in Barney Reservoir, on the Middle Fork of the North Fork of the Trask River, and Scoggins Reservoir (Hagg Lake) on Scoggins Creek, a tributary of the Tualatin River. JWC Member Agencies have their own water sources in addition to the JWC sources, which are described in this WMCP as well.

**Treatment:** The JWC diverts water from the Tualatin River through the Spring Hill Pumping Plant Intake south of Forest Grove. Water is treated at the JWC Water Treatment Plant (WTP) located at 4475 SW Fern Hill Road. Treatment at the plant consists of conventional media filtration with coagulation, flocculation, and sedimentation processes prior to filtration.

**Storage:** Finished water is stored in the Fern Hill Reservoirs, two 20-Million Gallon (MG) concrete reservoirs located approximately one-third mile east of the JWC Water Treatment Plant.

**Transmission:** After treatment, finished water is pumped from the JWC Water Treatment Plant to the Fern Hill Reservoirs or directly to the high-pressure transmission system. From the Fern Hill Reservoirs, water is conveyed via the south transmission line (STL) to the City of Hillsboro, the Tualatin Valley Water District, and the City of Beaverton. The north transmission line (NTL) provides service to the City of Hillsboro, City of North Plains, City of Cornelius, and the Tualatin Valley Water District. The NTL can be fed from the WTP’s pump stations or Fern Hill Reservoirs. A third transmission main feeds the City of Forest Grove and the City of Hillsboro’s Upper System from the WTP’s pump stations.



The JWC is also committed to water conservation and water supply emergency preparedness.

**Water Conservation:** The JWC and its member agencies implement an array of water conservation activities aimed at minimizing system water loss and reducing use by water customers. Efforts to minimize water loss include conducting annual water audits, tracking meter reads for signs of leaks, and transmission and system line repairs or replacements to address leaks. Efforts to reduce customer demand include extensive public education and outreach, providing rebates on water saving fixtures, and implementing rate structures that encourage conservation.

**Water Supply Emergency Preparedness:** The JWC and its member agencies have water curtailment plans to address water supply emergencies. The curtailment plans identify triggers for different levels of curtailment, such as drought or infrastructure failures. For each curtailment level, the curtailment plans identify actions that could be taken by the water providers, such as curtailment of water consuming activities by water providers, customer outreach efforts, and voluntary or mandatory customers' actions.

The JWC is governed by a Board of Commissioners (three commissioners from each agency) and the City of Hillsboro's Water Department Director serves as the General Manager for the JWC. The JWC has been assigned the state and federal Public Water System Identification Number 4100379.

## 1.2. History of JWC Water Management and Conservation Plans

- 1993: A Conservation Plan was prepared and adopted by members of the JWC as part of the Barney Reservoir Expansion Project. The purpose of the plan was to address the role of conservation in the resource management and planning process.
- August 1998: The JWC submitted Phase I of a Water Management Plan to the Oregon Water Resources Department (OWRD) to fulfill OWRD's requirements for JWC's Permit S-50879 for diversion of water from Scoggins Creek.
- February 8, 1999: OWRD approved several sections of the 1998 JWC Water Management Plan and granted interim approval of Section 3, Water Conservation, and Section 5, Long Range Supply Plan. OWRD requested that these sections be updated by January 31, 2003.
- 2003: The JWC submitted to the OWRD a Water Management Plan Update that superseded the measures and actions originally described in 1998 plans.
- August 17, 2004: OWRD issued a Final Order accepting the WMCP and requiring an updated WMCP by August 16, 2009.
- August 13, 2009: The JWC submitted a draft WMCP update.

- September 9, 2010: OWRD approved an extension of time for Permit S-50879, which required a WMCP before diverting any water under the permit.
- September 14, 2010: OWRD issued a Final Order approving the JWC's WMCP. The Final Order authorized the diversion of up to 26 cfs under Permit S-50879 and included the requirement that the JWC submit a WMCP progress report by September 14, 2015 containing information required under OAR-086-0120(4) and an updated WMCP by September 14, 2020.
- December 15, 2011: OWRD issued a Final Order approving a change in point of diversion on Scoggins Creek, under Permit S-50879, to the Spring Hill Pumping Plant Intake and issued superseding Permit S-54737 to describe the approved change in point of diversion. Permit S-54737 restates the requirement to submit a WMCP progress report by September 14, 2015 and a WMCP update by September 14, 2020.
- October 26, 2015: OWRD issues a letter stating that the WMCP progress report submitted by the JWC was complete.

This Water Management and Conservation Plan, 2020 replaces all previously submitted plans.

### 1.3. Plan Requirement

The Final Order dated September 14, 2010 approving the JWC's WMCP and Permit S-54737 issued by OWRD on December 15, 2011 require the JWC to submit a WMCP by September 14, 2020.

This municipal Water Management and Conservation Plan (WMCP) fulfills the requirements of the Oregon Administrative Rules adopted by the Water Resources Commission in November

2002 (OAR Chapter 690, Division 86) and amended in December 2018. It describes water management, water conservation, and curtailment programs that guide the use and stewardship of JWC's water supply.

### 1.4. Plan Organization

This WMCP is organized into the following sections, each addressing specific sections of OAR Chapter 690, Division 86:

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

**Section 2** is a self-evaluation of the JWC'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 JWC and its member agencies can improve its water conservation and water supply planning efforts.

**Section 3** reviews progress made on previous water conservation benchmarks, describes current water conservation program measures, and presents new 5-year water conservation benchmarks.

**Section 4** contains the water curtailment plan of the JWC and its member agencies, which describe potential triggers of water supply shortages, levels of curtailment, and actions to be taken for each level of curtailment.

**Section 5** describes the JWC’s population projections, demand projections, and water supply strategy to meet those projected demands. It also considers alternative water sources.

The WMCP also includes appendices with supporting information.

## 1.5. Affected Local Governments

The following local governmental agencies are considered “affected local governments” under OWRD’s WMCP administrative rules:

- City of Hillsboro
- City of Forest Grove
- City of Beaverton
- Metro
- Washington County
- Multnomah County
- City of Portland
- City of Wilsonville
- City of North Plains
- City of Gaston
- City of Cornelius
- City of Tigard
- City of Lake Oswego

Thirty days before submitting this WMCP to OWRD, the JWC made the draft WMCP available for review by each affected local government listed above, and included a request for comments relating to consistency with the local government’s comprehensive land use plan. In addition, the JWC provided courtesy copies of the draft plan to: Tualatin Valley Water District, LA Water Cooperative, and the Willamette River Water Coalition. The letters requesting comments and documentation of any comments received are in Appendix A.

## 1.6. Plan Update Schedule

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

## 1.7. Time Extension

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

## 2. Water Supplier Description

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

### 2.1. Service Area and Service Population Description

*OAR 690-086-0140 (2)E*

The JWC provided drinking water to a population of approximately 436,205 in 2019 through its four member agencies and two wholesale customers (City of North Plains and Westside Lutheran School), as shown in Exhibit 2-1. The JWC current and future water service areas and major water system features are shown in Exhibits 2-2. A detailed description of service area and service area population estimates for the JWC Member Agencies follows. The total population of the Wholesale Customers is based on the City of North Plains population estimate of 3,285 from Portland State University's Population Research Center and a population estimate of 230 from Westside Lutheran School.

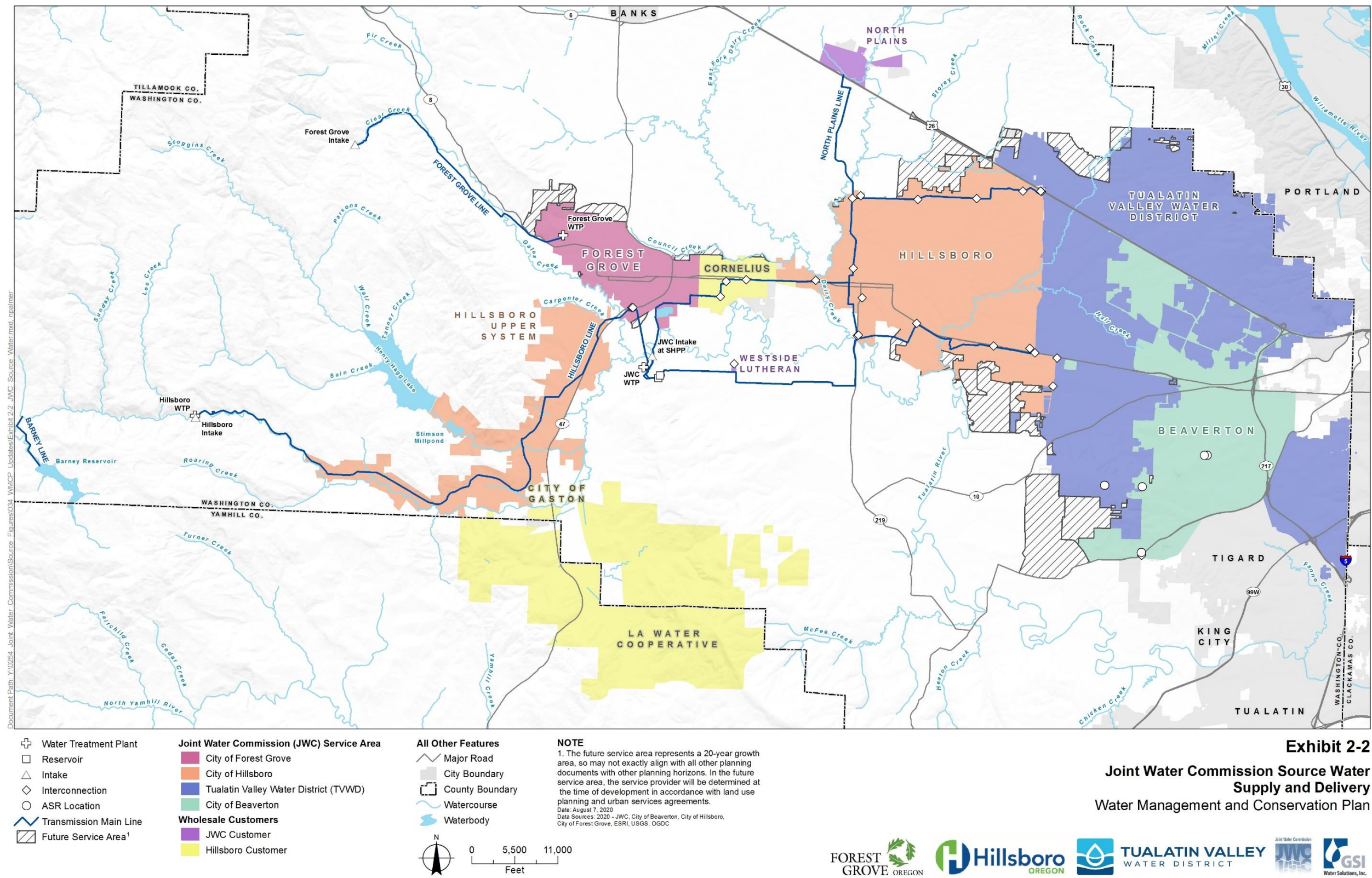
**Exhibit 2-1. Summary of Customer Connections and Total Population of JWC Member Agencies and Wholesale Customers, 2019**

JWC Member Agencies and Wholesale Customers	Total Customer Connections (2019)	Total Population Served (2019)
Hillsboro	25,509	102,692
Forest Grove	6,659	25,303
Beaverton	22,501	89,978
TVWD	60,003	214,717
Wholesale Customers	3	3,515
<b>Total</b>	<b>114,675</b>	<b>436,205</b>

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Exhibit 2-2. JWC Current and Future Service Areas and System Schematic



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## 2.1.1. Hillsboro

The City of Hillsboro’s current retail water service area consists of two areas that are geographically separated: (1) the In-Town retail service area, which includes approximately 75% of the City of Hillsboro’s urban boundary, and (2) the Upper System, which serves an unincorporated area to the southwest of the City of Forest Grove. The City of Hillsboro wholesales water to the City of Cornelius through interconnections near the In-Town area, and to the City of Gaston and LA Water Cooperative through interconnections in the Upper System. The City of Hillsboro serves its In-Town service area from the JWC WTP, and its Upper System from both the JWC and Cherry Grove WTPs. The City of Hillsboro’s remaining population, east of Cornelius Pass Road, is served by TVWD. Exhibit 2-2 shows the City of Hillsboro’s existing service area.

The 2019 service area population in the City of Hillsboro’s In-Town service area was approximately 87,929, plus 1,889 people in its Upper System (Portland State University Population Research Center). The City of Hillsboro wholesales to 2,500 people within LA Water Cooperative (as reported to the Oregon Health Authority by the LA Water Cooperative). The City of Hillsboro also wholesales water to the Cities of Cornelius and Gaston with 2019 populations of 9,719, and 655, respectively (Portland State University PRC). Summing the City of Hillsboro service and wholesale customer populations yields a total service population of 102,692. The City’s service area populations are shown in Exhibit 2-3.

**Exhibit 2-3. Hillsboro Water Service Areas and Service Area Populations, 2019**

Water Service Area	Service Area Population
Hillsboro In-Town	87,929
Hillsboro Upper System	1,889
Cornelius	9,719
Gaston	655
LA Water Cooperative	2,500
Hillsboro & Wholesale	102,692

The City of Hillsboro has eight customer categories: single family residential, multi-family residential, commercial, industrial, public entity, non-profit, irrigation, and wholesale customer categories. These customer classes were established in October 2006. Exhibit 2-4 shows the number of accounts by customer category in 2019.

**Exhibit 2-4. Hillsboro Accounts by Customer Category, 2019**

<b>Customer Category</b>	<b>Number of Accounts (2019)</b>	<b>Percent</b>
Single Family	23,616	92.56%
Commercial	877	3.44%
Irrigation	460	1.80%
Multi-Family	271	1.06%
Public	119	0.47%
Industrial	84	0.33%
Non-Profit	82	0.32%
Wholesale	4	0.02%
<b>Total</b>	<b>25,513</b>	<b>100%</b>

## 2.1.2. Forest Grove

The City of Forest Grove, the smallest of the JWC member agencies, is home to Pacific University. Forest Grove's diverse economic base includes high tech, food and beverage processing, wood products, metalworking, education, and healthcare. The City of Forest Grove's service area is the area within its city limits plus 57 connections outside of the city limits in the Urban Growth Boundary along Gales Creek, Stringtown Road, and Oppenlander Lane, as depicted in Exhibit 2-2. The City of Forest Grove's estimated 2019 water service area population was 25,303, according to Portland State University's PRC. The City of Forest Grove has six customer categories: residential, commercial, school, multi-family, city, and industrial users. Exhibit 2-5 shows the number of customer connections for each of these six customer categories in 2019.

**Exhibit 2-5. City of Forest Grove Water Connections by Customer Category, 2019**

<b>Customer Category</b>	<b>Number of Accounts (2019)</b>	<b>Percent</b>
Residential	6,061	90.30%
Commercial	368	5.48%
School	42	0.63%
City	43	0.64%
Multi-Family	177	2.64%
Industrial	21	0.31%
<b>Total</b>	<b>6,712</b>	<b>100.00%</b>



## 2.1.3. Beaverton

The City of Beaverton's water service area is generally bounded on the east by Highway 217, on the north by the Oregon 8 Tualatin Valley Highway (TV Hwy), on the west by SW 160th Avenue, and on the south by SW Scholls Ferry Road, beyond which is the City of Tigard. The City of Beaverton's service area also includes the developing South Cooper Mountain area on the north side of SW Scholls Ferry Road from SW Loon Drive west to SW Tile Flat Road. The remaining portions of the City are served by neighboring water providers, including TVWD to the north, west, and east, and West Slope Water District and Raleigh Water District (RWD) to the northeast. Exhibit 2-2 depicts the City of Beaverton's existing service area.

The City of Beaverton's estimated 2019 water service area population was 89,743, according to Portland State University PRC. Only a portion of the City of Beaverton's population receives water provided by the City. The City of Beaverton has seven customer categories: apartment, commercial, fire line, irrigation, multi-family, public, and residential. The apartment category is defined as accounts that have greater than four units and the multi-family categories defined as accounts that have four units or fewer. Exhibit 2-6 shows the number of connections by customer category in Fiscal Year 2018/2019.

**Exhibit 2-6. Beaverton Water Connections by Customer Category, Fiscal Year 2018/2019**

Category	Number of Accounts	Percent
Residential	18,872	83.87%
Multi-Family	1,382	6.14%
Commercial	1,102	4.90%
Public Facility	98	0.44%
Irrigation and Fire	1,047	4.65%
<b>Total</b>	<b>22,501</b>	<b>100.00%</b>

## 2.1.4. Tualatin Valley Water District

TVWD provides services to an area of more than 45 square miles. TVWD serves portions of the cities of Beaverton, Hillsboro, Portland, and Tigard. TVWD also serves a portion of Washington County, including the unincorporated communities of Cedar Hills, Bethany, Rock Creek, Cooper Mountain, Progress, Metzger, and Aloha, as well as a small portion of Multnomah County. Exhibit 2-2 shows the TVWD's existing service area.

TVWD's water service area population was 214,717 in 2019, according to Portland State University PRC. TVWD has eight customer categories: single family residential, multi-family residential, commercial, industrial, public entity, irrigation, temporary irrigation (previously included within the irrigation category in the 2010 JWC WMCP), and wholesale customer categories. Exhibit 2-7 shows the number of accounts by customer category.

**Exhibit 2-7. TVWD Water Accounts by Customer Category, 2019**

<b>Customer Category</b>	<b>Number of Accounts (2019)</b>	<b>Percent</b>
Residential	55,682	92.80%
Multi-Family Residential	1,075	1.79%
Commercial	1,381	2.30%
Production	25	0.04%
Fireline	808	1.35%
Irrigation	975	1.62%
Temp Irrigation	40	0.07%
Wholesale	17	0.03%
<b>Total</b>	<b>60,003</b>	<b>100.00%</b>

## 2.2. Interconnections with Other Systems

OAR 690-086-0140(7)

As shown on Exhibits 2-3 through 2-7, multiple interconnections exist between JWC transmission lines and JWC member agencies, between JWC transmission lines and small water providers, between JWC member agencies themselves, and between JWC member agencies and neighboring communities. Exhibit 2-8 provides a summary of the interconnections between systems.

**Exhibit 2-8. Summary of Interconnections for JWC Members and Wholesale Customers**

Agency	Metered or Un-metered	Hillsboro	Forest Grove	Beaverton	TVWD	JWC	PWB	Cornelius	North Plains	West Side Lutheran	Other <sup>2</sup>	Total	Overall Total
Hillsboro <sup>1</sup>	M		0	0	0	17	0	4	0	0	3	24	33
	U		0	0	8	0	0	0	0	0	1	9	
Forest Grove	M	0		0	0	1	0	0	0	0	0	1	2
	U	0		0	0	0	0	1	0	0	0	1	
Beaverton	M	0	0		4	1	1	0	0	0	0	6	26
	U	0	0		17	0	0	0	0	0	3	20	
TVWD	M	0	0	4		0	4	0	0	0	4	12	55
	U	8	0	17		2	9	0	0	0	7	43	
JWC	M	17	1	1	2		0	4	1	1	0	27	27
	U	0	0	0	0		0	0	0	1	0	0	

### Notes

<sup>1</sup>Total includes Hillsboro In-Town and Hillsboro Upper System Service Areas

<sup>2</sup>Connections to City of Tigard, City of Gaston, and LA Water Cooperative included in "Other" category

The Portland Water Bureau (PWB) provides reliable supplies to TVWD, and will have the ability to supply emergency water to JWC partners through the North Transmission Line (NTL). PWB obtains its water from the Bull Run Watershed, with a seasonal and emergency water supply from the Columbia South Shore Wellfield.

Wholesale customers only receive water from the JWC and JWC Member Agencies, so do not provide water supply.

### **2.2.1. JWC Interconnections**

The JWC serves Hillsboro (Upper System and In-Town System), Forest Grove, Beaverton, TVWD, and wholesale customers through a total of 27 interconnections along JWC transmission lines. The City of Cornelius has 4 interconnections along the JWC transmission line, Westside Lutheran School has 2 interconnections, and the City of North Plains has one interconnection. All of these interconnections are metered except for one unmetered fire connection at Westside Lutheran School.

The JWC recently installed a connection with a new Willamette Water Supply Program (WWSP) transmission line, the South Transmission Line (STL), that is not yet in service. When the WWSP is fully operational, this intertie will allow for emergency supply provisions between the two agencies. A second of these connections is also planned.

### **2.2.2. Hillsboro Interconnections**

The City of Hillsboro's Upper System transmission line has one metered interconnection with the City of Gaston, one metered interconnection with the LA Water Cooperative, and one metered interconnection with the JWC supply system. If the Cherry Grove WTP was impacted, a majority of the Upper System can be fed with adequate pressure by the JWC WTP. The Upper System's Cherry Grove WTP cannot currently serve the In-Town System.

The City of Hillsboro's In-Town System has interconnections with the JWC supply system and the TVWD service area. The City of Hillsboro has 17 master meter locations connecting to JWC transmission lines. The City of Hillsboro serves the City of Cornelius water via a JWC transmission line and currently water can only be conveyed one-way to the City of Cornelius. Eight unmetered emergency interties with TVWD are located on the boundary between the two systems. In the South Hillsboro development, one metered connection provides water from TVWD to Hillsboro and a second is planned. These connections are being established to serve the South Hillsboro development as the WWSP and Hillsboro distribution system improvements are completed. They will remain in place as emergency connections after those projects are complete.

### **2.2.3. Forest Grove Interconnections**

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

### **2.2.4. Beaverton Interconnections**

Beaverton has distribution system interties with three adjacent water providers: TVWD, PWB, and City of Tigard.

The City is connected to PWB's Burlingame system at SW 60th Avenue; this connection is inactive. Beaverton has three emergency distribution system interties with the City of Tigard:

near SW Springwood Drive, SW 135th Avenue, and SW Barrows Road. The SW 135th Avenue connections can supply flow in either direction between the two cities. The SW Springwood Drive connection allows Tigard to supply water to Beaverton under emergency conditions. The intertie at SW Barrows Road can convey water to Tigard.

The City has several interties with TVWD, the majority of which are along the City's western water service area boundary where it adjoins TVWD's boundary. All current interties with TVWD are inactive.

### **2.2.5. TVWD Interconnections**

TVWD has 55 interconnections, four of which provide the district with its primary water supply. TVWD has two interconnections with the JWC, which are located along the western boundary of its service area: the South Transmission Line entering near Tualatin Valley Highway and 75th Avenue, and the North Transmission Line entering near Cornelius Pass Road and Highway 26. TVWD has interconnections with PWB via the Washington County Supply Line (a transmission line that supplies several PWB wholesale customers in Washington County) and via an intertie with a transmission main that runs along Oleson Road and enters the distribution system at Florence Lane and 80th. Another connection (Garden Home) to the PWB system provides water supply to approximately 170 homes. TVWD has additional backup interconnections with PWB, and emergency interconnections with the Cities of Hillsboro, Beaverton, and Tigard, West Slope Water District, and Raleigh Water District.

## **2.3. Intergovernmental Agreements**

*OAR 690-086-0140(1)*

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

Under some of these agreements, the JWC member agency ownership shares of the 85 mgd capacity of the JWC WTP (this is the new capacity after the 10 mgd WTP expansion was completed in 2019) are currently as follows: City of Hillsboro 41.75 mgd (52.21 cfs), City of Beaverton 18.75 mgd (29.01 cfs), TVWD 14.5 mgd (19.34 cfs), and City of Forest Grove 10 mgd (15.47 cfs).



## 2.4. Water Sources

*OAR 690-086-0140(1 & 2)*

### 2.4.1. JWC Sources

The JWC water supply comes from two surface water sources: the Tualatin River including its tributaries Sain Creek and Scoggins Creek, and the Middle Fork of the North Fork of the Trask River. The JWC only diverts water directly from the “live” or natural flow of the Tualatin River during the non-peak season given that the JWC is regulated off most of its natural flow water right permits during the peak season by the Oregon Water Resources Department. (The JWC defines peak season as the six month period from May 1 through October 31 and non-peak season as the remaining six months of the year.) When this happens, JWC releases water from storage supplies in Barney Reservoir, on the Middle Fork of the North Fork of the Trask River, and Scoggins Reservoir (Hagg Lake) on Scoggins Creek, a tributary of the Tualatin River. The JWC also holds an Aquifer Storage and Recovery (ASR) Limited License (LL-019), but no wells have reached full production status to date.

#### Tualatin River

JWC’s main natural flow source is the Tualatin River and its tributaries. The JWC’s drinking water source area in the Tualatin River Basin encompasses approximately 220 square miles. The valley is surrounded to the north and east by the Tualatin Mountains, to the south by Chehalem and Parrett Mountains, and to the west by the Coast Range where the Tualatin River headwaters are located.

The JWC obtains water from the Tualatin River through the Spring Hill Intake and Pumping Plant (SHPP) at River Mile (RM) 56.3, south of Forest Grove. Water is treated at the JWC Water Treatment Plant (WTP) located at 4475 SW Fern Hill Road southwest of the intake. The JWC WTP has a rated peak capacity of 85 mgd and treatment consists of conventional media filtration with coagulation, flocculation, and sedimentation processes prior to filtration. Finished water from the JWC WTP is pumped via high pressure transmission lines directly to Forest Grove’s or Hillsboro’s distribution systems (The City of Beaverton and TVWD receive JWC water supply through interconnections with the JWC transmission line), or to the JWC-owned Fern Hill Reservoirs, two 20-million-gallon (MG) concrete reservoirs located on a hill approximately one-third mile east of the WTP. The first reservoir has been in operation since 1983, and the second came online in 2006. The location of the SHPP, JWC WTP, and two finished water reservoirs are shown on Exhibit 2-2.

The SHPP is shared with the Tualatin Valley Irrigation District and owned by the U.S. Bureau of Reclamation. The intake has traveling screens and strainers to prevent debris and wildlife from entering the pump well.

## Barney Reservoir

The Trask River watershed is approximately 175 square miles. However, the sub-watershed from which JWC diverts and stores water, the Middle Fork of the North Fork of the Trask River, is approximately 13.2 square miles. As presented in Exhibit 2-9, Barney Reservoir is owned jointly by: TVWD (35 percent), City of Hillsboro (31 percent), City of Beaverton (21.5 percent), Clean Water Services (10 percent), and the City of Forest Grove (2.5 percent). These entities make up the Barney Reservoir Joint Ownership Commission with the City of Hillsboro serving as the managing agency. The Barney Reservoir is formed by the 120-ft, rock-fill, Eldon S. Mills Dam. Its storage capacity is 20,000 acre-feet. Of the annual storage or fill capacity, 15 percent is reserved by the Oregon Department of Fish and Wildlife for releases to the Trask River during the low flow (peak demand) season, 460 acre-feet remain in the dead pool, and the remainder of the storage is divided between owners by the ownership percentages presented above. During the storage release season, a 36-inch pipeline that is 6,500 feet in length diverts water across a narrow Coast Range divide from the Trask River Watershed into the headwaters of the Tualatin River at RM 78. Because of the travel time from Barney Reservoir to the SHPP Intake, water released from the reservoir is available for diversion at the intake in approximately 24 hours during the low flow (peak) season. The location of Barney Reservoir is shown on Exhibit 2-2.

### Exhibit 2-9. Barney Reservoir Storage by Agency

Agency	Reservoir Ownership	Water Allocation	Storage at Full Capacity (ac-ft)
<b>Hillsboro</b>	31%	26%	5,127
<b>Beaverton</b>	21.5%	18%	3,556
<b>TVWD</b>	35%	29%	5,789
<b>Forest Grove</b>	2.5%	2%	414 <sup>1</sup>
<b>JWC Partner Sub-Total</b>	<b>90%</b>	<b>75%</b>	<b>14,886</b>
<b>Clean Water Services</b>	10%	8%	1,654
<b>ODFW</b>	0%	15%	3,000
<b>Dead Pool</b>	-	2%	460
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>20,000</b>

#### Note

<sup>1</sup>Forest Grove also has an 800 acre-foot buy back option not reflected in this storage capacity

## **Scoggins Reservoir**

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

## **Aquifer Storage and Recovery**

TVWD and the Cities of Hillsboro and Beaverton are parties to a JWC-held Aquifer Storage and Recovery (ASR) Limited License (LL-019), but no wells have reached full production status to date (ASR No. 6 and ASR No. 7 are also identified in LL-019). Each water provider has access to one-third the capacity of the JWC limited license. The City of Beaverton and TVWD currently have infrastructure to supply the Cooper Mountain area using ASR No. 6 and ASR No. 7, but the City of Hillsboro has not yet developed infrastructure for the use of ASR.

### **2.4.2. Non-JWC Water Sources**

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

#### **Hillsboro**

The City of Hillsboro serves its Upper System, the City of Gaston, and LA Water Cooperative with water from the Tualatin River, which is diverted at the Haines Falls Intake located at RM 73.2. This water is treated at the Cherry Grove WTP, which is a slow sand filter plant with a maximum capacity of 3 mgd (4.6 cfs).

The City of Hillsboro recently acquired a 56 cfs portion of water use permit S-55045 from the City of Salem. This permit authorizes the use of water from the Willamette River for municipal purposes year-round. A water treatment plant, transmission lines, and associated infrastructure are currently under construction and scheduled for completion in 2026.

The City of Hillsboro also recently acquired ASR Limited License LL-0274 storage and recovery of water using up to three wells (Crandall Reservoir, Butternut Creek, and Wood Street), which are not yet constructed. The City of Hillsboro plans to use JWC supply in the winter months to recharge the ASR system and to withdraw the water in summer months. The City of Hillsboro may divert up to 3,825 gallons per minute and may store up to 900 MG. The maximum injection

rate is 1,275 gallons per minute per well in the maximum recovery rate is 1,725 gallons per minute per well.

The City has numerous non-municipal water rights for use of water from such sources as the Tualatin River, McKay Creek and tributaries, Glencoe Swale, Beaverton Creek, Bronson Creek, Rock Creek and tributaries, Dairy Creek, a tributary to Jackson Slough, Sain Creek, a pond, wastewater effluent, and wells. The uses under these water rights include irrigation, supplemental irrigation, multi-purpose storage, wetlands creation enhancement, wildlife, hydroelectric production, nursery operations, fish culture, aesthetics, storage of wastewater, and instream use. These water rights are not used to meet the City's potable water supply needs; they are not withdrawn for treatment and are not put into the transmission or distribution systems.

## **Forest Grove**

The City of Forest Grove supplements its JWC-supplied water with water from the City-owned Clear Creek Watershed. Forest Grove has intake facilities within the Clear Creek Watershed on Clear Creek, Roaring Creek, Thomas Creek, Deep Creek and Smith Creek. Forest Grove's water rights within this basin total 7.26 cfs (4.69 mgd). Water receives conventional, media-filtration treatment at the Forest Grove WTP located at Watercrest Road on Buxton Hill. During the summer, the supply is limited by the low flows in the creeks and can drop to as low as approximately 1.5 mgd, as measured by the raw water flow meter at the WTP.

## **Beaverton**

The City of Beaverton owns and operates two native groundwater wells and two active ASR wells (ASR No. 2 and ASR No. 4), which store and recover water under the City of Beaverton and TVWD's jointly held ASR LL-02. Beaverton uses JWC supply in the winter months to recharge the ASR system, and this water is withdrawn in the summer months along with native groundwater to help meet peak demand.

ASR No. 2 is located at the Sorrento Water Works site and ASR No. 4 is located at SW Hanson Road and 135th across the street from the Sorrento Water Works site. The two ASR wells have a maximum combined capacity of approximately 5.0 mgd. They are generally operated daily during the summer season at a rate of approximately 700 gallons per minute (gpm) each, with a total daily supply contribution of approximately 2.0 mgd. The optimal operating point for the well pumps is 700 gpm (1.0 mgd) and the total 2.0 mgd output from this flow rate generally meets peak summer demands in excess of supply from JWC.

ASR No. 1 (referred to historically as "Well #2" or the "Hanson Road well") is located at the Sorrento Water Works site and recently was taken out of service and converted to a monitoring well. ASR No. 3 is located north of the intersection of SW Loon Drive and Scholls Ferry Road in the South Cooper Mountain (SCM) area and was taken out of service because of low yields and relatively high iron and manganese concentrations in the water.

Beaverton is scheduled to develop three new ASR wells (ASR No. 3A, ASR No. 5, and ASR No. 7) within the next five years. ASR No. 3 is located in South Cooper Mountain area and will be used primarily for irrigation demands to offset potable water demands. ASR No. 5 is located at the Sorrento Water Works site near ASR No. 1. Completion of this well along with new buildings and other improvements at the Sorrento site are currently in the design phase. ASR No. 7 is located at the Cooper Mountain Reservoir site west of the Beaverton's existing service area. ASR No. 6 is located in a residential area at 9460/9450 SW 166th Avenue, and is planned to be developed in the future by 2030. All of the ASR wells described above currently operate or would operate under the ASR limited license held by Beaverton and TVWD (LL-002).

Beaverton also owns a groundwater well (Well No. 1) located northeast of the Beaverton service area boundary within the limits of the West Slope Water District (WSWD). Well No. 1 was one of the original wells in the City's groundwater right, but it is currently inactive.

Finally, Beaverton is authorized to use up to 33.7cfs (21.8 mgd) of water from the Willamette River for municipal purposes under Permit S-54940.

## **TVWD**

TVWD currently obtains water from one active ASR well (Grabhorn) under the City of Beaverton and TVWD's jointly held limited license, ASR LL-02, which is described in greater detail above. TVWD also purchases wholesale water from the City of Portland, as administered by the Portland Water Bureau (PWB).

The PWB source of supply comes from the Bull Run Watershed and the Columbia South Shore Well Field (CSSWF). TVWD receives water from the PWB by gravity primarily via the Washington County Supply Line (WCSL). TVWD owns approximately 42.3 million gallons per day (mgd) of capacity in the WCSL. The WCSL splits near the intersection of Beaverton-Hillsdale Highway and Scholls Ferry Road to serve two portions of its service area (metered at the main Portland-TVWD intertie and at the Florence Lane and 80th interconnection). In addition, two small portions of TVWD's service area are supplied water through interconnections from the PWB (Garden Home and Thompson meters) to provide water to a pressure zones that sits at a higher elevations than the surrounding areas and cannot be served by the existing hydraulic grade lines of the distribution system.

TVWD is also the managing agency and member of the Willamette River Water Coalition, which holds a water use permit for the use of water from the Willamette River for municipal and industrial purposes. TVWD intends to replace its PWB water supply with its Willamette River water supply in 2026, when construction of the Willamette Water Supply System is complete. TVWD is prepared to use its groundwater rights for emergency back-up water supply, as well.



## 2.5. System Description

*OAR 690-086-0140(8)*

### 2.5.1. JWC Facilities

As described in the Water Sources section above, the JWC has contracted water in Scoggins Reservoir, uses the SHPP, and owns the JWC WTP and two finished water reservoirs. These facilities are shown on Exhibit 2-2.

In addition, the JWC owns a transmission system that includes transmission lines, meters, and pressure reducing valves. Finished water is distributed to member agencies through the transmission lines shown on Exhibit 2-2, and described below:

- 36 and 42-inch lines from SHPP Intake to the JWC WTP (raw water)
- 24-inch line from the JWC WTP to Forest Grove and Hillsboro's Upper System
- 42- and 72-inch lines from the JWC WTP to Fern Hill Reservoirs
- 45-inch line from the Fern Hill Reservoirs to Hillsboro (South Transmission Line)
- 42-inch line from Hillsboro to Beaverton (South Transmission Line)
- 72-inch line from the JWC WTP to Hillsboro (North Transmission Line)
- 66-inch line from Hillsboro to TVWD (North Transmission Line)
- 42-inch line located near Hillsboro's western border (North-South Intertie)<sup>1</sup>

Exhibit 2-10 presents an inventory of JWC-owned transmission lines by diameter. The transmission system is primarily constructed with concrete cylinder pipe (95.9 percent), of diameters 42-inches and greater. The remainder of the system is ductile iron (3.8 percent) and cast iron (0.3 percent). Exhibit 2-11 summarizes the relative age of the transmission lines by pipe size. The JWC was established in 1976. The age of the system varies from approximately 30 years (46 percent) to less than 10 years (1.25 percent). Exhibit 2-12 is an inventory of JWC master meters and pressure reducing valves.

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<sup>1</sup> The North-South Intertie is part of the North Transmission Line

**Exhibit 2-10. JWC Transmission Line Inventory By Pipe Diameter**

<b>Diameter</b>	<b>Length (ft)</b>	<b>Length (mi)</b>	<b>Percentage</b>
24-inch	10,843	2.10	7%
30-inch	103	0.02	0%
36-inch	2,510	0.48	2%
42-inch	34,488	6.50	22%
45-inch	37,543	7.10	24%
54-inch	1,103	0.20	1%
66-inch	25,239	4.80	16%
72-inch	47,709	9.00	30%
<b>Total</b>	<b>159,538</b>	<b>30.19</b>	<b>100%</b>

**Exhibit 2-11. JWC Transmission System By Decade of Installation**

<b>Date Installed</b>	<b>Percentage of System</b>
2010-2019	1.25%
2000-2009	22.24%
1990-1999	30.10%
1980-1989	0.00%
1970-1979	46.40%
<b>Total</b>	<b>100.00%</b>

**Exhibit 2-12. JWC Master Meter and Pressure Reducing Valve Inventory**

Meter Vault Locations	Customer	PRV Size (inch)	Meter Size (inch)	Meter Type
<b>45"/42" South Transmission Line</b>				
S 1 <sup>st</sup> Ave & Maple	Hillsboro	8"	8"	Magnetic
TV Hwy & Minter Bridge	Hillsboro	8"	4" 8"	Magnetic
TV Hwy & Imlay (south vault)	Hillsboro	10"	10"	Magnetic
TV Hwy & Imlay (north vault)	Hillsboro	10"	10"	Magnetic
TV Hwy & 75th Ave	TVWD	4"	12"	Magnetic
TV Hwy & Cornelius Pass	Beaverton	N/A	36"	Magnetic
Jackson Bottom	Hillsboro	N/A	1.5"	AMR
Clean Water Services	Hillsboro	N/A	2"	AMR
TV Hwy & Cornelius Pass	WWSS			
<b>72"/66" North Transmission Line</b>				
10th & Heather	Cornelius	8"	8"	Magnetic
12th & Baseline	Cornelius	6"	6"	Magnetic
17th & Baseline	Cornelius	6"	6"	Magnetic
Valley View on TV Hwy	Hillsboro	3"	3"	Magnetic
	Cornelius	6"	6"	Magnetic
TV Hwy west of Dairy Creek	Cornelius	6"	3"	Magnetic
	Hillsboro			
Connell & Jackson	Hillsboro	3"	3"	Magnetic
Crandall Reservoir	Hillsboro	10"	18"	Magnetic
Glencoe & Evergreen	Hillsboro	6"	12"	Magnetic
Glencoe & Evergreen	North Plains	N/A	10"	Magnetic
25 <sup>th</sup> & Evergreen	Hillsboro		18"	Magnetic
Evergreen Reservoir	Hillsboro		12"	
Shute & Evergreen (aka Dawson Creek)	Hillsboro	6"	18"	Magnetic
229th & Bennet	Hillsboro	10"	24"	Magnetic
Cornelius Pass & Hwy 26	TVWD	N/A	10"	Magnetic
Cornelius Pass & Hwy 26	TVWD	N/A	20"	Magnetic
<b>24" Dilley/Forest Grove Line</b>				
Elm St. & Hwy 47 Bypass (aka Dilley)	Hillsboro	8"	8"	Magnetic
	Forest Grove	24"	24"	Sonic

## 2.5.2. Non-JWC Distribution System Facilities

In addition to the facilities described in the Non-JWC Water Sources section above, JWC member agencies have non-JWC finished water storage facilities and distribution systems. Exhibit 2-13 summarizes non-JWC finished water storage facilities.

**Exhibit 2-13. Non-JWC Finished Water Storage Facilities**

Agency	Number of Reservoirs	Total Reservoir Storage Capacity (MG)	Aquifer Storage Capacity (MG)
Hillsboro	4	31.9	0
Forest Grove	2	6	0
Beaverton	4	27.25	750
TVWD	23	67.35	750
<b>Total</b>	<b>31</b>	<b>132.5</b>	<b>1,500</b>

Exhibits 2-14 summarizes member agency distribution system inventories by length. The total length of the distribution systems in JWC's partner agencies is approximately 1,322 miles. TVWD accounts for approximately 48 percent of this length with 631 miles of pipeline. Forest Grove has the smallest distribution system of the JWC member agencies with 91 miles of pipeline.

**Exhibit 2-14. Non-JWC Distribution System Inventory: Length By Diameter**

JWC Member Agency	<=6 (in)	8 to 14 (in)	16 to 42 (in)	>42 (in)	Unknown	Total (ft)	Total (mi)
Hillsboro	464,218	963,547	242,035	7,920	106	1,677,826	305.5
Beaverton	483,648	882,288	119,328	0	0	1,485,264	281
Forest Grove	210,619	260,093	2,482	9,715	0	482,909	91
TVWD	1,409,760	2,048,640	443,520	63,360	0	3,970,560	752
<b>Total</b>						<b>7,616,559</b>	<b>1,124</b>

## 2.6. Records of Water Use

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

### 2.6.1. Terminology

Demand (i.e., production) refers to the quantity of water delivered to a distribution system from a water treatment plant, wholesale supplier, native ground water well, or an ASR well. Water supplied to an ASR system is not included in demand given that counting water from an ASR system as demand and water delivered to an ASR system as demand results in counting the same water twice. Demand includes metered consumption (for example, residential, commercial, industrial, public, and irrigation customers<sup>2</sup>), un-metered public uses (firefighting, hydrant flushing, other), and water lost to leakage, reservoir overflow, and evaporation. Consumption is equal to the metered water use. Demand minus consumption equals water loss. Water loss is equal to the sum of un-metered uses (hydrant flushing, for example), leakage, overflows, evaporation, and inaccuracies of measurement at the production or customer meters. JWC defines its peak season as the six-month period from May through October. To evaluate seasonal use, summer season is defined as the four consecutive months of highest monthly demand or consumption. In general, this corresponds to the months of June through September for demand data, and July through October for billed consumption data. The offset in summer season for the two data sets results from differences in the timing of demand meter and customer meter reading.

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, it is typical to refer to the total quantity of water in million gallons (MG). Water use per person (per capita use) is expressed in gallons per capita per day (gpcd). The following terms are used to describe specific values of demands:

- **Average day demand (ADD)** equals the total annual demand divided by 365 days.
- **Maximum day demand (MDD)** equals the highest demand that occurs on any single day during a calendar year. It is also called the one-day MDD or peak day demand. MDD for the JWC system is calculated using the system demand on the JWC water treatment plant and Fernhill Reservoirs. MDD for each water provider is estimated based on metered customer use, demand from all sources, and relevant peaking factors.
- **Monthly demand** refers to demand during a calendar month. This demand can be expressed as the total volume of water produced in a month, or as a daily demand value by dividing the total monthly volume by the number of days in the month.

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<sup>2</sup> Each JWC member agency defines its own customer categories.

- **Maximum monthly demand (MMD)** equals the highest monthly demand during a calendar year.
- **Peaking factors** are the ratios of one demand value to another. The most common and important peaking factors are the ratio of the MDD to the ADD.

## 2.7. Historical Water Demands

The information presented in the following sections builds upon historical water demand information reported in the JWC's previous 2010 WMCP in order to provide better context and understanding of long-term trends. Data are provided through 2019 for the JWC and JWC Member Agencies except for the City of Beaverton, which has monthly data provided only through December 2018 and the following through Fiscal Year 2018/2019: ADD, MDD, and annual demand; this is the result of the City following a fiscal year data verification schedule.

### 2.7.1. JWC Annual Demand

Exhibit 2-15 depicts ADD from all sources of water for all JWC Member Agencies and wholesale customers<sup>3</sup> from 2008 through 2019. ADD ranged from 42 mgd to 54 mgd and averaged 47 mgd from 2008 through 2018 for all JWC Member Agencies and wholesale customers. The water supplier with the greatest average ADD was TVWD (21 mgd), followed by the City of Hillsboro (17 mgd).

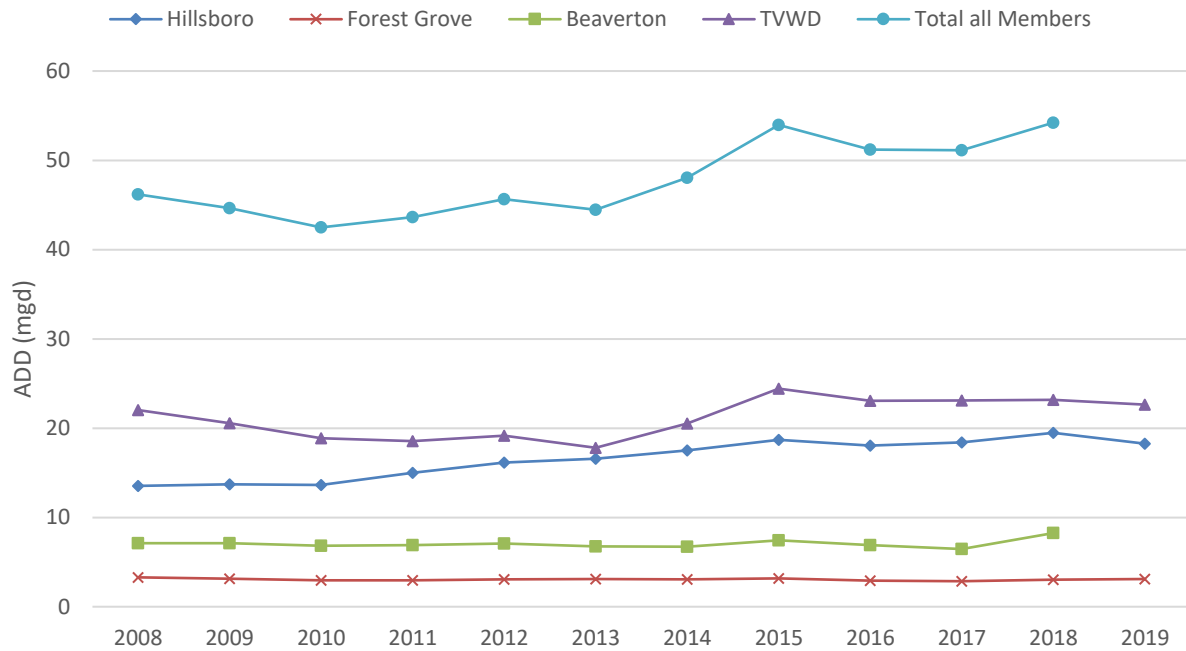
Exhibit 2-16 depicts ADD for JWC supplied water from 2008 through 2019. The JWC was able to provide 2019 data for the City of Beaverton. ADD for JWC supplied water ranged from 26 mgd to 36 mgd, with an average of 31 mgd for the 12 year period. Exhibit 2-17 depicts the 2017 ADD of JWC supplied water amongst JWC Member Agencies and wholesale customers.

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<sup>3</sup> For simplicity, JWC wholesale customer demands are not shown individually, but are included in the total demand curve shown on Exhibits 2-, 16, 2-18, and 2-19. MDD values were not determined for these customers.

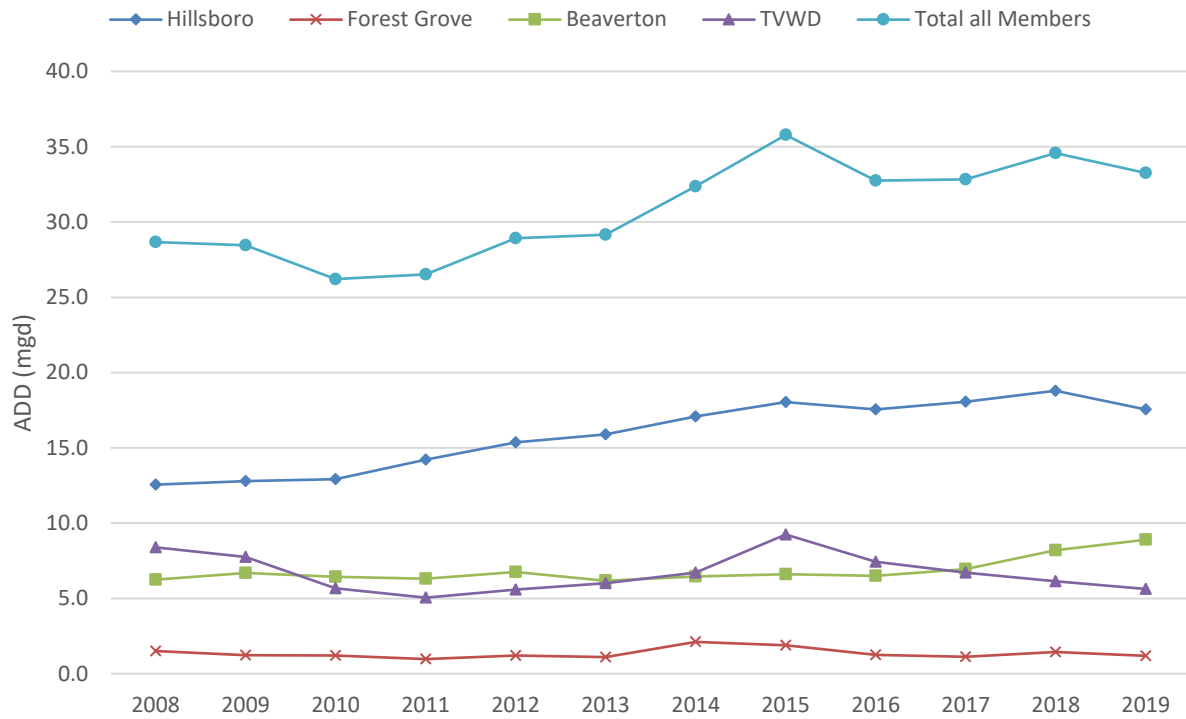


**Exhibit 2-15. Average Day Demand From all Sources for JWC Members, 2008-2019<sup>4</sup>**



<sup>4</sup> The City of Beaverton's fiscal year data are aligned with the calendar year in which the fiscal year began. FY 2019/2020 data for the City of Beaverton were not available.

**Exhibit 2-16. Average Day Demand from JWC WTP for JWC Members, 2008-2019**



**Exhibit 2-17. JWC Member Agency and Wholesale Customer Portions of JWC ADD (mgd) of JWC-supplied Water, 2019**

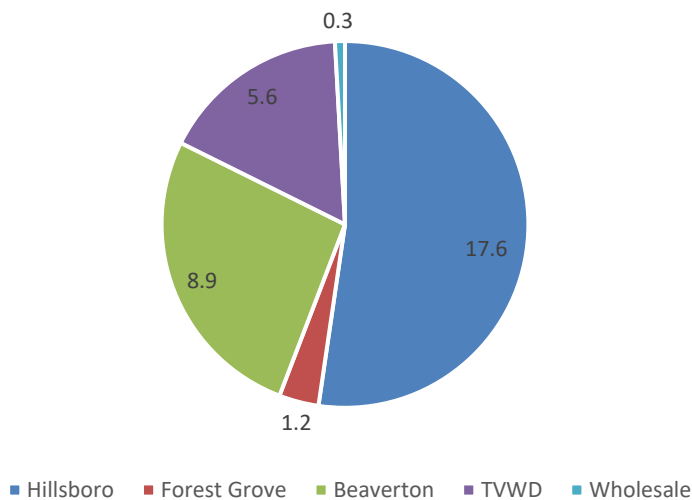
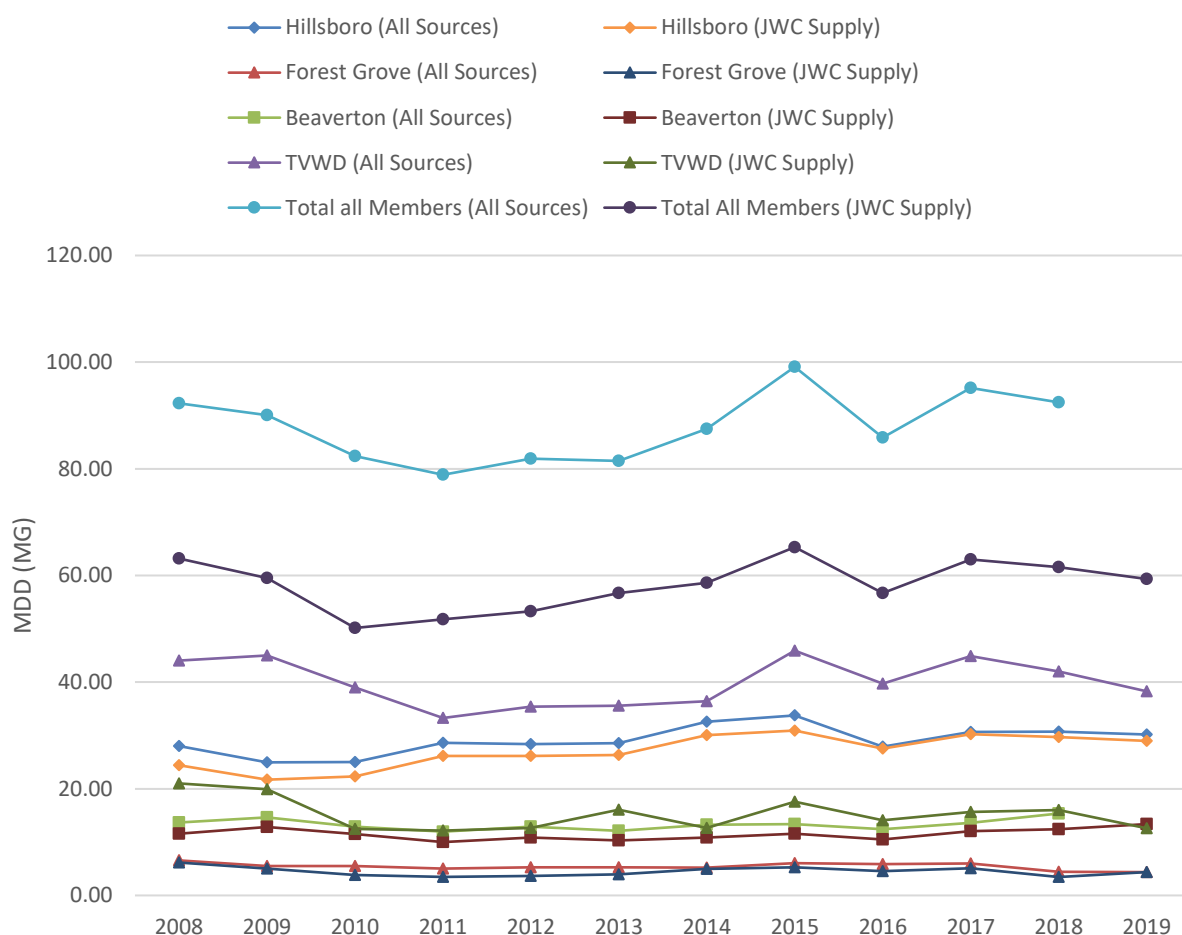


Exhibit 2-18 shows MDD values for all member agencies from 2008 through 2019. These values were calculated by each member agency.<sup>5</sup> TVWD had the greatest MDD values from 2008 through 2019, and MDD values remained relatively stable over time with the exception of TVWD, which had a drop in MDD from 2009 through 2011. MDD values tend to be more variable than ADD values. MDDs are generally more sensitive to fluctuations in weather patterns year to year, such as hot and dry weather that lead to increased outdoor water uses, such as irrigation.

**Exhibit 2-18. Maximum Daily Demand from All Sources for JWC Members, 2008-2019<sup>6</sup>**



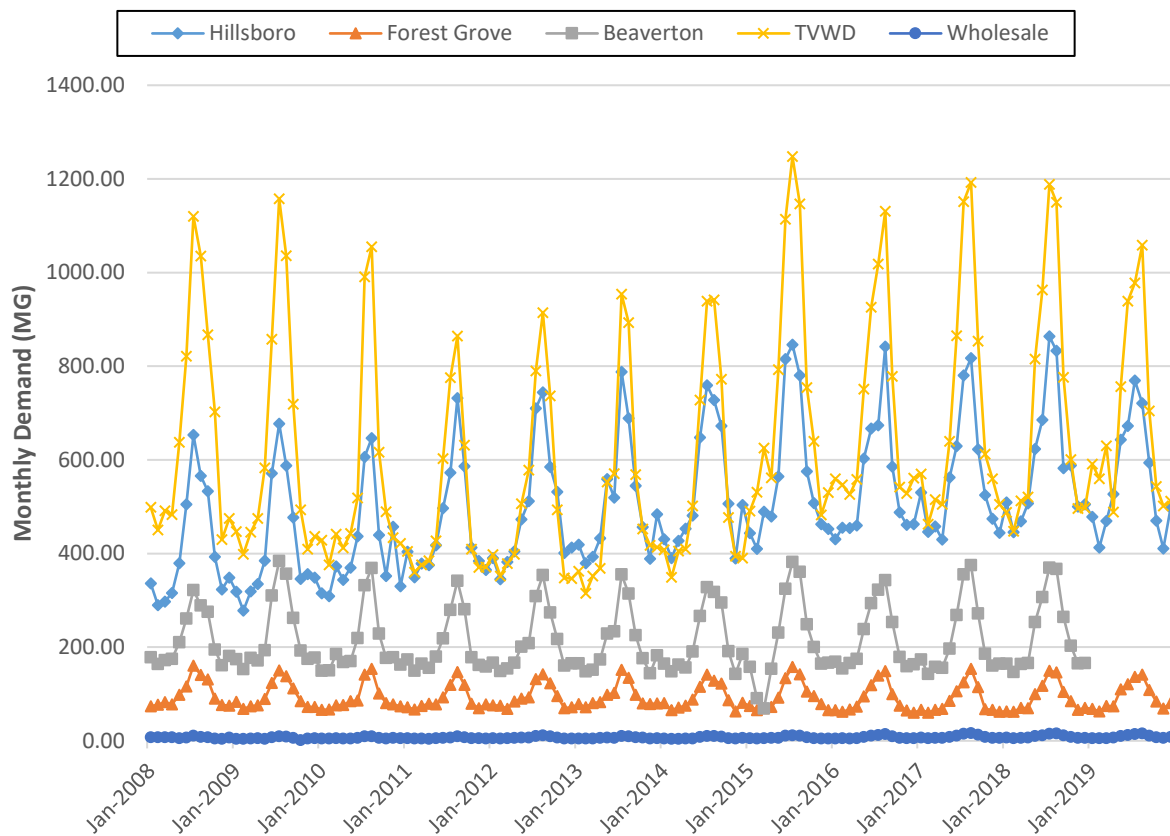
<sup>5</sup> Because individual systems experience maximum demand events at different times during the peak season, the sum of member agency MDDs in Exhibit 2-18 provides only an estimate of system-wide values. Wholesale customer MDDs were not determined.

<sup>6</sup> The City of Beaverton's fiscal year data are aligned with the calendar year in which the fiscal year began. FY 2018/2019 and FY 2019/2020 data for the City of Beaverton were not available.

## 2.7.2. JWC Monthly Demand

Exhibit 2-19 depicts monthly demand for all member agencies and wholesale customers from all sources from 2008 through 2019 and Exhibit 2-20 depicts monthly demand of JWC supplied water. Demands peak in summer when weather is hotter and drier, which results in increased outdoor water use. TVWD consistently had the highest peak month demand of all the member agencies throughout the eleven year period. However, because TVWD obtains a large amount of its peak season supply from non-JWC sources, TVWD's JWC supplied peak monthly demand is consistently lower than Hillsboro's JWC supplied peak monthly demand throughout the eleven year period. Forest Grove consistently had the lowest monthly demand of all the member agencies. It relies heavily on the JWC to meet its peak month supply needs.

**Exhibit 2-19. Monthly Demand from all Sources for JWC Members and Wholesale Customers, 2008-2019<sup>7</sup>**



<sup>7</sup> FY 2018/2019 and FY 2019/2020 data for the City of Beaverton were not available.

**Exhibit 2-20. JWC-Supplied Monthly Demand for JWC Members and Wholesale Customers, 2008-2019**

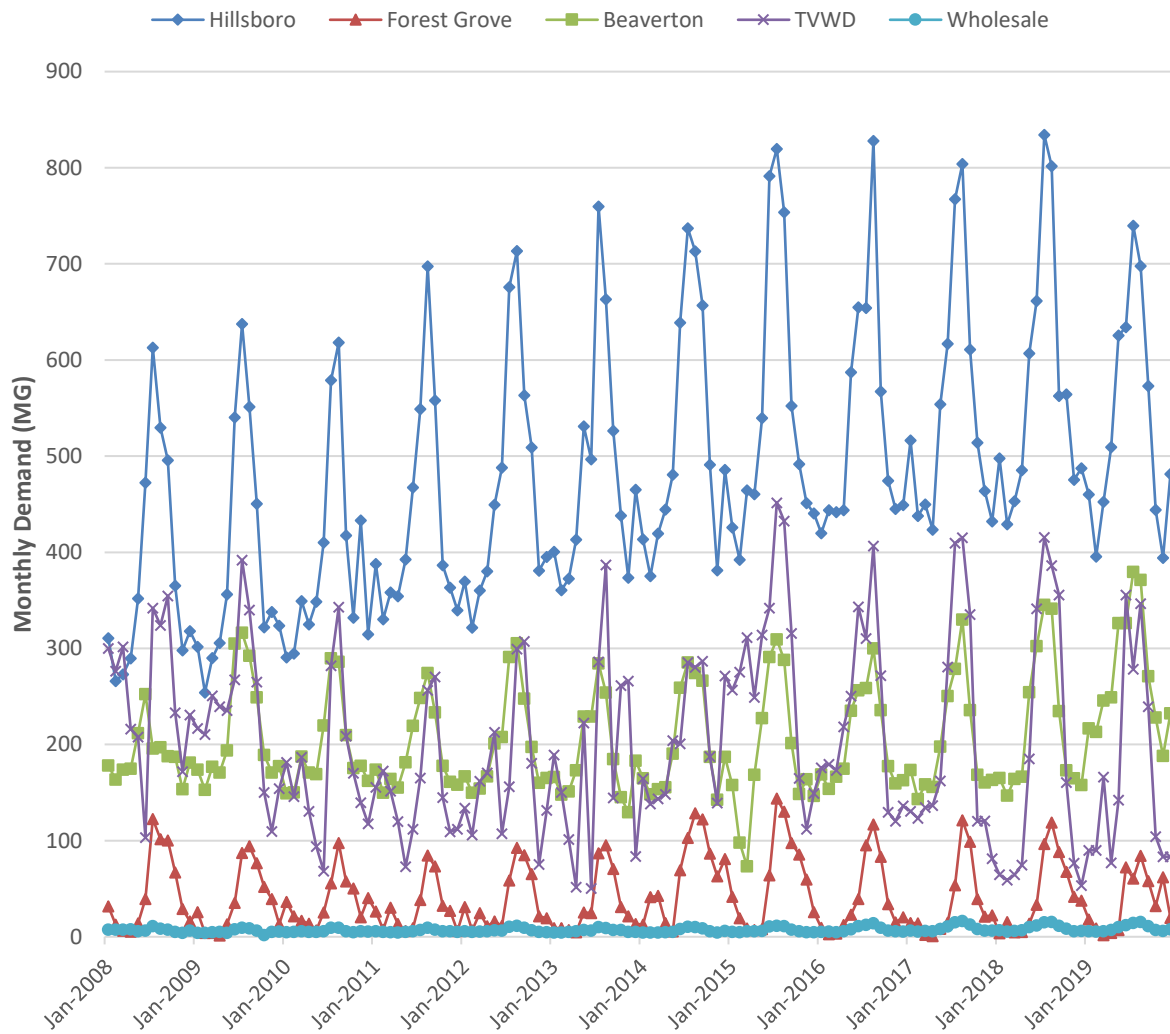
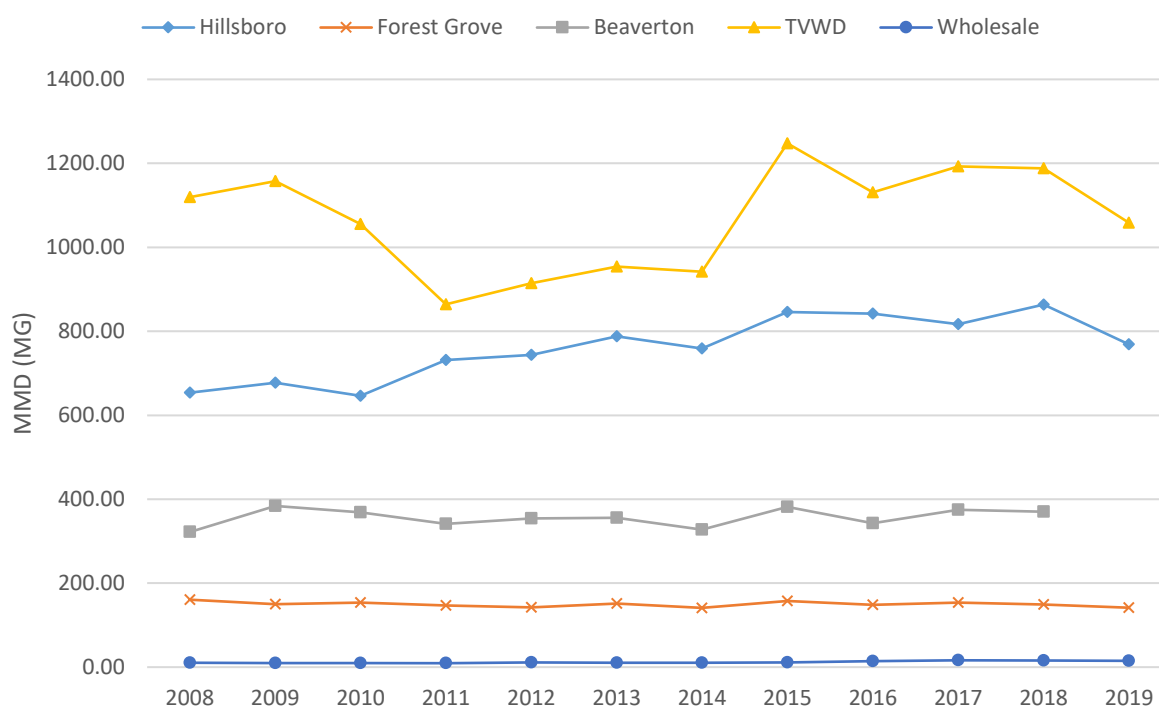


Exhibit 2-21 depicts the maximum monthly demand from all water sources for the JWC member agencies from 2008-2019. TVWD consistently had the highest maximum monthly demand, followed by Hillsboro, Beaverton, and Forest Grove, respectively. Like with MDD, MMD reflects weather patterns. Hot dry months in which people use water outdoors at a greater rate, are a large contributing factor to increased MMD.

**Exhibit 2-21. Maximum Monthly Demand from All Sources for JWC Members, 2008-2019<sup>8</sup>**



Exhibits 2-22 through 2-25 provide a tabular summary of water demands from all sources and JWC-supplied water demands for the JWC member agencies and JWC wholesale customers from 2008 through 2019. Data include: ADD, MDD, MMD, and MDD to ADD peaking factors for each member agency and wholesale customer. Exhibit 2-26 provides a summary of annual volume and ADD for JWC-supplied water for wholesale customers from 2008 through 2019.

<sup>8</sup> 2019 data for the City of Beaverton was not available.



**Exhibit 2-22. Summary of ADD, MDD, MMD, and MDD/ADD peaking factor for total and JWC-supplied water for Hillsboro, 2008-2019**

JWC Agency/Year	All Sources					JWC-supplied		Percentage of annual supply from JWC
	Annual Volume (MG)	Overall ADD (mgd)	Overall MDD (mgd)	MDD/ADD Peaking Factor	MMD (MG)	Annual Volume (MG)	ADD (mgd)	
Hillsboro								
2008	4,939.5	13.53	28.02	2.1	653.6	4,583.0	12.56	93%
2009	4,998.7	13.69	24.95	1.8	677.3	4,670.9	12.80	93%
2010	4,977.5	13.64	24.99	1.8	646.3	4,712.8	12.91	95%
2011	5,474.7	15.00	28.64	1.9	731.9	5,184.5	14.20	95%
2012	5,892.0	16.14	28.37	1.8	744.1	5,607.2	15.36	95%
2013	6,051.6	16.58	28.54	1.7	788.0	5,800.9	15.89	96%
2014	6,389.0	17.50	32.57	1.9	759.3	6,237.1	17.09	98%
2015	6,825.0	18.70	33.75	1.8	846.2	6,583.0	18.04	96%
2016	6,583.1	18.04	27.88	1.5	842.0	6,409.8	17.56	97%
2017	6,720.7	18.41	30.68	1.7	817.1	6,590.2	18.06	98%
2018	7,109.9	19.48	30.70	1.6	863.6	6,859.4	18.79	96%
2019	6,665.3	18.26	30.15	1.7	769.2	6,407.3	17.55	96%
Average 2008-2019	6,052.2	16.58	29.10	1.8	761.5	5,803.8	15.90	96%

**Exhibit 2-23. Summary of ADD, MDD, MMD, and MDD/ADD peaking factor for total and JWC-supplied water for Forest Grove, 2008-2019**

JWC Agency/Year	All Sources					JWC-supplied		Percentage of annual supply from JWC
	Annual Volume (MG)	Overall ADD (mgd)	Overall MDD (mgd)	MDD/ADD Peaking Factor	MMD (MG)	Annual Volume (MG)	ADD (mgd)	
Forest Grove								
2008	1,200.5	3.29	6.57	2.0	160.7	546.3	1.50	46%
2009	1,144.1	3.13	5.54	1.8	150.2	446.1	1.22	39%
2010	1,083.6	2.97	5.50	1.9	153.7	441.6	1.21	41%
2011	1,075.6	2.95	5.01	1.7	146.6	353.9	0.97	33%
2012	1,120.3	3.07	5.26	1.7	142.2	443.5	1.22	40%
2013	1,137.7	3.12	5.25	1.7	151.9	398.4	1.09	35%
2014	1,119.0	3.07	5.22	1.7	141.2	770.2	2.11	69%
2015	1,153.1	3.16	6.08	1.9	157.6	691.7	1.90	60%
2016	1,068.6	2.93	5.86	2.0	148.7	455.5	1.25	43%
2017	1,042.3	2.86	6.00	2.1	154.0	410.6	1.12	39%
2018	1,103.4	3.02	4.42	1.5	149.3	526.5	1.44	48%
2019	1,130.1	3.10	4.37	1.4	141.3	429.0	1.18	38%
Average 2008-2019	1,114.8	3.05	5.42	1.8	149.8	492.8	1.35	44%

**Exhibit 2-24. Summary of ADD, MDD, MMD, and MDD/ADD peaking factor for total and JWC-supplied water for Beaverton, Fiscal Year 2008/2009-2018/2019<sup>9</sup>**

JWC Agency/Year	All Sources					JWC-supplied		Percentage of annual supply from JWC
	Annual Volume (MG)	Overall ADD (mgd)	Overall MDD (mgd)	MDD/ADD Peaking Factor	MMD (MG)	Annual Volume (MG)	ADD (mgd)	
08/09	2,602.4	7.13	13.67	1.9	321.9	2,275.7	6.23	87%
09/10	2,590.7	7.10	14.62	2.1	384.0	2,441.6	6.69	94%
10/11	2,489.9	6.82	12.89	1.9	369.1	2,345.1	6.42	94%
11/12	2,525.0	6.92	11.96	1.7	341.5	2,300.4	6.30	91%
12/13	2,586.0	7.09	12.87	1.8	354.2	2,464.3	6.75	95%
13/14	2,471.0	6.77	12.14	1.8	355.4	2,252.4	6.17	91%
14/15	2,456.0	6.73	13.24	2.0	327.7	2,358.7	6.46	96%
15/16	2,719.0	7.45	13.38	1.8	412.8	2,412.6	6.61	89%
16/17	2,516.0	6.89	12.43	1.8	342.8	2,373.4	6.50	94%
17/18	2,715.0	6.46	13.61	2.1	374.8	2,535.7	6.95	93%
18/19	3,011.0	8.25	15.36	1.9	-	2,994.5	8.20	99%
Average 2008-2019	2,607.5	7.06	13.29	1.9	358.4	2,376.0	6.66	93%

<sup>9</sup> Monthly data were unavailable for the entire fiscal year 2018/2019.

**Exhibit 2-25. Summary of ADD, MDD, MMD, and MDD/ADD peaking factor for total and JWC-supplied water for TVWD, 2008-2019**

JWC Agency/Year	All Sources					JWC-supplied		Percentage of annual supply from JWC
	Annual Volume (MG)	Overall ADD (mgd)	Overall MDD (mgd)	MDD/ADD Peaking Factor	MMD (MG)	Annual Volume (MG)	ADD (mgd)	
2008	8,037.2	22.02	43.98	2.0	1,119.8	3,060.8	8.39	38%
2009	7,499.0	20.55	42.52	2.1	1,087.4	2,830.9	7.76	38%
2010	6,884.5	18.86	37.09	2.0	1,013.8	2,068.0	5.67	30%
2011	6,776.1	18.56	32.74	1.8	911.3	1,842.3	5.05	27%
2012	6,986.6	19.14	35.39	1.8	950.0	2,042.3	5.60	29%
2013	6,497.9	17.80	35.57	2.0	908.5	2,193.9	6.01	34%
2014	7,491.9	20.53	36.44	1.8	964.4	2,449.7	6.71	33%
2015	8,916.2	24.43	45.90	1.9	1,247.5	3,373.9	9.24	38%
2016	8,424.4	23.08	39.70	1.7	1,131.2	2,715.1	7.44	32%
2017	8,431.8	23.10	44.90	1.9	1,192.5	2,450.0	6.71	29%
2018	8,456.4	23.17	42.00	1.8	1,188.4	2,237.3	6.13	26%
2019	8,262.3	22.64	38.30	1.7	1,058.5	2,056.0	5.63	25%
Average 2008-2019	7,722.0	21.16	39.54	1.9	1,064.4	2,443.4	6.69	32%

**Exhibit 2-26. Summary of Annual Volume and ADD for JWC-supplied water for wholesale customers, 2008-2019**

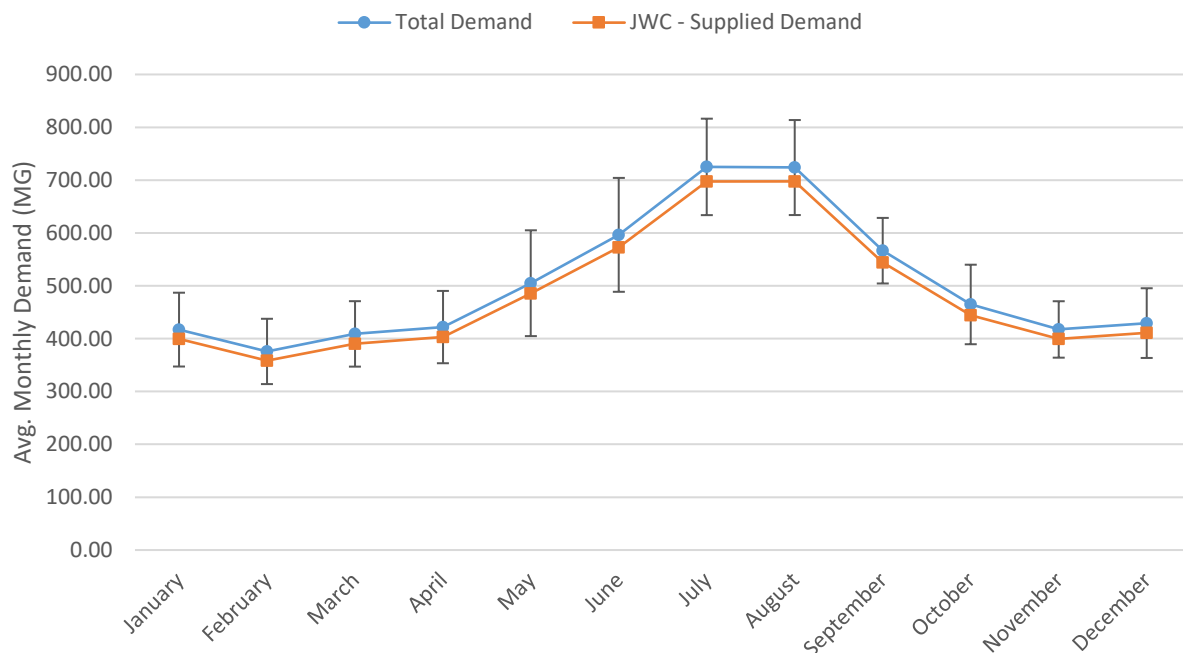
Year	Annual Volume (MG)	ADD (mgd)
2008	83.58	0.23
2009	66.14	0.18
2010	71.72	0.20
2011	70.69	0.19
2012	82.21	0.23
2013	76.69	0.21
2014	76.12	0.21
2015	83.20	0.23
2016	92.53	0.25
2017	106.92	0.29
2018	108.61	0.30
2019	107.52	0.29
Average 2008-2019	85.49	0.23

## 2.7.3. Hillsboro

Hillsboro's ADD from all sources ranged from 13.5 mgd to 19.48 mgd over the eleven year period, an increase of 69%. ADD increased between 0.4 mgd and 1.4 mgd each year, except for in 2009 and 2015 when ADD decreased by 0.06 mgd and 0.7 mgd respectively, and 2018 to 2019 when ADD decreased by 1.2 mgd. Hillsboro's MDD ranged from 24.95 mgd to 33.75 mgd, and the greatest MDD occurred in 2015. The MDD to ADD peaking factor averaged 1.8 for the eleven year period. The JWC supplied an average of 96% of Hillsboro's water demand from 2008 to 2019, with the remaining demand met by water from the Cherry Grove WTP.

Exhibit 2-27 depicts Hillsboro's average monthly demand from all sources and from JWC supplied sources for the eleven year period. Standard deviation is depicted for the total demand. On average, July and August were the months of highest demand, with the average maximum month demand occurring in August. The months June through September (one-third of the year) accounted for 43 percent of total average annual demand, with the remaining 57 percent of demand distributed over the remaining two thirds of the year.

**Exhibit 2-27. City of Hillsboro Average Monthly Demand (Total and JWC-supplied), 2008-2019**

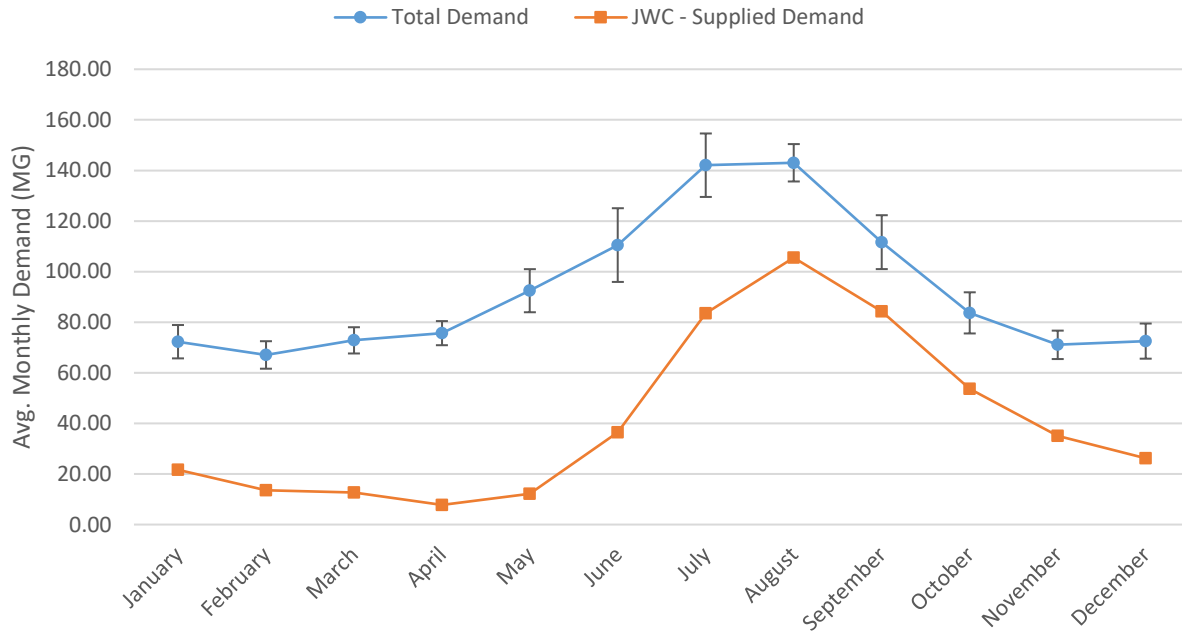


## 2.7.4. Forest Grove

From 2008 through 2019, Forest Grove’s ADD ranged from 2.9 mgd to 3.3 mgd and averaged 3 mgd. The MDD ranged from 4.4 mgd to 6.6 mgd and averaged 5.4 mgd. The MDD to ADD peaking factor ranged from 1.4 to 2.1 during the eleven year period, and averaged 1.8. The JWC supplied an average of 44% of Forest Grove’s water demand from 2008 to 2019, with the remaining demand met by water from the Forest Grove water treatment plant.

Exhibit 2-28 shows Forest Grove’s average monthly demand from all sources and from the JWC. Standard deviation is shown for total demand. Throughout the eleven year period, the average maximum month demand occurred in August. The four month period of June through September accounted for an average of 63 percent of annual demand.

**Exhibit 2-28. City of Forest Grove Average Monthly Demand (Total and JWC-supplied), 2008-2019**



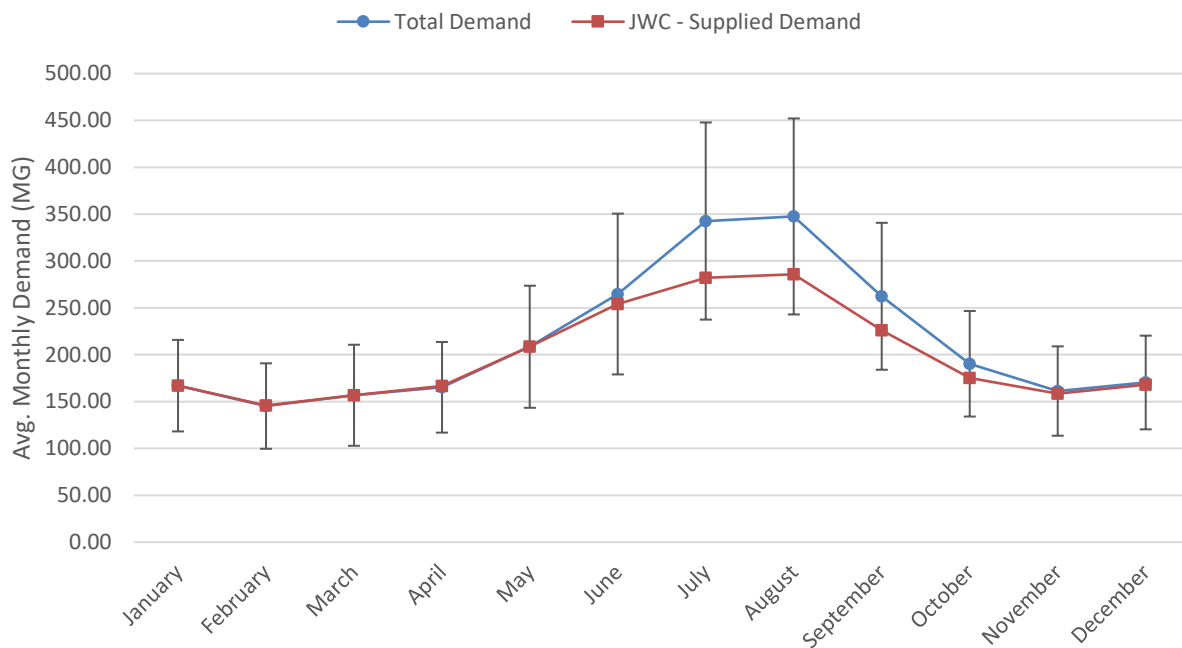


## 2.7.5. Beaverton

From Fiscal Year 2008/2009 through 2017/2018, Beaverton’s ADD ranged from 6.5 mgd to 7.5 mgd and averaged 7.0 mgd. MDD ranged from 12.0 mgd to 15.4 mgd and averaged 13.3 mgd for the ten year period. The MDD to ADD peaking factor was fairly consistent from year to year, averaging 1.9. The JWC supplied an average of 93% of Beaverton’s water demand from Fiscal Year 2008/2009 to 2017/2018, with the remaining demand met by ASR and native groundwater.

Exhibit 2-29 shows Beaverton’s average monthly demand from all sources and from JWC supplied water. Standard deviation is shown for the total water demand. While the JWC is Beaverton’s primary water supply source throughout the year, the difference between total and JWC supplied water, observed in July through September, reflects Beaverton’s use of native groundwater wells. The four month period, June through September, accounted for 44 percent of the City’s demand. The remaining supply was distributed throughout the remaining two-thirds of the year.

**Exhibit 2-29. City of Beaverton Average Monthly Demand (Total and JWC-supplied), 2008-2018**

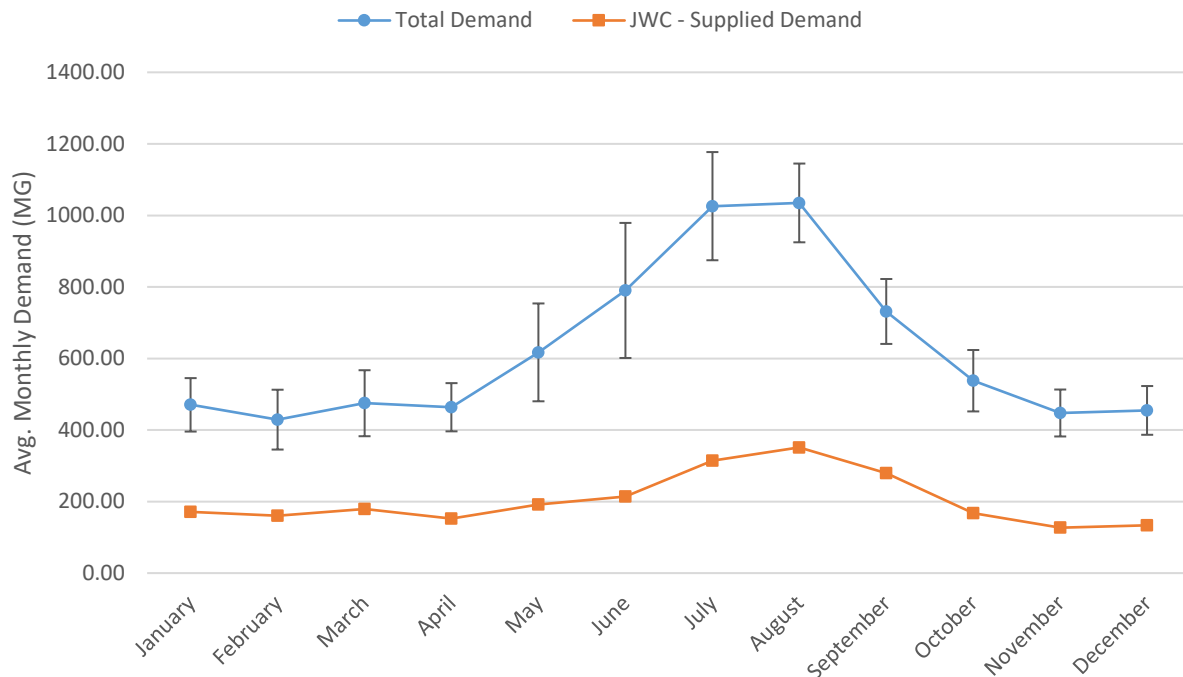


## 2.7.6. TVWD

From 2008 through 2019, TVWD’s overall ADD ranged from 16.4 mgd to 24.5 mgd and averaged 20.4. The MDD ranged from 33.3 mgd to 45.9 mgd, and averaged 40 mgd. The MDD to ADD peaking factor for the period averaged 2.0. The JWC supplied an average of 33% of TVWD’s water demand from 2008 to 2019, with the remaining demand met by PWB wholesale water and ASR.

Exhibit 2-30 shows the average monthly metered demand from all sources and from the JWC WTP for the 2008 through 2019. As shown, the JWC WTP supplied a base demand to TVWD throughout the year, with peak summer demands supplied by TVWD’s other sources. August and September are typically the months of peak demand, with the average maximum month demand occurring in September. The four month period of June through September accounted for an average of 47% of annual demand.

**Exhibit 2-30. TVWD Average Monthly Metered Demand (Total and JWC-supplied), 2008-2019**



## 2.8. Annual Consumption and Water Loss

Consumption is equal to the metered or approved unmetered water use within the system. Some members estimate unmetered water used for firefighting, water main water quality flushing, main breaks, hydrant maintenance, and for construction. All customers served by JWC member agencies are metered.

For the purposes of this WMCP, water loss is equal to the difference between annual demand and annual metered consumption, and represents the sum of unmetered uses (e.g., hydrant flushing and distribution system flushing), system leakage, overflows, evaporation, and inaccuracies of measurement at demand (i.e., production) meters and customer meters. When this difference is divided by the demand value, water loss is expressed as a percentage of total demand. The OWRD administrative rules set a water loss goal of 10 percent or less.

Exhibits 2-31 through 2-34 present annual demand, metered consumption, and water loss values for 2008 through 2019 for Hillsboro, Forest Grove, Beaverton, and TVWD, respectively. A more detailed description of the methods that the JWC Member Agencies use to calculate water loss is provided in Section 3, along with descriptions of activities to minimize water loss and sources of any significant water loss.

**Exhibit 2-31. Summary of Annual Demand, Metered Consumption, and Water Loss for Hillsboro, 2008-2019**

Year	Total Demand (MG)	Metered Consumption (MG)	Water Loss (%)
2008	4,939.5	5,368.3	-8.7%
2009	4,998.7	5,495.1	-9.9%
2010	4,977.5	5,343.8	-7.4%
2011	5,474.7	5,191.2	5.2%
2012	5,892.0	5,566.5	5.5%
2013	6,051.6	5,598.8	7.5%
2014	6,389.0	6,017.2	5.8%
2015	6,825.0	6,398.6	6.2%
2016	6,583.1	6,236.1	5.3%
2017	6,720.7	6,338.2	5.7%
2018	7,109.9	6,719.8	5.5%
2019	6,665.3	6,619.6	0.7%

**Exhibit 2-32. Summary of Annual Demand, Metered Consumption, and Water Loss for Forest Grove, 2008-2019**

<b>Year</b>	<b>Total Demand (MG)</b>	<b>Metered Consumption (MG)</b>	<b>Water Loss (%)</b>
2008	1,200.5	964.6	19.7%
2009	1,144.1	950.1	17.0%
2010	1,083.6	872.8	19.5%
2011	1,075.6	871.2	19.0%
2012	1,120.3	912.4	18.6%
2013	1,137.7	913.4	19.7%
2014	1,119.0	967.9	13.5%
2015	1,153.1	992.3	13.9%
2016	1,068.6	965.1	9.7%
2017	1,042.3	948.6	9.0%
2018	1,103.4	972.4	11.9%
2019	1,130.1	960.1	15.0%

**Exhibit 2-33. Summary of Annual Demand, Metered Consumption, and Water Loss for Beaverton, Fiscal Year 2008/2009-2018/2019**

<b>Fiscal Year</b>	<b>Total Demand (MG)</b>	<b>Metered Consumption (MG)</b>	<b>Water Loss (%)</b>
08/09	2,602.4	2,515.0	3.4%
09/10	2,590.7	2,441.8	5.7%
10/11	2,489.9	2,270.8	8.8%
11/12	2,525.0	2,254.5	10.7%
12/13	2,586.0	2,314.9	10.5%
13/14	2,471.0	2,261.3	8.5%
14/15	2,456.0	2,360.8	3.9%
15/16	2,719.0	2,526.1	7.1%
16/17	2,516.0	2,307.9	8.3%
17/18	2,715.0	2,656.8	2.1%
18/19	3,011.0	2,808.5	6.7%

**Exhibit 2-34. Summary of Annual Demand, Metered Consumption, and Water Loss for TVWD, 2008-2019**

Calendar Year	Total Demand (MG)	Metered Consumption (MG)	Wheeled Water (MG)	Other (MG)	Total Water Consumption	Water Loss (%)
2008	8,037.2	7,626.0	26.22	22.9	7,675.1	4.5%
2009	7,499.0	7,601.2	24.93	19.5	7,645.6	-2.0%
2010	6,884.5	7,022.1	23.69	9.8	7,055.6	-2.5%
2011	6,776.1	7,030.7	19.53	11.4	7,061.6	-4.2%
2012	6,986.6	7,322.5	24.04	20.7	7,367.2	-5.4%
2013	6,497.9	7,437.5	22.70	21.5	7,481.7	-15.1%
Fiscal Year	Total Demand (MG)	Metered Consumption (MG)	Wheeled Water (MG)	Other (MG)	Total Water Consumption	Water Loss (%)
13/14	7,185.1	7,369.6	22.4	24.6	7,416.6	-3.2%
14/15	8,485.8	7,836.3	23.1	31.9	7,891.3	7.0%
15/16	8,455.8	8,206.4	23.1	36.7	8,266.2	2.2%
16/17	8,008.3	7,775.2	0.5	43.5	7,819.3	2.4%
17/18	8,523.7	8,064.7	22.4	34.4	8,121.6	4.7%
18/19	8,342.7	7,925.2	22.5	30.9	7,978.5	4.4%

Note: “Wheeled water” is water moved through TVWD’s water distribution system for PWB, City of Beaverton, and City of Hillsboro customers. “Other” consists of tracked, but unmetered authorized uses, such as hydrant use or pipeline flushing.

## 2.9. Customer Characteristics and Use Patterns

*OAR 690-086-0140(6)*

The JWC’s individual member agencies have unique customer bases and billing practices, and as a result, customer characteristics and use patterns are presented separately below. JWC Member agencies bill customers monthly and bi-monthly.

In addition to annual and monthly consumption, customer consumption characteristics are described as follows:

- Summer season: water consumption during the four months with the highest monthly consumption.

- Winter season: water consumption during the months of December through March. No irrigation was assumed to occur during the winter season months.
- Indoor: average winter monthly consumption applied to a twelve-month period, estimated for single family and multi-family residential customers only.
- Outdoor: difference between annual consumption and indoor consumption, estimated for single family and multi-family residential customers only.

Indoor and outdoor water consumption was not determined for commercial and industrial customers because seasonal changes in water use may be process related, and not necessarily because of irrigation. Water use by commercial and industrial water customers must be examined individually. All water from irrigation accounts was assigned to outdoor use regardless of when the accounts were billed.

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

### **2.9.1. Hillsboro**

Hillsboro began billing all customers monthly in 2019, and in previous years billed some customers monthly and others bi-monthly. Exhibit 2-35 and Exhibit 2-36 depict annual metered consumption by customer category for the City of Hillsboro from 2008-2019. During these years, metered consumption averaged approximately 5,907 MG and just over half of this consumption went towards commercial and industrial uses, 34% was used residentially, and the remaining metered water use was divided between public and non-profit use, irrigation, and wholesale customers.

For comparison, the 2010 JWC WMCP showed five customer categories for the City of Hillsboro: residential, business/industrial, public and nonprofit, wholesale, and irrigation. Residential consumption was 1,949 MG in 2007, which is similar to the combined consumption of single family and multi-family residential customers in recent years. Similarly, consumption by public entities and nonprofit customers has remained steady since 2007. Irrigation consumption has decreased and returned to 2007 levels, and wholesale consumption has shown a decreasing trend since 2007. Meanwhile, industrial consumption has greatly increased from the 2,178 MG reported for business/industrial customers (which included commercial customers) in 2007.



**Exhibit 2-35. Hillsboro Metered Consumption by Customer Category (MG), 2008-2019**

Year	Metered Consumption by Sector (MG)								Total
	Single Family	Multi-Family	Commercial	Industrial	Public Entities	Non-profit	Irrigation	Wholesale	
2008	1,675	426	441	1,826	166	16	281	536	5,368
2009	1,651	435	396	1,998	182	15	271	549	5,495
2010	1,464	423	365	2,230	146	14	185	516	5,344
2011	1,474	423	369	2,065	130	13	219	498	5,191
2012	1,536	435	396	2,265	134	15	262	523	5,567
2013	1,503	412	377	2,378	144	14	246	524	5,599
2014	1,542	434	391	2,684	162	17	259	530	6,017
2015	1,573	458	418	2,961	169	16	283	521	6,399
2016	1,515	451	402	2,910	163	15	261	519	6,236
2017	1,552	469	408	2,991	155	13	234	516	6,338
2018	1,570	489	433	3,254	159	15	284	515	6,720
2019	1,484	469	400	3,321	145	31	251	519	6,620

**Exhibit 2-36. Hillsboro Metered Consumption by Customer Category, 2008-2019**

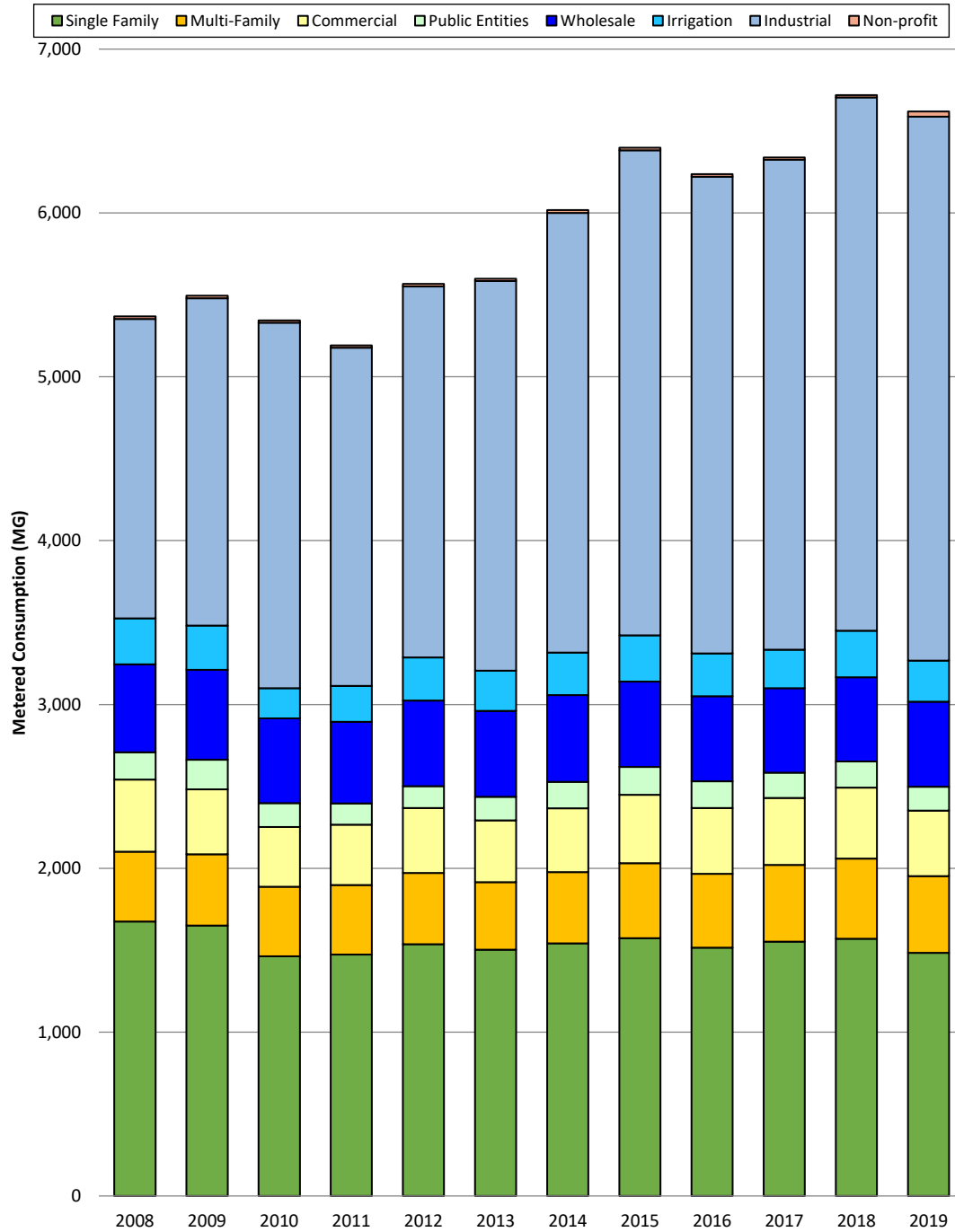


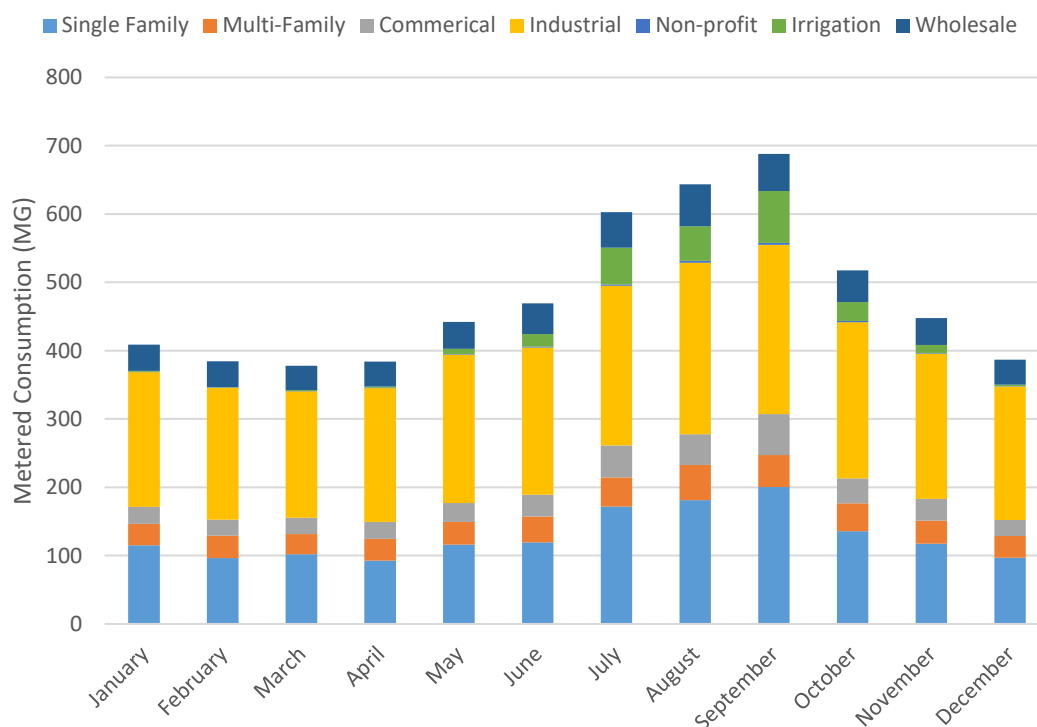
Exhibit 2-37 lists the City of Hillsboro’s top ten water users, including wholesale customers, for 2019. The City of Hillsboro’s system totals, including wholesale customers were 3,838 MG in 2019. The top ten water users accounted for 56.6 percent of total system use. The top three water users accounted for 47.4 percent of total system use.

**Exhibit 2-37. Hillsboro Top 10 Water Users, 2019**

Rank	Customer Class	Consumption (MG)
1	Industrial	2,828.1
2	Wholesale	383.4
3	Industrial	199.6
4	Wholesale	93.7
5	Industrial	88.8
6	Industrial	58.0
7	Public Entity	49.6
8	Industrial	46.3
9	Industrial	45.4
10	Wholesale	44.6
<b>Total</b>		<b>3,838.09</b>

Exhibit 2-38 depicts average monthly billed consumption by customer category from 2008 through 2019. Consumption increases for all customer categories in the peak billing months July through September. Exhibit 2-39 shows the average monthly consumption for the summer season (July through October), winter season (December through March), and the annual average for 2008 through 2019.

**Exhibit 2-38. Hillsboro Average Monthly Billed Consumption by Customer Category, 2008-2019**



**Exhibit 2-39. Hillsboro Average Monthly Consumption by Season and Customer Category, 2008-2019**

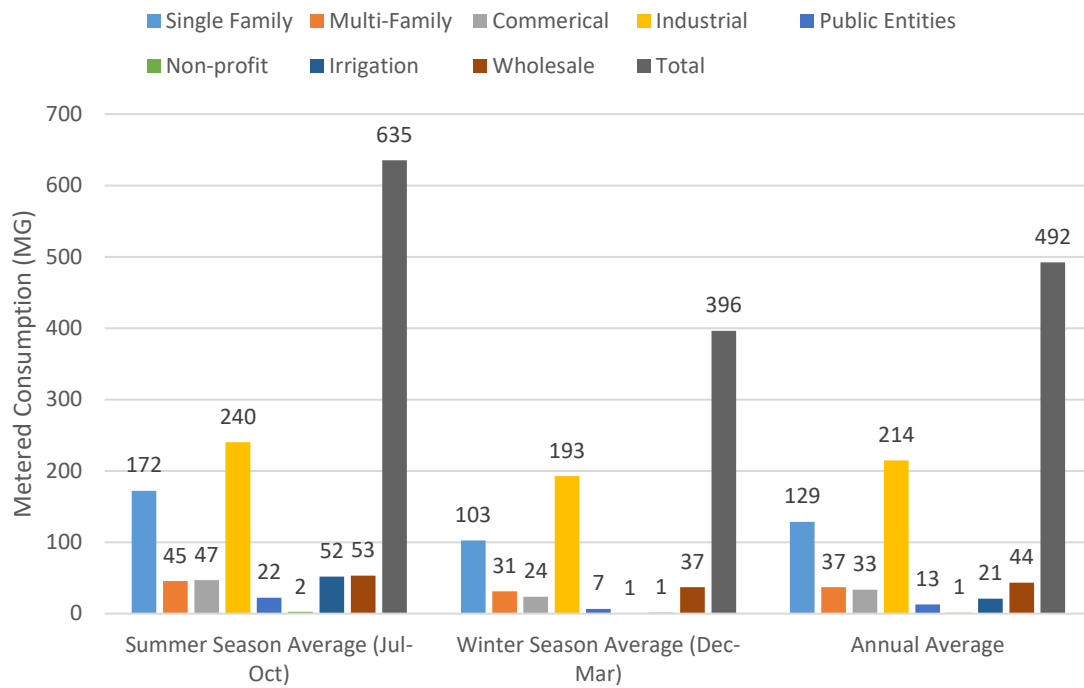
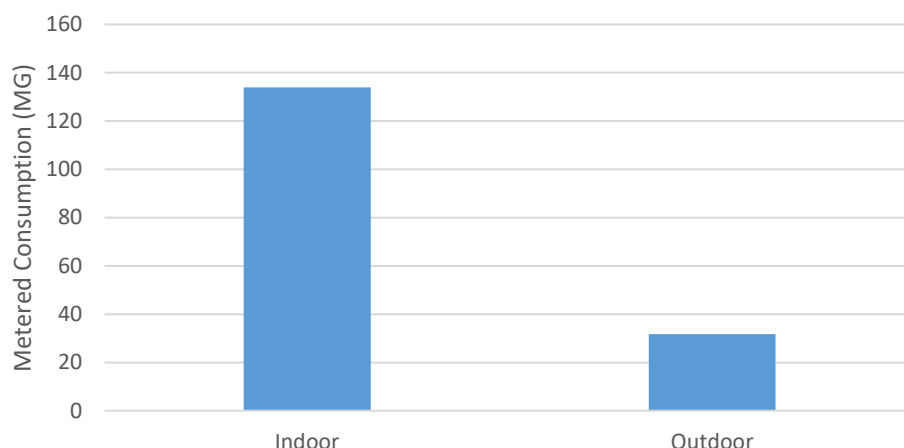


Exhibit 2-40 depicts estimated average indoor and outdoor water use from 2008-2019. Indoor water use was estimated by averaging winter water use (December through March) for all residential customers for the eleven year period. Winter water use was estimated by taking the difference of the annual average and subtracting the estimated winter indoor average, and then averaging for the eleven year period. Average indoor water use, over the eleven year period, was approximately four times greater.

**Exhibit 2-40. Hillsboro Estimated Average Monthly Indoor and Outdoor Water Consumption for Residential Accounts, 2008-2019**



## 2.9.2. Forest Grove

Forest Grove bills all customers monthly. Exhibit 2-41 and Exhibit 2-42 depict annual metered consumption by customer category for the City of Forest Grove from 2008 through 2019. Total metered consumption averaged approximately 941 MG over the eleven year period. Residential consumption averaged 62 percent of total metered consumption, with 46 percent attributed to single family customers and 16 percent attributed to multi-family customers. Commercial and industrial customers account for 30 percent of total metered consumption, and school and city customers account for the remaining 10 percent.

Consumption trends have varied among the customer categories since the 2010 JWC WMCP. Single family consumption has shown an increasing trend from the 403 MG reported in 2007 while industrial consumption has decreased from 210 MG in 2007 to 126 MG in 2019. Multi-family, commercial, school, and city consumption in 2019 remain close to 2007 consumption levels.

**Exhibit 2-41. Forest Grove Metered Consumption by Customer Category (MG), 2008-2019**

Year	Single Family	Multi-Family	Commercial	Industrial	School	City	Total
2008	405	150	137	185	59	28	965
2009	431	143	132	153	63	29	950
2010	400	136	119	143	43	31	873
2011	391	133	131	133	46	37	871
2012	412	134	144	145	42	36	912
2013	410	137	146	144	42	35	913
2014	447	141	152	139	52	36	968
2015	461	144	137	153	62	36	992
2016	453	141	130	139	66	35	965
2017	460	140	122	140	52	33	949
2018	468	138	149	127	57	34	972
2019	446	150	145	126	62	31	960
<b>Average</b>	<b>432</b>	<b>141</b>	<b>137</b>	<b>144</b>	<b>54</b>	<b>33</b>	<b>941</b>
<b>Percentage of Use</b>	<b>46%</b>	<b>15%</b>	<b>15%</b>	<b>15%</b>	<b>6%</b>	<b>4%</b>	<b>100%</b>



**Exhibit 2-42. Forest Grove Annual Consumption by Customer Category (MG), 2008-2019**

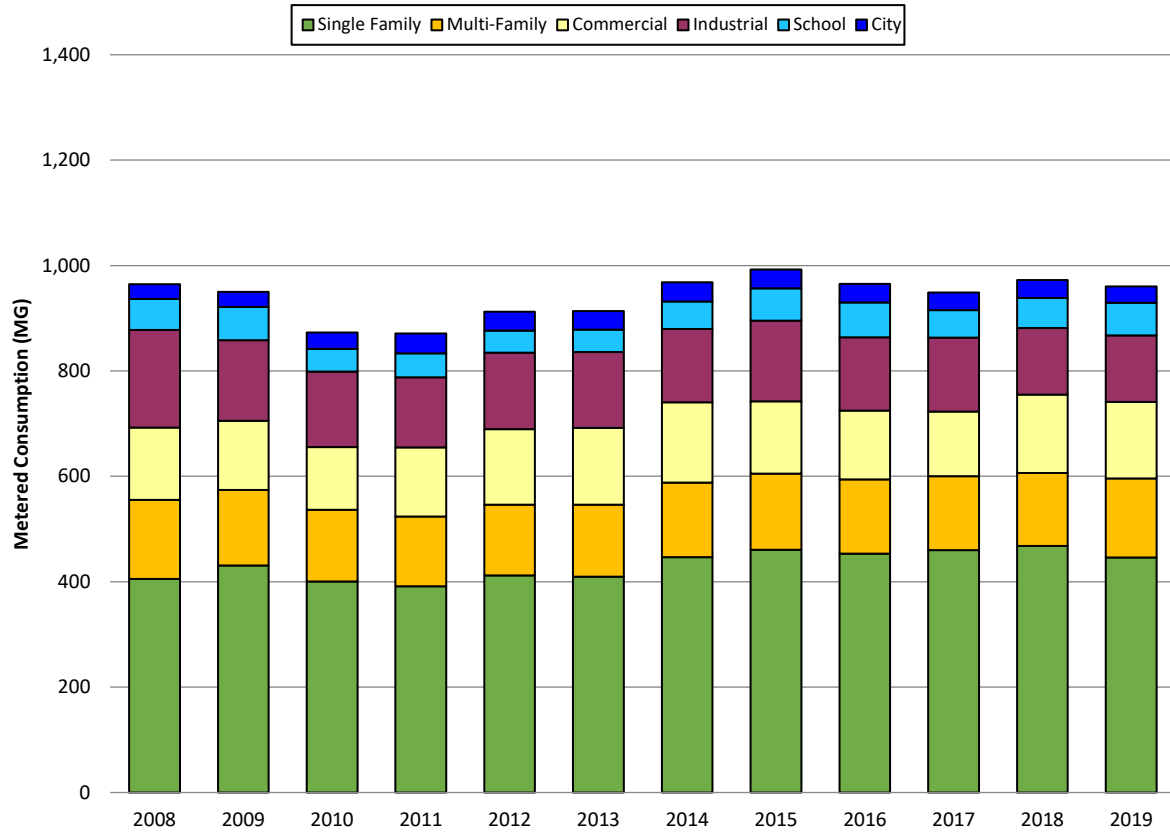


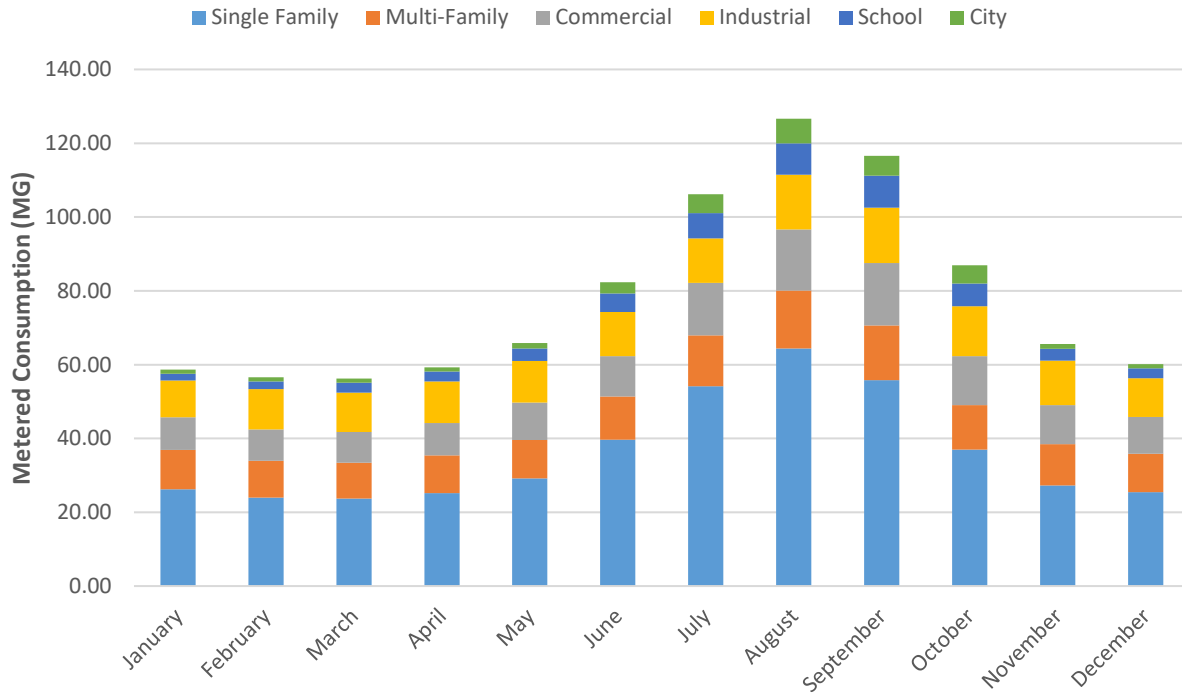
Exhibit 2-43 shows the ten customer accounts with the largest metered water consumption in 2019. The top industrial water user accounted for 4 percent of Forest Grove’s total consumption. The top three water users accounted for 10 percent of total consumption.

**Exhibit 2-43. Forest Grove Top 10 Water Users, 2019**

Rank	Customer Class	Consumption (MG)
1	Industrial	41.1
2	Industrial	29.0
3	Commercial	26.3
4	Industrial	17.4
5	Multifamily	16.5
6	Multifamily	14.6
7	School (Elementary)	12.8
8	Multifamily	12.2
9	Commercial	9.6
10	School (University)	9.3
<b>Total</b>		<b>188.8</b>

Exhibit 2-44 shows average monthly metered consumption by customer category from 2008 through 2019. August was on average the greatest month of consumption. Exhibit 2-45 shows the average overall monthly consumptions for the summer season, winter season, and for total annual consumption. The total summer season average was 109 MG, the total winter season average was 58 MG, and the total annual average was 78 MG.

**Exhibit 2-44. Forest Grove Average Monthly Metered Consumption by Customer Category (MG), 2008-2019**



**Exhibit 2-45. Forest Grove Average Monthly Consumption by Season and Customer Category (MG), 2008-2019**

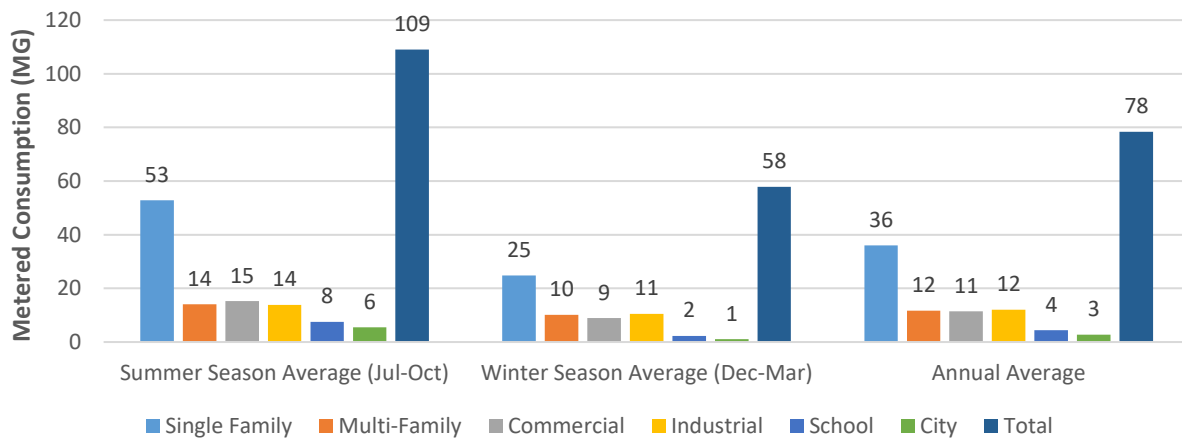
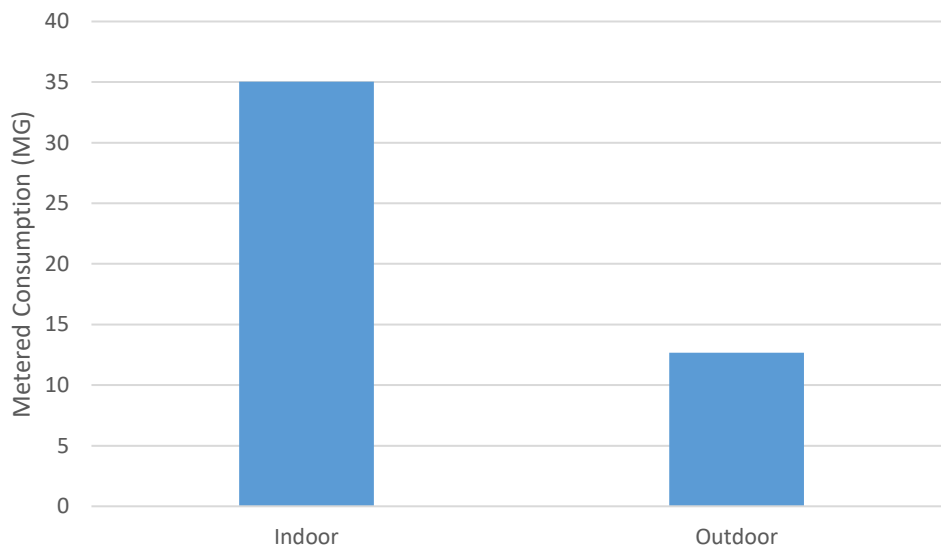


Exhibit 2-46 shows estimated average monthly indoor and outdoor water consumption amongst residential customers. Total average indoor water consumption is just over two and a half times greater than total average outdoor water consumption for the eleven year period.

**Exhibit 2-46. Forest Grove estimated average monthly indoor and outdoor water consumption for residential accounts, 2008-2019**



### **2.9.3. Beaverton**

Beaverton began billing all customers monthly in 2013. Exhibit 2-47 and Exhibit 2-48 show the annual metered consumption by customer category for the City of Beaverton from fiscal year 2008/2009 through fiscal year 2018/2019.

When comparing recent consumption patterns to the 2010 JWC WMCP, different trends have emerged among the customer categories. Single family consumption has remained below the 2007 consumption of 1,077 MG and multi-family plus apartments consumption has consistently been lower than the multi-family consumption reported in 2007. Likewise, public facilities consumption has generally been lower than in 2007. Commercial consumption has fluctuated from the 537 MG reported in 2007, with a large increase in recent years. Irrigation consumption has similarly fluctuated from 210 MG in 2007 and then notably increased in the past two years.

**Exhibit 2-47. Beaverton Metered Consumption by Customer Category (MG), FY 2008/2009 - 2018/2019**

<b>Fiscal Year</b>	<b>Single Family</b>	<b>Multi-Family</b>	<b>Apartments</b>	<b>Commercial/Industrial</b>	<b>Public Facilities</b>	<b>Irrigation</b>	<b>Fire</b>	<b>Total</b>
<b>08/09</b>	1,054	95	596	520	29	221	1	2,515
<b>09/10</b>	1,019	95	592	499	27	209	0	2,442
<b>10/11</b>	950	89	581	463	25	164	0	2,271
<b>11/12</b>	944	89	567	471	19	164	0	2,254
<b>12/13</b>	983	90	547	470	21	205	0	2,315
<b>13/14</b>	931	86	584	470	26	165	0	2,262
<b>14/15</b>	979	93	568	498	22	201	0	2,361
<b>15/16</b>	1,053	88	591	523	23	249	0	2,527
<b>16/17</b>	960	83	573	479	21	192	0	2,308
<b>17/18</b>	1,005	82	568	686	60	255	0	2,657
<b>18/19</b>	1,052	81	616	748	0	312	0	2,808
<b>Average</b>	994	88	580	530	25	212	0	2,429
<b>Percentage of Use</b>	41%	4%	24%	22%	1%	9%	0%	100%

**Exhibit 2-48. Beaverton Annual Consumption by Customer Category, FY 2008/2009 - 2018/2019**

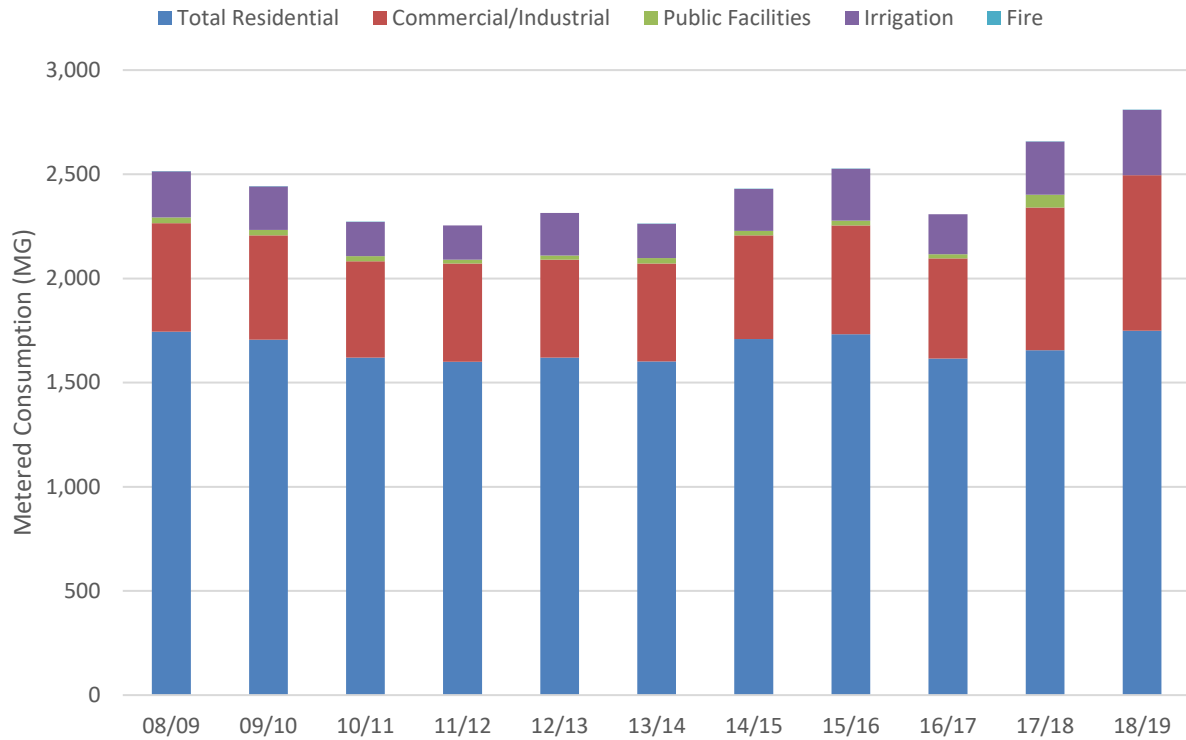




Exhibit 2-49 depicts Beaverton’s top ten customer accounts with the largest metered water consumption in FY 2018/2019. The top water user accounted for over 1 percent of Beaverton’s total consumption. The top three water users accounted for nearly 4 percent of total consumption.

**Exhibit 2-49. Beaverton Top 10 Water Users, FY 2018/2019**

Rank	Customer Class	Consumption (MG)
1	Public Facilities	36.0
2	Multi-Family	35.0
3	Single-Family	26.6
4	Commercial	22.4
5	Irrigation	22.4
6	Irrigation	22.2
7	Multi-Family	18.5
8	Multi-Family	16.2
9	Commercial	15.7
10	Single-Family	15.4
	<b>Total</b>	<b>216.4</b>

Exhibit 2-50 shows average monthly metered consumption from fiscal year 2008/2009 through fiscal year 2018/2019. The four month period from July through October represent the peak season, with August accounting for the highest average monthly consumption.

**Exhibit 2-50. Beaverton Average Monthly Consumption by Customer Category, FY 2008/2009-2018/2019**

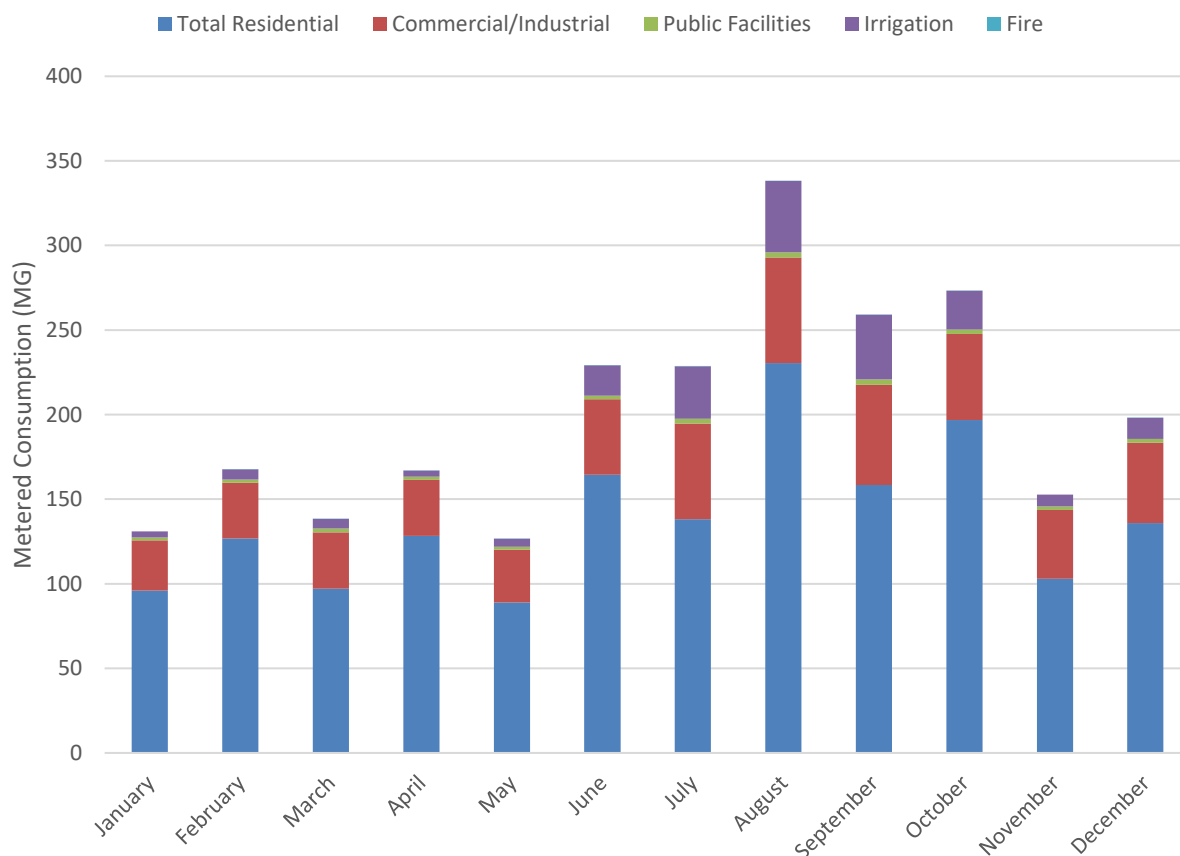


Exhibit 2-51 shows average monthly consumption for the summer season, winter season, and entire year. The total summer season average was approximately 293 MG, the total winter season average was approximately 164 MG, and the total annual average was approximately 203 MG.

**Exhibit 2-51. Beaverton Average Monthly Consumption by Season and Customer Category, FY 2008/2009-2018/2019**

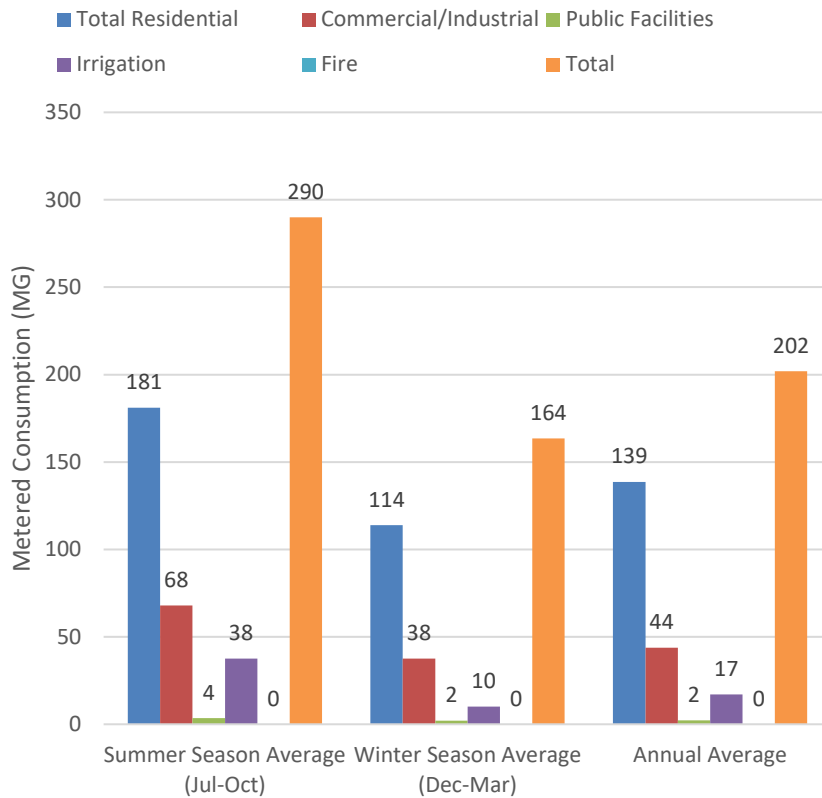
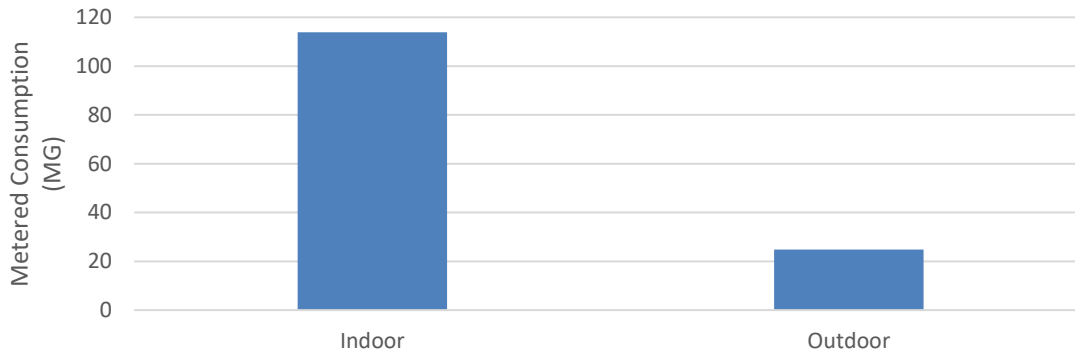


Exhibit 2-52 shows average monthly indoor and outdoor water consumption for residential accounts. Estimated average monthly indoor consumption was approximately 4.6 times greater than estimated average outdoor consumption.

**Exhibit 2-52. Beaverton estimated average monthly indoor and outdoor water consumption for residential accounts, FY 2008/2009-2018/2019**



## 2.9.4. TVWD

TVWD bills residential customer classes bi-monthly and commercial customer classes on a monthly basis. Exhibit 2-53 and Exhibit 2-54 depict annual metered consumption by customer category for TVWD from 2008 through 2019. For the eleven year period, average annual metered consumption averaged approximately 7,603 MG. Residential customers accounted for approximately 70 percent of all metered consumption. Commercial use accounted for another 16 percent. The remaining 14 percent was divided between production (8.5 percent), irrigation (5.7 percent), fire line (0.02 percent), wholesale (0.3 percent), and temporary irrigation customers (0.06 percent).

Consumption trends by TVWD's customer categories have been mixed since the 2010 JWC WMCP. Single family consumption has remained below the 2007 consumption of 4,089 MG, commercial consumption remained below the 2007 consumption of 1,321 MG except for two years, and wholesale consumption has decreased considerably since 2007. However, multi-family consumption fluctuated around levels reported from 2002 through 2007, production consumption (formally called Industrial) increased from 505 MG in 2007 to more than 700 MG in recent years, and irrigation consumption has fluctuated around the 2007 level of 422 MG.

**Exhibit 2-53. TVWD Annual Consumption by Customer Category (MG), 2008-2019**

Year	Single Family	Multi-Family	Commercial	Production	Irrigation	Fireline	Wholesale	Temporary Irrigation	Total
2008	3,939	1,416	1,202	600	423	3	43	0	7,626
2009	4,022	1,399	1,180	527	445	1	28	0	7,601
2010	3,648	1,363	1,055	592	336	1	28	0	7,022
2011	3,572	1,402	1,038	637	360	1	20	0	7,031
2012	3,738	1,432	1,123	588	418	1	22	0	7,322
2013	3,730	1,452	1,208	614	388	2	41	3	7,437
2014	3,797	1,567	1,271	704	438	2	53	6	7,837
2015	4,009	1,595	1,361	695	525	1	8	10	8,204
2016	3,805	1,570	1,273	692	466	2	1	10	7,818
2017	3,895	1,628	1,297	709	461	2	0	11	8,003
2018	3,927	1,644	1,364	723	506	1	5	10	8,181
2019	3,454	1,477	1,107	680	400	1	30	8	7,157
<b>Average</b>	<b>3,795</b>	<b>1,495</b>	<b>1,207</b>	<b>647</b>	<b>431</b>	<b>1</b>	<b>23</b>	<b>5</b>	<b>7,603</b>
<b>Percent of Use</b>	<b>49.91%</b>	<b>19.67%</b>	<b>15.87%</b>	<b>8.51%</b>	<b>5.66%</b>	<b>0.02%</b>	<b>0.31%</b>	<b>0.06%</b>	<b>100.00%</b>

**Exhibit 2-54. TVWD Annual Consumption by Customer Category, 2008-2019**

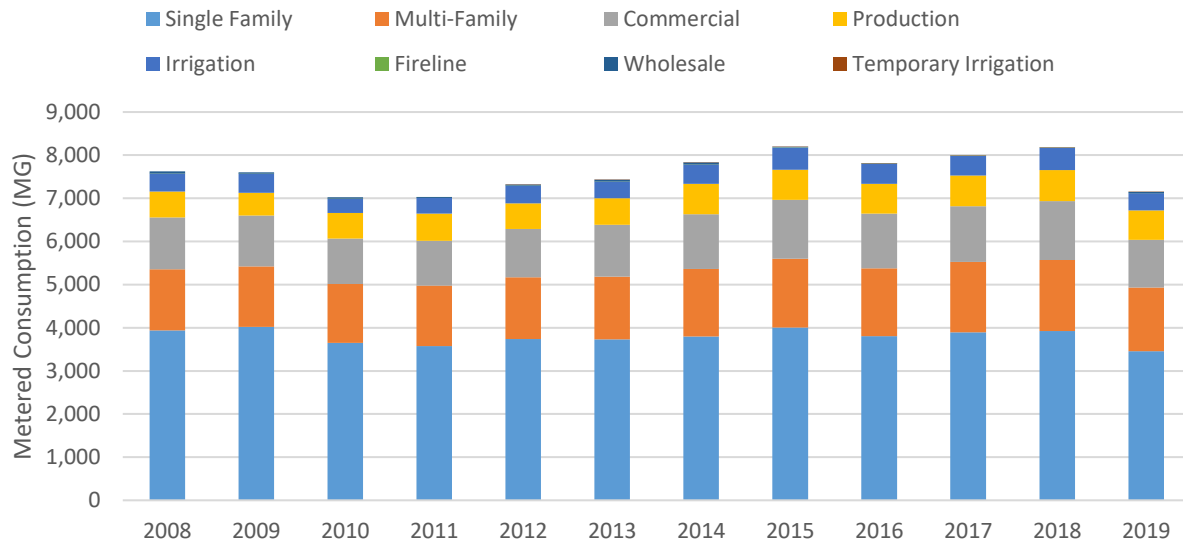


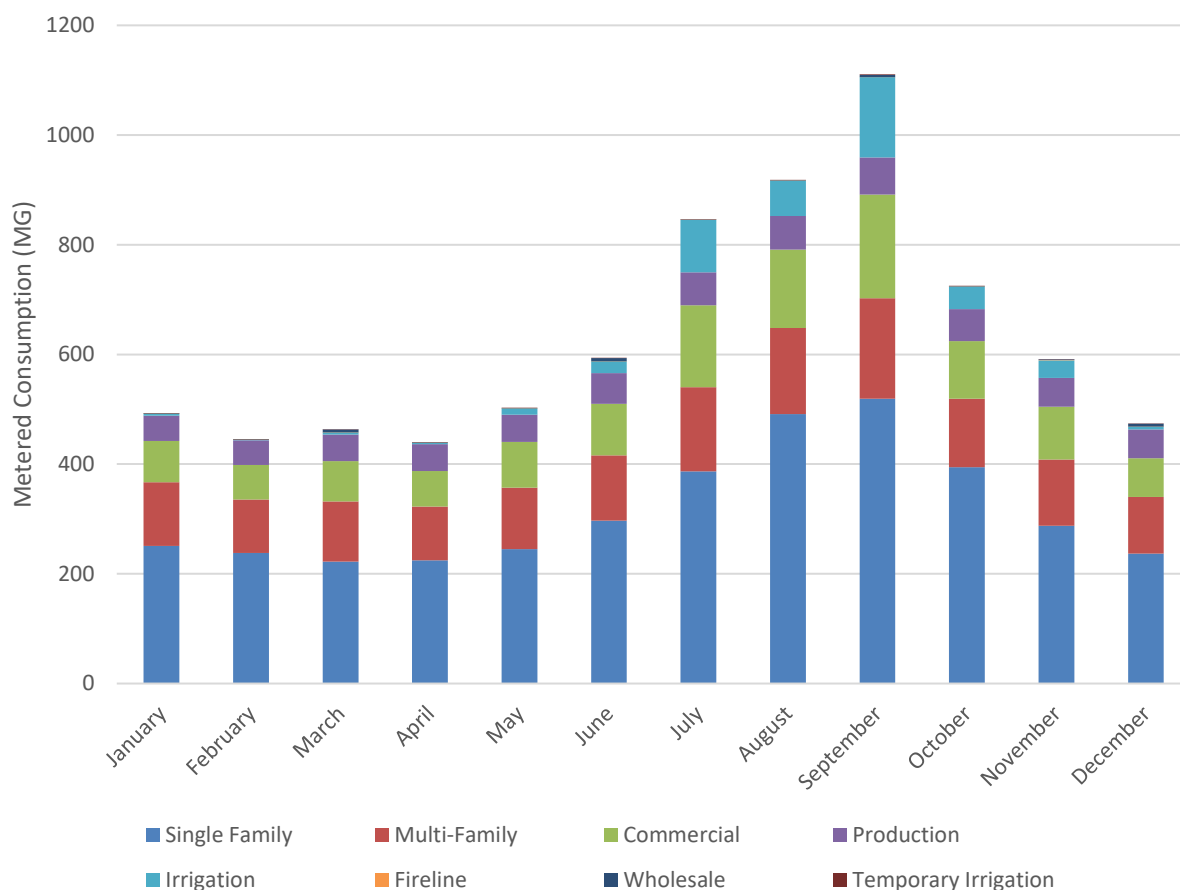
Exhibit 2-55 presents TVWD’s top ten largest water consumers from 2019. These top water users accounted for approximately 13 percent of TVWD’s total consumption for the year 2019. The top three water users accounted for approximately 8 percent of total consumption.

**Exhibit 2-55. TVWD’s Top 10 Largest Water Consumers, 2019**

Customer Class	Total Consumption (MG)
Commercial	231.8
Commercial	227.9
Commercial	96.5
Commercial	91.0
Commercial	56.4
Multi-Family	45.4
Commercial	41.7
Multi-Family	40.7
Irrigation	40.5
Multi-Family	38.2

Exhibit 2-56 shows average monthly consumption from 2008 through 2019. The months of peak consumption were July through October. As shown in Exhibit 2-57, the total summer season average monthly consumption was approximately 903 MG, the total winter season average was 469 MG, and the annual average was 634 MG.

**Exhibit 2-56. TVWD Average Monthly Metered Consumption by Customer Category, 2008-2019**





**Exhibit 2-57. TVWD Average Monthly Consumption by Season and Customer Category, 2008-2019**

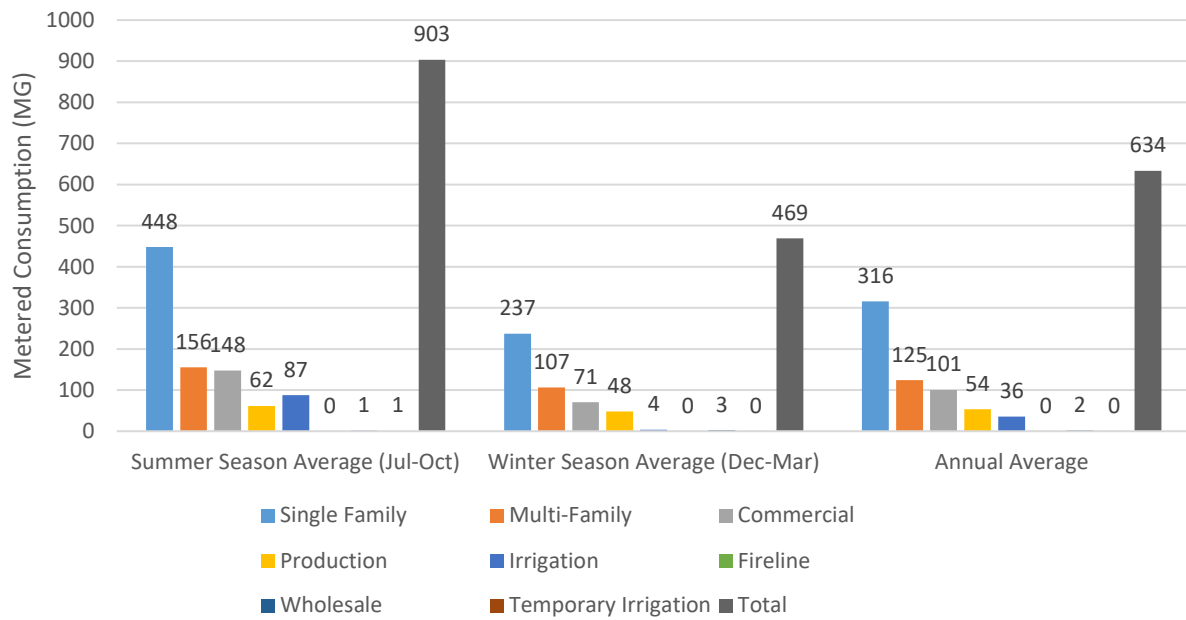
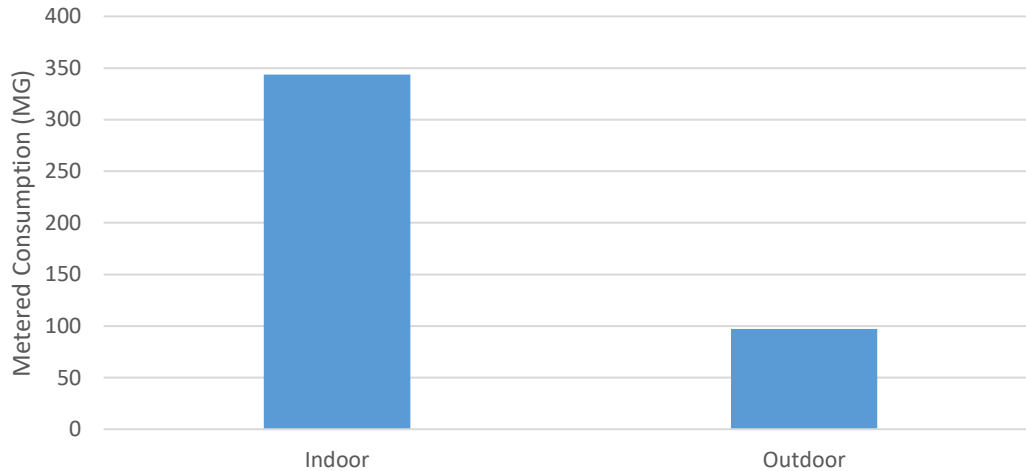


Exhibit 2-58 shows average estimated indoor and outdoor water use from 2008-2019. Indoor water use was estimated by averaging winter water use (December through March) for all residential customers for the eleven year period. Outdoor water use was estimated by taking the difference of the annual average and subtracting the estimated winter indoor average, and then averaging for the eleven year period. Indoor water use was approximately three and a half times greater than outdoor water use over the eleven year period.

**Exhibit 2-58. TVWD Average Annual Indoor and Outdoor Metered Consumption, 2008-2019**



## 2.10. Per Capita Demand

Exhibit 2-59 presents the overall system, and residential per capita demands for the JWC members. Demand from all sources and total population data from 2019 were used to estimate overall system average day per capita demand. Residential per capita demand was estimated based on the proportion of residential water use within each system. Overall system per capita average and maximum day demands ranged from 91.7 to 177.8 gallons and 170.7 to 293.6, respectively. Larger overall system per capita demands can result from greater proportions of commercial and industrial water uses. The residential per capita average day demands, including both single-family and multi-family residences, ranged from 52.6 gallons to 76.0 gallons.

**Exhibit 2-59. 2019 Per Capita Demand for JWC Member Agencies**

JWC Member	ADD (MG)	MDD (MG)	MDD/ADD Peaking Factor	2019 Population	ADD per capita (gal)	MDD per capita (gal)	Residential Percentage of Total Use	Residential ADD per capita (gal)
Hillsboro	18.3	30.2	1.7	102,692	177.8	293.6	30%	52.5
Forest Grove	3.1	4.4	1.4	25,303	122.4	172.7	62%	76.0
Beaverton	8.3	15.4	1.9	89,978	91.7	170.7	62%	57.1
TVWD	22.6	38.3	1.7	214,717	105.4	178.4	69%	72.6

## 2.11. Water Rights

*OAR 690-086-0140(5)*

The JWC's use of water is authorized by numerous water rights, including rights for the use of natural flow, storage rights, secondary rights to use stored water, and Aquifer Storage and Recovery (ASR) rights. These water rights authorize the use of water for municipal purposes, with the exception of two water rights for pollution abatement. Some water rights are held by the JWC, some are held by the Barney Reservoir Joint Ownership Commission, and some are held by the individual member agencies. Exhibit 2-60 provides a summary of JWC water rights and further description is provided below.

In addition to the water rights used by the JWC, the individual member agencies hold surface water and groundwater rights for use outside of the JWC system, but within the individual member agencies municipal water supply systems. These water rights are also for municipal use. Exhibit 2-61 provides a summary of water rights held by member agencies that supply water for their individual municipal water supply systems and further description is provided below.

Some JWC member agencies hold additional water rights that are not part of their municipal water supply systems, such as water rights for irrigation and wildlife, which are summarized in Appendix C.

Exhibit 2-60. JWC Water Rights

Source	Priority Date	Application	Permit	Certificate/ Transfer	Entity name on water right	Type of Beneficial Use	Authorized Rate (cfs)	Authorized Volume	Maximum Rate of Withdrawal To Date		Average Daily Diversion (mgd)		Average Monthly Diversion (MG)		Authorized Date of Completion
									Instantaneous (cfs)	Annual (MG)	2019	5-year (2014-2019)	2019	5-year (2014-2019)	
JWC Water Rights															
Sain Creek	1/22/1912	S-2016	S-1136	81026	City of Hillsboro	Municipal	3	n/a	3		21.60	27.04	657.03	822.5	n/a
Sain Creek	5/1/1915	S-4250	S-2443	81027	City of Hillsboro	Municipal	2	n/a	2						n/a
Gales Creek	2/14/1947	S-22251	S-17549	<del>85113</del> T-11677	City of Forest Grove	Municipal	4.46	n/a	4.46						10/1/2035
Tualatin River	8/15/1930	S-13681	S-10408	67891	City of Hillsboro	Municipal	9	n/a	9						n/a
Tualatin River	2/6/1974	S-51643	S-46423	85913	City of Hillsboro	Municipal	43	n/a	43						n/a
Tualatin River	7/15/1980	S-60357	S-45455	85914	City of Beaverton	Municipal	25	n/a	25						n/a
Tualatin River	4/28/1976	S-54203	S-40615	85916	City of Forest Grove	Municipal	33	n/a	33						n/a
Tualatin River	1/31/2018	S-88506			Joint Water Commission	Municipal	44	n/a	0						
Scoggins Creek	6/9/1988	S-69637	S-54737		City of Hillsboro, City of Forest Grove, City of Beaverton, Tualatin Valley Water District, Joint Water Commission	Municipal	75 <sup>1</sup>	n/a	0						10/1/2071
Middle Fork of the North Fork Trask River (Barney Reservoir)	6/26/1958 & 12/10/1965	R-32420	R-4890	81024	City of Hillsboro	Municipal	n/a	12,600 AF & 7,400 AF	n/a	12,600 AF & 7,400 AF					n/a
Middle Fork of the North Fork Trask River and Barney Reservoir	6/26/1958	S-32421	S-32139	81020	City of Hillsboro	Municipal	38.7	n/a	38.7						n/a
Barney Reservoir	6/24/1971	S-48359	S-37837	81022	City of Forest Grove	Municipal	n/a	500 AF	n/a	500 AF					n/a
Middle Fork of the North Fork Trask River (in Barney Reservoir)	12/23/1971	R-48907	R-5773	81023	City of Hillsboro	Pollution Abatement	n/a	2,000 AF	n/a	2,000 AF					n/a
Barney Reservoir	7/8/1971	S-48420	S-35782	81021	City of Hillsboro	Pollution Abatement	30	n/a	30						n/a
Barney Reservoir	12/26/2017	S-88492	S-55219		Barney Reservoir Joint Ownership Commission	Municipal	30	8,734	0						7/26/2039
Scoggins Creek	2/20/1963	R-38449	R-5777	81149	Bureau of Reclamation	Irrigation, Supplemental Irrigation, Municipal, Water Quality Control, and Fish and Recreation	n/a	60,000 AF (13,500 AF for Municipal Use by JWC Member Agencies)	n/a	60,000 AF					n/a

Source	Priority Date	Application	Permit	Certificate/ Transfer	Entity name on water right	Type of Beneficial Use	Authorized Rate (cfs)	Authorized Volume	Maximum Rate of Withdrawal To Date		Average Daily Diversion (mgd)		Average Monthly Diversion (MG)		Authorized Date of Completion
									Instantaneous (cfs)	Annual (MG)	2019	5-year (2014-2019)	2019	5-year (2014-2019)	
JWC Water Rights, continued															
Scoggins Reservoir/Henry Hagg Lake	2/20/1963	S-38447	S-35792	87304	Bureau of Reclamation	Municipal	70.0	13,000	70.0						n/a
Scoggins Reservoir/Henry Hagg Lake	2/20/1963	S-38447	S-35792	93873	Bureau of Reclamation	Municipal	n/a	500 AF	n/a	500 AF	n/a	n/a	n/a	n/a	n/a
Sain Creek, Tualatin River, Scoggins Creek and the Bull Run River, tributaries of Scoggins Creek, the Willamette River, the Tualatin River, and the Sandy River.			ASR LL-019		Joint Water Commission	Aquifer Storage and Recovery (ASR)	Recovery: up to 28,000 gpm (40.3 mgd) total (2000 gpm, 2.9 mgd) from each of 14 wells	2.1 billion gallons	0	0	0	0	0	0	9/27/2021

<sup>1</sup>Diversion of water under Permit S-54737 is currently limited to 26.0 cfs due to the development limitations in the extension of time dated September 9, 2010 and the subsequent WMCP Final Order dated September 14, 2010.

Notes

AF = acre-feet  
ASR = aquifer storage and recovery  
cfs = cubic feet per second

gpm = gallons per minute  
JWC = Joint Water Commission  
LL = limited license

MG = million gallons  
mgd = million gallons per day  
N/A = not applicable

TVWD = Tualatin Valley Water District

Exhibit 2-61. Non-JWC Water Rights Held by JWC Member Agencies

Source	Priority Date	Application	Permit	Certificate/ Transfer/Claim	Entity name on water right	Type of Beneficial Use	Authorized Rate (cfs)	Authorized Volume	Maximum Rate of Withdrawal To Date		Average Daily Diversion (mgd)		Average Monthly Diversion (MG)		Authorized Date of Completion
									Instantaneous (cfs)	Annual (MG)	2019	5-year (2015-2019)	2019	5-year (2015- 2019)	
Non-JWC Water Rights Held By Member Agencies															
City of Hillsboro															
Willamette River	12/6/1976	S-55010	S-55045 (Permit amendment T-12512)		City of Salem, City of Hillsboro	Municipal	200 (56 cfs of which is the City of Hillsboro’s portion) <sup>1</sup>	n/a	0	0	0	0	0	0	10/1/2086
Crandall Reservoir ASR Well Butternut Creek ASR Well Wood Street ASR Well			ASR LL-027		City of Hillsboro	Aquifer Storage and Recovery (ASR)	Recovery: up to 1725 gpm per well for up to three wells	900 MG	0	0	0	0	0	0	1/21/2025
City of Forest Grove															
Branches of Clear Creek	3/29/1917	S-5460	S-3318	2194	City of Forest Grove	Municipal	0.80	n/a	0.80		1.92	1.52	58.42	46.28	
Four Branches of Clear Creek	4/16/1935	S-15790	S-12034	13471	City of Forest Grove	Municipal	1.00	n/a	1.00						
Branches of Clear Creek	7/27/1939	S-18298	S-13944	13797	City of Forest Grove	Municipal	1.00	n/a	1.00						
Roaring Creek, a tributary of Clear Creek, and Clear Creek, a tributary to Gales Creek	4/28/1976	S-54203	S-40615	92949	City of Forest Grove	Municipal	4.46, being 2.43 cfs from Roaring Creek and 2.83 from Clear Creek	n/a	4.46, being 2.43 cfs from Roaring Creek and 2.83 from Clear Creek						
City of Beaverton															
Native Groundwater • Well #1 Golf Cr. Basin • Well #2 Fanno Cr. Basin  ASR 2  ASR 3  ASR 4  Rubber Reservoir Well  Dernbach Well  ASR 5  ASR 6  ASR 7	1932 (Well #1)  1945 (Well #2)	--	--	GR modification T-10990; GR 343	City of Beaverton	Municipal	3.01  (1,350 gpm) Note: Original authorized appropriation for Well #1 is 400 gpm (0.89 cfs) and Well #2 is 950 gpm (2.12 cfs).	NA	3.01	N/A	0.12 (ASR) + 0.47 (native ground- water) = 0.58 <sup>2</sup>	0.17 (ASR) + 0.43 (native ground- water) = 0.59 <sup>2</sup>	3.58 (ASR) + 14.21 (native ground- water) = 17.78 <sup>2</sup>	5.08 (ASR) + 13.00 (native ground-water) = 18.08 <sup>2</sup>	N/A



Source	Priority Date	Application	Permit	Certificate/ Transfer/Claim	Entity name on water right	Type of Beneficial Use	Authorized Rate (cfs)	Authorized Volume	Maximum Rate of Withdrawal To Date		Average Daily Diversion (mgd)		Average Monthly Diversion (MG)		Authorized Date of Completion
									Instantaneous (cfs)	Annual (MG)	2019	5-year (2015-2019)	2019	5-year (2015- 2019)	
City of Beaverton, continued															
Willamette River	3/11/2014	S-87964	S-54940	--	City of Beaverton	Municipal	33.7	N/A	0	N/A	0	0	0	0	05/4/2035
Tualatin River and Bull Run	N/A	--	ASR LL-002	--	City of Beaverton and TVWD	ASR	Recovery: up to 14.4 mgd from 13 wells	Storage: up to 1.5 billion gallons	Recovery: up to 9 mgd from 4 wells	Storage: up to 1.15 billion gallons	2.0 (Beaverton's use)	2.0 (Beaverton's use, 2014- 2019)	45.5 (Beaverton's use)	1.7 (Beaverton's use, 2014- 2019)	12/20/2023  Limited License renewable every 5 years
Tualatin Valley Water District															
Groundwater, tributary to Beaverdam Creek	1/21/1959	G-1351	G-1229	<del>86081</del> Transfer T-11612	TVWD and Aloha Huber Water District	Municipal	0.58 <sup>3</sup>	116 acre- feet Season of use limited to: May 1 - Sept. 30	0.58		0	0	0	0	10/1/2035; Transfer added five points of appropriation
Groundwater, a tributary to Beaverton Creek	5/2/1957	G-637	G-588	<del>36440</del> Transfer T-11612	Aloha Huber Water District	Municipal	1.10	N/A	1.10		0	0	0	0	10/1/2035; Transfer added five points of appropriation
Groundwater, a tributary to Butternut Creek	2/23/1962	G-2242	G-2064	<del>36441</del> Transfer T-11612	Aloha Huber Water District	Municipal	2.2	N/A	2.2		0	0	0	0	10/1/2035; Transfer added five points of appropriation
Willamette River	6/19/1973	S-50693	S-49240	Permit amendment T-10477	Willamette River Water Coalition	Municipal and Industrial	202 <sup>4</sup>	N/A	0 <sup>5</sup>	0	0	0	0	0	10/1/2047
Tualatin River and Bull Run	N/A	--	ASR LL-002	--	City of Beaverton and TVWD	ASR	Recovery: up to 14.4 mgd from 13 wells	Storage: up to 1.5 billion gallons	Recovery 4.45 cfs (2.9 mgd)	211.1	0.51	0.45	15.4	13.54	12/20/2023  Limited License renewable every 5 years

<sup>1</sup> The City of Salem assigned the City of Hillsboro a 56 cfs portion of the total permitted rate of 200 cfs in August 2016 and retained the remaining 144 cfs. Diversion of water under Permit S-55045 is currently limited to 30.94 cfs for the City of Hillsboro due to the development limitations in the extension of time dated July 31, 2015 and the subsequent Final Order approving the City of Hillsboro’s WMCP dated August 28, 2017.

<sup>2</sup> Due to rounding, the parts do not exactly equal the total.

<sup>3</sup> Total diversion, in combination with the remaining irrigation right (Certificate 44119), is limited to 1.31 cfs.

<sup>4</sup> Diversion of water under Permit S-49240 is currently limited to 80.1 cfs for TVWD due to the development limitations in the extension of time dated June 26, 2007 and the subsequent Final Order approving TVWD’s WMCP dated January 16, 2015.

<sup>5</sup> Although the City of Sherwood has used water under the WRWC Permit S-49240, TVWD has not diverted any water under this permit to date.

Notes

AF = acre-feet  
ASR = aquifer storage and recovery  
cfs = cubic feet per second

gpm = gallons per minute  
JWC = Joint Water Commission  
LL = limited license

MG = million gallons  
mgd = million gallons per day  
N/A = not applicable

TVWD = Tualatin Valley Water District

## 2.11.1. JWC Water Rights

### Overview

The JWC's current water supply sources are the Tualatin River and its tributaries, which include a combination of natural flow and stored water released from Hagg Lake, and Barney Reservoir in the Trask River watershed. The JWC, along with its member agencies and the Barney Reservoir Joint Ownership Commission (BRJOC), have several water rights granting access to these water supply sources. The intergovernmental agreements previously described in Section 2 clarify how and when these water rights are pooled together.

The JWC also holds a limited license (ASR LL-019) for an aquifer storage and recovery (ASR) program. TVWD, the City of Hillsboro, and the City of Beaverton each has access up to one-third of the capacity of the JWC limited license.

### Direct Diversion (Natural Flow) Water Rights

The JWC manages water rights for the use of natural flow from:

- the Tualatin River with authorized points of diversion at the Haines Falls Intake and at the Spring Hill Pumping Plant (SHPP);
- Sain Creek, which flows into Scoggins Creek at Hagg Lake, with points of diversion on Sain Creek and at the Scoggins Dam outlet, with re-diversion authorized at the SHPP;
- Scoggins Creek; and
- Gales Creek, with an authorized additional point of diversion at the SHPP.

These water rights for natural flow consist of six certificates, one water right in transfer status, one permit, and one permit application.

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

The JWC manages the following four certificated water rights for natural flow from the Tualatin River for municipal purposes:

- Certificate 67891, in the name of the City of Hillsboro, has a priority date of August 15, 1930 and authorizes diversion of up to 9.0 cfs (the authorized points of diversion are at the Haines Falls Intake and at the SHPP Intake);
- Certificate 85913, in the name of the City of Hillsboro, has a priority date of February 6, 1974 and authorizes diversion of up to 43.0 cfs;
- Certificate 85916, in the name of the City of Forest Grove, has a priority date of April 28, 1976 and authorizes the use of up to 33.0 cfs; and
- Certificate 85914, in the name of the City of Beaverton, has a priority date of July 15, 1980, and authorizes the use of up to 25.0 cfs.

The JWC manages Transfer T-11677, which added a point of diversion to enable the JWC to divert up to 4.46 cfs of water from Gales Creek at the SHPP Intake. However, water can only be diverted at the additional point of diversion (POD) from June 1 through September 30 if a streamflow gaging station with telemetry is installed at or near the original POD on Gales Creek and streamflow measurements are taken using a protocol and following a frequency stated in the Final Order approving Transfer T-11677. Transfer T-11677 has a priority date of February 14, 1947, and a development deadline of October, 1, 2035.

The JWC holds Permit S-54737, which allows up to 75.0 cfs to be diverted from Scoggins Creek for municipal purposes from October 1 through May 31. Diversion of water under Permit S-54737 is currently limited to 26.0 cfs due to the development limitations in the extension of time dated September 9, 2010 and the subsequent WMCP Final Order dated September 14, 2010. The priority date of this permit is June 9, 1988, which makes it a junior water right in the Tualatin River Basin. This right is subordinate to the fill schedule of Scoggins Reservoir, and requires bypass of 20 cfs from October 1 through November 30 and 15 cfs from December 1 through May 31.

The JWC has Application S-88506 pending at OWRD requesting a water right for municipal use of up to 44 cfs from the Tualatin River. The requested permit is intended to increase the reliability of the JWC's water supply during a portion of the non-peak season (December 1 through April 30). The permit would not, however, provide additional water supply, because use of water under the requested permit, in combination with use of the 75 cfs authorized by Permit S-54737, will be limited to a total of 75 cfs. The priority date of the water right would be January 31, 2018.

## **Storage Rights and Secondary Rights to Use Stored Water**

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

## **Barney Reservoir**

The storage and secondary rights associated with Barney Reservoir are: Certificates 81020, 81021, 81023, and 81024 in the name of the City of Hillsboro; 81022 in the name of the City of Forest Grove; and Permit S-55219 in the name of Barney Reservoir Joint Ownership Commission (BRJOC). The stored water in the reservoir is currently allocated among JWC members by agreements through the BRJOC, and some of the water is also released for Clean Water Services and ODFW.

- Certificates 81023 and 81024, combined, authorize storage of up to 20,000 acre-feet of water from the Middle Fork of the North Fork Trask River in Barney Reservoir.
  - Certificate 81023 has a priority date of December 23, 1971, and authorizes the storage of water for pollution abatement. Clean Water Services manages releases of this stored water for pollution abatement in the Tualatin River.
  - Certificate 81024 has priority dates of June 26, 1958, and December 10, 1965, and authorizes storage for municipal purposes.
- Certificates 81020, 81021, and 81022 and Permit S-55219 authorize the use of the water stored in Barney Reservoir.
  - Certificate 81020 has a priority date of June 26, 1958, and authorizes the use of up to 38.70 cfs for municipal purposes.
  - Certificate 81021 has a priority date of July 8, 1971, and authorizes the use of up to 30.0 cfs for pollution abatement.
  - Certificate 81022 has a priority date of June 24, 1971, and authorizes the use of up to 500 acre-feet of stored water for municipal purposes.
  - Permit S-55219 has a priority date of December 26, 2017, and authorizes the use of up to 30 cfs (limited to 8,734 AF) for municipal purposes.

## **Scoggins Reservoir**

The Bureau of Reclamation holds Certificate 81149, which authorizes storage of up to 60,000 acre feet from Scoggins Creek in Scoggins Reservoir/Henry Hagg Lake for irrigation, municipal, water quality, fish, and recreation purposes. The Bureau of Reclamation has contracts with JWC member agencies (Hillsboro, Forest Grove, and Beaverton) to provide up to 13,500 acre-feet of stored water from the reservoir for municipal purposes under two secondary water rights. Certificate 87304 authorizes the use of up to 70 cfs (and up to 13,000 acre-feet) from Scoggins Reservoir. Certificate 93873 authorizes use of up to 500 acre-feet of water stored from Scoggins Reservoir during the irrigation season of each year.

## **Reservoir Storage and Release Management**

The JWC actively participates in the Tualatin River Flow Management Technical Committee. This committee provides a mechanism for the coordination and management of flow in the Tualatin

River. The members of the committee are technical staff who possess detailed knowledge of specific flow and water quality characteristics of the Tualatin River and represent several stakeholders in the basin including the following agencies:

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

Since its inception in 1987, the Tualatin River Flow Management Technical Committee has prepared annual reports documenting the flow management of the Tualatin River. In addition to detailing reservoir releases and river withdrawals for each agency, these reports also highlight overall basin characteristics, such as precipitation patterns, water quality, and improvement projects. The communication and coordination among various Tualatin River users that comes from this committee is invaluable to the JWC. The annual flow reports can be viewed on the Washington County Watermaster's website (District 18) at <http://www.co.washington.or.us/Watermaster/index.cfm>

### **JWC ASR Program**

The JWC (on behalf of the City of Hillsboro, City of Beaverton, and TVWD) holds ASR Limited License #019 (LL-019) to assess the feasibility of developing a regional ASR project in the Cooper Mountain vicinity. Each partner has access to one-third of the capacity of the Limited License.

OWRD most recently granted the JWC a five-year time renewal for ASR LL-019, from September 27, 2016 to September 27, 2021. ASR LL-019 was issued in the name of the JWC to authorize ASR pilot testing. It authorizes the storage of up to 2.1 billion gallons, which can be injected using up to 14 wells. Water can be injected at a maximum rate of 8,100 gpm (11.7 mgd). The JWC ASR limited license authorizes recovery of the stored water at a combined rate of up to 28,000 gpm (40.3 mgd). Recovery is limited to 2,000 gpm (2.9 mgd) at each of the 14 recovery wells, which are also the injection wells.

Thus far, development under ASR LL-019 has included development of ASR wells and test wells. No ASR pilot testing activities have occurred to date.

## **Non-JWC Water Rights Held By Member Agencies**

### **City of Hillsboro**

The City holds a 56 cfs portion of Permit S-55045, which authorizes the use of water from the Willamette River year-round for municipal purposes. The City of Salem assigned the City of Hillsboro a 56 cfs portion of the total permitted rate of 200 cfs in August 2016 and retained the remaining 144 cfs. Diversion of water under Permit S-55045 is currently limited to 30.94 cfs for the City of Hillsboro due to the development limitations in the extension of time dated July 31, 2015 and the subsequent Final Order approving the City of Hillsboro's WMCP dated August 28, 2017 (The City of Salem is currently not authorized to divert any water under Permit S-55045). The priority date of this permit is December 6, 1976. The current development timeline for this permit is October 1, 2086. Permit amendment T-12512 changed the authorized point of diversion for the City's 56 cfs portion of the permit to the Willamette River Intake near the City of Wilsonville. In addition, the City holds ASR Limited License LL-0274, which authorizes recovery of up to 1,725 gpm per well for up to three wells and storage of up to 900 MG.

As shown in Appendix C, the City has numerous non-municipal water rights for purposes other than potable water supply. The sources of these water rights include the Tualatin River, Barney Reservoir, McKay Creek and tributaries, Glencoe Swale, Beaverton Creek, Bronson Creek, Rock Creek and tributaries, Dairy Creek, a tributary to Jackson Slough, Sain Creek, a pond, wastewater effluent, and wells. The uses under these water rights include pollution abatement, irrigation, supplemental irrigation, multi-purpose storage, wetlands creation enhancement, wildlife, hydroelectric production, nursery operations, fish culture, aesthetics, storage of wastewater, and instream. Many of these water rights have been acquired through land acquisitions. The City's efforts identifying and tracking water rights acquired through land acquisitions are described in the City's 2017 WMCP.

### **City of Forest Grove**

The City of Forest Grove has its own water treatment facility and holds a number of non-JWC natural flow water rights that can be used in conjunction with its JWC water supply. Forest Grove holds three certificates authorizing use of natural flow of up to 2.80 cfs from branches of Clear Creek, a tributary of Gales Creek, for municipal purposes. Certificate 2194 for the use of up to 0.8 cfs has a priority date of March 29, 1917, Certificate 13471 for the use of up to 1.0 cfs has a priority date of April 16, 1935, and Certificate 13797 for the use of up to 1.0 cfs has a priority date of July 27, 1939. Additionally, Forest Grove holds Certificate 92949 for the use of up to 4.46 cfs, being 2.43 cfs from Roaring Creek, and 2.83 cfs from Clear Creek for municipal purposes. Certificate 92949 has a priority date of April 28, 1976.

### **City of Beaverton**

The City holds three non-JWC water rights: a surface water right for use of the Willamette River, a groundwater right (groundwater registration), and a limited license for the use of water for ASR.

The City's one groundwater registration (i.e. a claim to a groundwater right that pre-dates Oregon's Ground Water Act of 1955), GR-343, claims the right to use up to 1,350 gpm (3.01 cfs) for municipal purposes. The registration originally included two wells, with claimed priority dates of 1932 and 1945. The City amended GR-343 under GR modification T-10990 (approved September 3, 2014) to add six additional wells (ASR wells numbers two through seven) as authorized points of appropriation and to change the authorized place of use. The City amended GR-343 again under GR modification T-13012 (approved April 9, 2020) to add five points of appropriation (ASR 5, ASR 6K, ASR 3-IW1, ASR 3-IW2, and ASR 3-IW3).

The City and TVWD were issued ASR Limited License #002 (LL-002) in 1998, which authorized ASR pilot testing for 5 years (until 2003). OWRD subsequently renewed ASR LL-002 four times (2003, 2009, 2013, 2018). Most recently, OWRD extended ASR LL-002 to December 20, 2023. ASR LL-002 authorizes the storage of up to 1.5 billion gallons, which can be injected using up to 13 wells. The project's water sources are the Tualatin River, as authorized under the City's existing municipal water right Certificate 85914 (further described above), and the Bull Run River, as authorized by ORS 538.420. Water can be diverted from these sources for ASR purposes at a combined rate of 12.5 mgd, with diversion from the Bull Run River limited to 2 mgd. ASR LL-002 authorizes the recovery of the stored water for municipal use at a rate of up to 14.4 mgd, and specifies recovery rates of 1.5 mgd or 3.0 mgd for each of the 13 recovery wells, which also serve as the injection wells. To date, up to 954 MG has been stored in a single year and up to 6 mgd has been recovered from three wells.

The City also holds Permit S-54940, which authorizes the use of up to 33.7 cfs of water from the Willamette River year-round for municipal purposes and has a priority date of March 11, 2014. The current development timeline for this permit is May 4, 2035.

## **TVWD**

TVWD holds five non-JWC water rights: a surface water right for use of the Willamette River, three groundwater rights, and a joint limited license for the use of water for ASR.

TVWD is the managing agency and a member of the Willamette River Water Coalition (WRWC), which holds Permit S-49240 modified by Permit Amendment T-10477. The WRWC also includes the Cities of Tigard, Tualatin, and Sherwood. This permit authorizes use of up to 202 cfs from the Willamette River year-round for municipal and industrial purposes and it has a priority date of June 19, 1973. Diversion of water under Permit S-49240 is currently limited to 80.1 cfs for TVWD due to the development limitations in the extension of time dated June 26, 2007 and the subsequent Final Order approving TVWD's WMCP dated January 16, 2015 (The City of Sherwood's diversion of water under Permit S-49240 is currently limited to 9.04 cfs as a result of the Final Order approving the City of Sherwood's WMCP dated December 20, 2018). To date, the cities of Tigard and Tualatin have not sought access to any water under Permit S-49240. The current development timeline for this permit is October 1, 2047. Currently, the City of Sherwood is the only WRWC member that is appropriating water under Permit S-49240.

TVWD holds three water rights for the use of groundwater for municipal purposes, all under Transfer T-11612 that added five points of appropriation to former Certificates 86081, 36440,



and 36441. The water rights previously evidenced by Certificates 36440 and 36441 authorized the use of up to 1.1 cfs and 2.2 cfs of groundwater year-round, respectively. The water right evidenced by Certificate 86081 authorized the use of up to 0.58 cfs of groundwater from one well. This water right originally authorized the use of groundwater for irrigation use. As a result, it has a period of use limited to May 1 through September 30 and an annual volume limitation of 116 acre-feet.

As described above, TVWD and the City of Beaverton jointly hold ASR Limited License #002 (LL-002).

## **2.12. Aquatic Resources Concerns**

*OAR 690-086-140(5)*

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 state-designated Critical Groundwater Area.

### **2.12.1. Water Quality**

The JWC's water rights authorize diversions on the Tualatin River and tributary creeks, and the Middle Fork of the North Fork Trask River. The Tualatin River and many of its tributaries are on the Department of Environmental Quality's (DEQ) 303(d) list for several water quality issues. Some JWC members also hold municipal water rights on the Willamette River and non-municipal water rights on tributaries in the Tualatin River basin that are 303(d) listed for multiple water quality impairments within the reach of the permitted points of diversion. Water quality issues by source are listed for JWC municipal water rights and for non-JWC municipal and non-municipal water rights held by JWC Member Agencies in Appendix D.

### **2.12.2. Listed Fish Species**

Listed fish species with state or federal protections that occur in the Tualatin River watershed, Trask River watershed, and the Willamette River (at approximately River Mile 39) are summarized in Exhibit 2-62. The Trask River watershed contains JWC water sources, the Tualatin River watershed contains JWC water sources and non-JWC water sources held by JWC Member Agencies, and the Willamette River is a non-JWC water source held by some JWC Member Agencies.



**Exhibit 2-62. Native Fish Species that Occur Within the Tualatin River Basin (includes JWC and non-JWC water sources held by JWC Member Agencies), Trask River Basin (includes JWC water source), and Willamette River (non-JWC water source held by JWC Member Agencies) that are Listed as Sensitive, Threatened, or Endangered Under the Oregon or Federal Endangered Species Acts**

Listed Fish Species	Type of Listing		Evolutionarily Significant Unit (ESU)/ Species Management Unit (SMU) (i.e., Range of Federal/State Listing)	Affected Watershed(s)
	Federal	State		
Fall Chinook	Threatened	Sensitive-Critical	Lower Columbia River	Tualatin, Willamette
Spring Chinook	Threatened	Sensitive-Critical	Lower Columbia River, Upper Willamette River	Tualatin, Willamette
Coastal Cutthroat		Sensitive-Vulnerable, below Willamette Falls	Lower Columbia River, including up to Willamette Falls; Coastal Cutthroat Trout Species Management Unit (SMU)	Tualatin, Willamette, Trask
Coho Salmon	Threatened	Endangered	Lower Columbia River, including up to Willamette Falls	Tualatin, Willamette
Coastal Spring Chinook		Sensitive-Critical	Coastal Spring Chinook SMU	Trask
Coastal Coho Salmon	Threatened	Sensitive-Vulnerable	Coastal Coho Salmon SMU/ Oregon Coast	Trask
Coastal Winter Steelhead		Sensitive-Vulnerable	Oregon Coast	Trask
Winter Steelhead	Threatened	Sensitive-Critical	Lower Columbia River, Upper Willamette River	Tualatin, Willamette
Summer Steelhead		Sensitive-Vulnerable	Oregon Coast ESU/Coastal SMU	Trask
		Sensitive-Critical	Lower Columbia SMU/ESU	Tualatin, Willamette
Chum Salmon	Threatened	Sensitive-Critical	Columbia River	Tualatin, Willamette
Oregon Chub		Sensitive-Vulnerable	Willamette SMU	Tualatin, Willamette
Bull Trout		Sensitive-Vulnerable	Willamette SMU	Tualatin, Willamette

Listed Fish Species	Type of Listing		Evolutionarily Significant Unit (ESU)/ Species Management Unit (SMU) (i.e., Range of Federal/State Listing)	Affected Watershed(s)
	Federal	State		
Western Brook Lamprey		Sensitive-Vulnerable	Columbia River System	Tualatin, Willamette, Trask
Pacific Lamprey	Petitioned for listing	Sensitive-Vulnerable	Columbia River System	Tualatin, Willamette, Trask
Pacific Eulachon	Threatened	Sensitive-Vulnerable	Southern DPS, Northern Oregon and Washington	Tualatin, Willamette, Trask

**Sources:**

ESA listed species, from the National Oceanic and Atmospheric Administration (NOAA).  
[https://archive.fisheries.noaa.gov/wcr/publications/gis\\_maps/maps/salmon\\_steelhead/critical\\_habitat/wcr\\_salmonid\\_ch\\_esa\\_july2016.pdf](https://archive.fisheries.noaa.gov/wcr/publications/gis_maps/maps/salmon_steelhead/critical_habitat/wcr_salmonid_ch_esa_july2016.pdf)

Oregon State Sensitive Species, from the Oregon Department of Fish and Wildlife:  
[https://www.dfw.state.or.us/wildlife/diversity/species/docs/2017\\_Sensitive\\_Species\\_List.pdf](https://www.dfw.state.or.us/wildlife/diversity/species/docs/2017_Sensitive_Species_List.pdf)

Federal Species of Concern, from the U.S. Fish and Wildlife Service, Oregon Fish and Wildlife Office:  
<http://www.fws.gov/oregonfwo/Species/Data/PacificLamprey/default.asp>

## 2.12.3. Critical Groundwater Areas

### JWC Water rights

The JWC does not hold native groundwater rights for municipal water supply, so a critical groundwater area designation does not apply to its municipal water rights.

### Non-JWC Water Rights held By Member Agencies

The Cities of Hillsboro and Forest Grove do not hold native groundwater rights for municipal water supply, so a critical groundwater area designation does not apply to their municipal water rights. The City of Hillsboro's non-municipal groundwater rights are not located within critical groundwater areas. The City of Beaverton's native groundwater right (groundwater registration GR-343 modified by T-10990) for municipal water supply is within the Cooper Mountain-Bull Mountain Critical Groundwater Area. The City of Beaverton's ASR wells are located adjacent to the wells under the native groundwater right. TVWD's groundwater rights are located within the Cooper Mountain-Bull Mountain Critical Groundwater Area, as well.

## **2.13. Evaluation of Water Rights and Supply**

### **2.13.1. Tualatin River Basin and Barney Reservoir Water Supply**

The amount of water available to satisfy the JWC's water rights is a function of streamflow, water right priority date, and stored water.

Almost all precipitation in the Tualatin River Basin falls as rain during the months of November through April. This leads to high winter flows, with peak flows on the magnitude of 2,000 to 3,200 cfs near the JWC WTP. Little precipitation occurs during the low-flow months of May through October. The lowest river flows, typically less than 200 cfs, occur during the months of July, August, and September.<sup>10</sup> In the months of June through September, the Tualatin River yields less than 2 percent of its total annual discharge.<sup>11</sup>

As with all waters in the State of Oregon, the waters of the Tualatin and Trask Rivers are administered through OWRD's water right process. The Tualatin River has numerous water rights for consumptive uses (e.g., irrigation, industrial and municipal uses) and non-consumptive uses (e.g., recreation, fish protection and pollution abatement). These water rights are all regulated under the prior appropriation system. During water shortages, senior water rights have priority, and the junior water rights may be curtailed or regulated off by the Tualatin River Basin Watermaster to serve the senior water right holders' needs.

Water rights in the Tualatin River Basin date back to 1880, and as a result, even the JWC's most senior natural flow water right with a priority date of January 22, 1912 (Certificate 81026) has the potential to be regulated off. Five times in the past six years, every Tualatin River natural flow right used by the JWC was regulated off because of low flows and junior priority dates. These occurred from: July 31 through August 7, 2015; September 2 through 19, 2017; and in 2018 from August 31 through September 12, September 21 through October 9, and October 29 through 31. The Watermaster looks at flows at the Golf Course gage to regulate most of the JWC's water rights.

Exhibit 2-63 depicts in "red" the JWC water rights that are typically regulated off during the peak season. Beginning in mid-May to early June, the following rights are typically regulated off: Certificates 85913, Certificate 85914, and Certificate 85916, and Transfer T-11677. In addition, the authorized season of use for Permit S-54737 (and Application S-88506 if a permit is issued) preclude use from June through October. Although not depicted in the exhibit, the two Sain Creek water rights are periodically regulated off in September, and in an average year, these natural flow water rights are available for use again in mid-October or early November.

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<sup>10</sup> USGS: *Sediment Oxygen Demand in the Tualatin River Basin, Oregon 1992-1996*.

<sup>11</sup> <http://www.epa.gov/fedrgstr/EPA-IMPACT/2001/December/Day-13/i30775.htm>

To provide water during low-flow summer months, JWC members currently rely on stored water, and as needed, individual member agencies rely on ASR, City of Portland, and non-JWC water rights. Starting in early June, JWC's releases from Scoggins and Barney Reservoirs can average 115 acre-feet per day for 140 days. The JWC stores water during November through April or May for use during the low-flow, peak season months. Exhibit 2-63 depicts in "yellow" the secondary water rights for use of stored water that the JWC typically does not use during the non-peak season: Certificate 81020, Certificate 87304, and Permit S-55219.

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Exhibit 2-63. JWC municipal water rights, monthly rates, seasonal volumes, and typical regulation during peak season

(Red = JWC water rights typically regulated off during the peak season; Yellow = secondary water rights for use of stored water that the JWC typically does not use during the non-peak season)

Source	Priority Date	Application and Permit	Certificate or Transfer	Entity name on water right	Type of Beneficial Use	Authorized Rate (cfs)	Authorized Volume (AF)		Monthly Rate or Seasonal Volume (cfs unless otherwise noted)												
									Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep 1-14	Sep 15-30	Oct	Nov	Dec
Sain Creek	1/22/1912	A: S-2016	c. 81026	City of Hillsboro	MU	3	n/a		3	3	3	3	3	3	3	3	3	3	3	3	
		P: S-1136																			
Sain Creek	5/1/1915	A: S-4250	c. 81027	City of Hillsboro	MU	2	n/a		2	2	2	2	2	2	2	2	2	2	2	2	
		P: S-2443																			
Tualatin River	8/15/1930	A: S-13681	c. 67891	City of Hillsboro	MU	9	n/a		9	9	9	9	9	9	9	9	9	9	9	9	
		P: S-10408																			
Tualatin River	2/6/1974	A: S-51643	c. 85913	City of Hillsboro	MU	43	n/a		43	43	43	43	43	43	43	43	43	43	43	43	
		P: S-46423																			
Tualatin River	7/15/1980	A: S-60357	c. 85914	City of Beaverton	MU	25	n/a		25	25	25	25	25	25	0	0	25	25	25	25	
		P: S-45455																			
Tualatin River	4/28/1976	A: S-54203	c.85916	City of Forest Grove	MU	33	n/a		33	33	33	33	33	33	33	33	33	33	33	33	
		P: S-40615																			
Scoggins Creek	6/9/1988	A: S-69637	--	Joint Water Commission	MU	75	n/a		75	75	75	75	75	0	0	0	0	0	75	75	
P: S-54737																					
Tualatin River	1/31/2018	A: S-88506	--	Joint Water Commission	MU	44	n/a		75	75	75	75	0	0	0	0	0	0	0	75	
Gales Creek	2/14/1947	A: S-22251	T-11677	Forest Grove	MU	4.46	n/a		4.46	4.46	4.46	4.46	4.46	4.46	4.46	4.46	4.46	4.46	4.46	4.46	
		P: S-17549																			
Middle Fork of the North Fork Trask River and (Barney Reservoir)	6/26/1958	A: S-32421	c. 81020	City of Hillsboro	MU	38.7	n/a		38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	
		P: S-32139																			
Scoggins Reservoir	2/20/1963	A: S-38447	c. 87304	Bureau of Reclamation	MU	70	13,000		70	70	70	70	70	70	70	70	70	70	70	70	
		P: S-35792																			
Barney Reservoir	12/26/2017	A: S-88492	--	Barney Reservoir Joint Ownership Commission	MU	30	8734		30	30	30	30	30	30	30	30	30	30	30	30	
		P: S-55219																			
Subtotals (With Typical Regulation)									194.46	194.46	194.46	194.46	194.46	152.7	152.7	152.7	152.7	152.7	152.7	194.46	194.46

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The reliability of Permit S-54737 (up to 75 cfs from Scoggins Creek during the non-peak season) is affected by permit extension conditions. As part of the municipal permit extension process, the Oregon Department of Fish and Wildlife (ODFW) recommended to OWRD that the extensions of time for this permit include conditions intended to “maintain the persistence of listed fish.” These conditions include curtailment beginning any time flows drop below 175 cfs at the point of diversion, which is the maximum authorized rate of Permit S-54737 (75 cfs) plus the target flows of 100 cfs on the Tualatin River measured at U.S. Geological Survey (USGS) Gage 14204800 (Golf Course Gage). If flows drop below 175 cfs, use of the undeveloped portion of the permit would be reduced based on the remaining flows measured at the Golf Course Gage as calculated and described in Permit S-54737. Exhibit 2-64 shows the curtailment flow under Permit S-54737, as well as average minimum flows from 2000 through 2018 and minimum flows in 2018. Exhibit 2-65 shows the number of days and range of months that the seven-day rolling average flow did not meet the above-described curtailment flows, as well as the rate and percentage by which the curtailment flows were missed. The curtailment flows often are not met in October as a result of such factors as low flows, ongoing water diversions by TVID, and refilling of Scoggins Reservoir. The curtailment flows often are not met in May as a result of such factors as increasing irrigation diversions, increasing municipal diversions, and refilling of Scoggins Reservoir.

**Exhibit 2-64. Curtailment Flows for Fish Persistence in the Tualatin River for Permit S-54737, Measured at U.S. Geological Survey (USGS) Gage 14204800 at Golf Course Gage**

Period	Curtailment Flow (cfs)	2000 - 2018 Averaged Minimum 7-day Rolling Average (cfs)	2018 Minimum 7-day Rolling Average (cfs)
October	175	91	85
November	175	169	53
December	175	549	90
January	175	719	1,079
February	175	543	406
March	175	679	524
April	175	477	555
May	175	179	81



**Exhibit 2-65. Tualatin River Flows at Golf Course Gage (seven-day rolling average) compared to Permit S-54737 Curtailment Flows, 2000-2018**

Year	Number of Days Flow Target Missed	Range	Average Deficit (cfs)	Average Deficit (%)	Max Deficit (cfs)	Max Deficit (%)
2008	61	October 1 - December 27	37	49%	75	100%
2009	39	October 1 - November 8	48	65%	75	100%
2010	26	October 1 - October 26	47	63%	71	94%
2011	50	October 1 - November 19	52	69%	75	100%
2012	29	October 1 - October 29	49	65%	70	94%
2013	46	May 2 - November 7	46	62%	70	93%
2014	37	January 4 - November 23	49	66%	69	92%
2015	74	April 27 - November 14	57	76%	75	100%
2016	36	May 6 - October 10	59	78%	75	100%
2017	28	October 1 - November 7	49	66%	65	87%
2018	79	May 18 - December 13	55	73%	75	100%
2019	92	May 8 - December 13	56	75%	75	100%

### 2.13.2. JWC ASR Program

TVWD and the Cities of Hillsboro and Beaverton have initiated an ASR project, which is authorized by ASR limited license #019 (held by the JWC). The limited license authorizes a maximum storage volume of 2.1 billion gallons and a maximum combined recovery rate of 40.3 mgd (62.3 mgd). To date, water has not been stored under this ASR limited license.

### 2.13.3. City of Beaverton/TVWD ASR Program

The City of Beaverton holds a joint ASR limited license with TVWD for a maximum authorized rate of 14.4 mgd from 13 wells. Water is injected into these wells under Certificate 85914 sourced from the Tualatin River via JWC.<sup>12</sup> In addition to the ASR limited license, the City of Beaverton holds groundwater rights totaling 3.06 cfs (1,350 gpm) from the same City of Beaverton wells used for their ASR operation. The City of Beaverton relies on two ASR wells to

<sup>12</sup> LL-019 allows water to be sourced from both the Tualatin River under Certificate 85914 and the Bull Run River under ORS 538.420, but Beaverton and TVWD sources only from the Tualatin River for their ASR programs.

meet its summer demand; these wells have a maximum combined capacity of approximately 5.0 mgd, although the optimal operating output for the wells is 2.0 mgd.

Although natural flow water rights served by JWC can have limitations (as described above), wintertime diversions for recharging of the ASR wells reduces the potential for surface water availability constraints because of greater winter stream flows. With that said, the ASR limited license does not have the same administrative protections of permitted or certificated water rights, and continued operations will have to meet OWRD's requirements, which could change over time.

#### **2.13.4. TVWD Groundwater**

TVWD's groundwater rights authorize the use of a total of up to 3.88 cfs. TVWD currently has three wells (Scheupbach, Grabhorn, and 189th Avenue) to appropriate groundwater under its groundwater rights. TVWD's current production capacity from these three wells is 3,036 gpm (6.8 cfs), which is sufficient to meet the maximum authorized rates of its existing groundwater rights. Two of the wells are used as emergency or backup supply sources (Scheupbach and 189th Avenue) while the other well (Grabhorn) is actively used for ASR.

Moreover, TVWD's groundwater rights are within the Cooper Mountain-Bull Mountain Critical Ground Water Area (CMBM CGWA). The CMBM CGWA order limits the total use of groundwater from the basalt aquifer within the CGWA to 2,900 acre-feet per year and provides that OWRD will allocate that amount among the existing water right holders. In recent years, the use of groundwater within the CGWA has been significantly less than the 2,900 acre-foot limitation. There is, however, no guarantee that groundwater use under existing water rights in the area will not increase in the future. In that event, OWRD could limit TVWD's use of groundwater to maintain the 2,900 acre-foot limitation. Despite this limitation, the water supply provided by these groundwater rights is relatively secure. The groundwater levels within the CMBM CGWA are stable or rising and TVWD's groundwater rights provide a reliable emergency or backup water supply.

#### **2.13.5. Willamette River Water for Hillsboro, Beaverton, and TVWD**

The Willamette River is scheduled to be a water supply source for TVWD, and the cities of Hillsboro and Beaverton in 2026. As previously described, the City of Hillsboro holds a 56 cfs portion of Permit S-55045 that will be used to meet future demands and to provide water supply redundancy. The City of Beaverton holds Permit S-54940 for 33.7 cfs that will be used to provide water supply redundancy and a reliable winter supply for recharging its ASR wells. TVWD will rely on water supply from the WRWC's Permit S-49240 to replace the wholesale purchase of City of Portland water. Permit S-49240 authorizes up to 202 cfs of withdrawal from the Willamette River. The reliability of these water rights on the Willamette River are described in the individual WMCPs developed by TVWD and the cities of Hillsboro and Beaverton.

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## 3. Water Conservation Element

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

### 3.1. Introduction

This section of the WMCP addresses the water conservation activities undertaken by the JWC Member Agencies, as well as conservation efforts implemented regionally that result in reduced water use by JWC Member Agencies and their customers. Each Member Agency's current conservation efforts and those planned for the future are described.

### 3.2. Progress Report

*OAR 690-086-0150(1)*

The JWC developed a WMCP Progress Report in 2015, as required under the WMCP Final Order issued by OWRD on September 14, 2010. The 2015 JWC WMCP Progress Report described progress made towards implementing five-year water conservation benchmarks outlined in the OWRD-approved 2010 WMCP. Exhibits 3-1 through 3-4 presents an update of JWC Member Agency efforts to implement those five-year water conservation benchmarks.

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City of Hillsboro

**Exhibit 3-1. City of Hillsboro Water Conservation Progress Report**

Section Requirement	Sub-section Requirement	2010 Benchmarks	2019 Benchmark Status
<p>OAR 690-086-150 (4)</p> <p>A description of the specific activities, along with a schedule that establishes five-year benchmarks, for implementation of each of the following conservation measures that are required of all municipal water suppliers:</p>	(a) An annual water audit that includes a systematic and documented methodology for estimating any un-metered authorized and unauthorized uses	Continue to conduct annual water audit, collect water audits from other JWC members, and submit water audit information to OWRD.	The City continues to conduct annual water audits. The City ceased submitting water audit reports to OWRD on an annual basis after OWRD stated that it only wanted annual water audit reports with WMCP updates and progress reports.
		Install an AMR system.	See OAR 690-086-150(4)(b).
		Revise and improve the bulk water program used for construction purposes, including requiring contractors to rent a hydrant meter instead of estimating water use. The new program and policy will be adopted by the City's Utilities Commission by the end of 2010.	The City approved and implemented a new bulk water program in Spring 2010. Contractors are no longer allowed to estimate bulk water usage then pay based on that estimate. Contractors must use a hydrant meter and pay for the metered water usage.
	(b) If the system is not fully metered, a program to install meters on all un-metered water service connections.	Fully install an automated meter reading (AMR) system within 10 years.	The City completed its AMR install in October 2018, ahead of schedule, and all customers were transferred to monthly billing in May 2019.
		Continue to meter all connections.	All connections are metered.
	(c) A meter testing and maintenance program	Replace all City of Hillsboro and JWC sonic master meters with magnetic flow meters in the next treatment plant expansion project scheduled to occur between 2016 and 2020.	The City replaced all City of Hillsboro sonic master meters in Fall 2010 with magnetic meters. Replacement of these master meters has resulted in more accurate unaccounted-for water data. The City continues to track system gains/losses. JWC sonic master meters were also replaced in FY 2015/2016. The City also performs an annual meter audit on meters 3-inches or larger.
	(d) A rate structure under which customers' bills are based, at least in part, on the quantity of water metered at the service connections	Evaluate the potential impact on water conservation of adjusting its tiered rates during the next rate study planned for 2013.	The City completed the rate study and the most recent rate changes were made in January 2020.
		Continue to analyze the monthly and seasonal peaking of each customer category and compare those factors to the rate structure.	The City completed the rate study and adjusted the rate structure so each class is billed fairly for system demand.
	(e) If the annual water audit indicates that system leakage	Continue regular leak surveys and line maintenance to continue to decrease the loss in the system.	The City conducts leak surveys during the winter. Leaks are then evaluated for their potential water loss and fixed on a prioritized basis. The City has a leakage rate of less than 10%. In addition, the City

Section Requirement	Sub-section Requirement	2010 Benchmarks	2019 Benchmark Status
	exceeds 10 percent, a regularly scheduled and systematic program to detect leaks in the transmission and distribution system using methods and technology appropriate to the size and capabilities of the municipal water supplier;		purchased new leak detection equipment. From February 2016 - July 2019 the City surveyed 669 miles of pipeline and found 49 leaks.
		Use the new AMR program to more closely monitor for leaks resulting in even less water loss.	The AMR program is designed to flag both intermittent leaks and sustained leaks in the customer side of the distribution system. The City notifies the customer of the potential leak so the customer can take corrective action.
OAR 690-086-150 (6)  If the supplier serves a population greater than 1,000 and proposes to expand or initiate diversion of water under an extended permit for which resource issues have been identified under OAR 690-086-0140(5)(i), or if the supplier serves a population greater than 7,500, description of the specific activities, along with a schedule that establishes five-year	(f) A public education program to encourage efficient water use and the use of low water use landscaping that includes regular communication of the supplier's water conservation activities and schedule to customers	Continue the aggressive public outreach conservation program.	The City continues to have an aggressive public outreach program. In 2010, the City added another Conservation staff person to further implement conservation programs. In 2011, the City added a residential WaterSense toilet rebate program and in 2014 an irrigation controller rebate program, and partnered on an indoor water and energy audit program with the Energy Trust of Oregon. In 2014, the audit program changed from including a site visit to operating completely online, and as of 2019, City staff conduct residential water audits. In 2013, the City designed a water-saving devices display board for events, which allows customers to only take the devices that they want to install rather than handing out generic conservation kits. The City continues to provide conservation information and water-saving devices at local events, such as the Latino Festival, Celebrate Hillsboro, County Fair, Earth Day events, Community Action Fair, and Watershed Tour Event. The City continues to implement its youth education program, which consists of classroom presentations about water resources that integrate water conservation messages. The Water Department continues to administer an annual conservation calendar for all elementary students related to water conservation messaging. Calendars are distributed to all participating schools. The City also contributes \$1,000 and staff time to help coordinate the annual Clean Water Festival, a regional water educational learning opportunity for fourth graders. The City installed a Water Wise demonstration garden in Jackson Bottom Wetland Preserve in 2018 and continues to fund the garden for new plants and maintenance.
		Update the Hillsboro Water Department website to include more information on indoor and outdoor conservation tips by mid-2010.	The City continues to have the <a href="http://www.hillsborowater.org">www.hillsborowater.org</a> website. The City added descriptions of water conservation programs to the website, along with teacher resources for conservation education. The City continues to have the Regional Water Providers website <a href="http://www.regionalh2o.org">www.regionalh2o.org</a> , which has updated water conservation videos along with emergency preparedness information. The City added a gardening website, <a href="http://www.hillsborogardening.org">www.hillsborogardening.org</a> with local sustainable plant options. The City also participated in several news segments about water conservation on several local news channels from 2013 – present. Since 2017 the City added a link to a Toilet Tips page and

Section Requirement	Sub-section Requirement	2010 Benchmarks	2019 Benchmark Status
<p>benchmarks, for implementation of each of the following measures;</p> <p>or documentation showing implementation of the measures is neither feasible nor appropriate for ensuring the efficient use of water and the prevention of waste</p>			provided new links to “how to” water conservation videos. A new tree care webpage was added to the conservation section on the City’s website to promote healthy tree care and water efficiency.
		Revamp overall website layout to make the information more accessible.	In 2010, the City launched a water supply website that included a water conservation section. The Water Department website will be revamped again in July 2021, which will include an updated water conservation webpage.
	(a) A system-wide leak repair or line replacement program to reduce system leakage to 15 percent and if the reduction of system leakage to 15 percent is found to be feasible and appropriate, to reduce system leakage to 10 percent	Continue to maintain the leak adjustment policy and budget.	The City updated its leak adjustment policy in 2020. To ensure that leaks are fixed properly and to avoid fraud, a customer now only qualifies for a leak adjustment once in an eighteen-month period, and must provide authentic receipt as proof of payment for expenses related to leak repair. The City added a better explanation of how to check for leaks to its website.
		Continue to maintain an annual budget for the steel line replacement program targeting high priority aging infrastructure.	<p>The City targets approximately \$2 million per year in funded depreciation projects to replace high priority aging infrastructure. The actual dollar value budget varies each year based on revenue and overall expenditure projections.</p> <p>In 2011, the City replaced 6,666 linear feet and spent \$600,000.  In 2012, the City replaced 1,831 linear feet and spent \$50,000.  In 2013, the City replaced 9,662 linear feet and spent \$235,000.  In 2014, the City replaced 10,701 linear feet and spent \$2.6 million.  In FY 2015, the City replaced 9,953 linear feet and spent \$147,000.  In FY 2016, the City replaced 6,002 linear feet and spent \$794,000.  In FY 2017, the City replaced 4,901 linear feet and spent \$1,704,000.  In FY 2018, the City replaced 748 linear feet and spent \$718,000.  In FY 2019, the City replaced 227 linear feet and spent \$11,000.</p> <p>From February 2016-July 2019, 669 miles of pipeline were surveyed and 49 leaks were repaired.  *Cost for linear foot varies widely based on pipe size and scope of project. The cost of the 2014 pipe replacement includes a large scale replacement project on two major streets owned by ODOT - Oak and Baseline.</p> <p>The City uses its GIS system to track pipe age. This information is used to decide which part of the system is in most need of replacement when funded depreciation projects are chosen annually.</p>
		Continue to adjust customer bills when leaks are repaired.	The City continues to adjust customer bills when leaks are repaired, according to the policy updated in 2020.
	(b) Technical and financial assistance programs to encourage and aid residential, commercial, and industrial	The Parks Department is considering expansion of its Community Garden program to other sites and the Water	In the past five years, the City has provided compost, water-wise gardening educational information, rain gauges, aqua spikes, and planting brochures to Cavalry and Sunrise Community Gardens. The City contributed compost and materials to City View Charter School's water-wise gardening program. In 2018, the City completed the Water Wise demonstration garden at Jackson Bottom. The



Section Requirement	Sub-section Requirement	2010 Benchmarks	2019 Benchmark Status
	customers in implementation of conservation measures;	Department will take its water-wise message, educational materials and water-conserving tools to those sites as well.	City has also provided mulch and multi-stream rotators that save up to 30% water at several parks in Hillsboro in partnership with the Hillsboro Parks Department. Signs have been displayed to educate public of these partnerships and water efficiency updates.
		Work with Master Gardeners at the Washington County Fair Complex Demonstration Garden to provide an educational showcase of water-wise gardening techniques for the general public.	In recent years, the Master Gardeners have said that they do not have a need for the City's assistance, so the City has focused on supporting other garden programs. The City has been assisting community gardens by providing compost and water-wise education materials and equipment. In 2010, the City assisted with the development of a water-wise demonstration garden at Dairy Creek in cooperation with Parks Dept. and local high school students. In 2011, the City partnered with City View Charter School and 4-H on a water-wise educational garden. In 2013, the City developed a partnership with Jackson Bottom to establish a water-wise demonstration garden and provided \$5,000 for the project. The project was completed in 2018. Jackson Bottom is a City park and a high-traffic recreation area. The City continues to seek opportunities to promote water-wise gardening techniques at community garden events and considers the development of new gardens a priority. In addition, the City provided a water audit and expertise in behavioral changes to Calvary Lutheran Church in 2011.
		Become a member of the Alliance for Water Efficiency by 2010.	The City became an Alliance for Water Efficiency member in 2010.
	(c) Supplier financed retrofitting or replacement of existing inefficient water using fixtures, including distribution of residential conservation kits and rebates for customer investments in water conservation;	Complete a feasibility study (in conjunction with the City of Beaverton) on the most cost effective rebate programs within EPA's new WaterSense certification and labeling program by 2011.	The City completed the feasibility study in 2010 using funding from the Water Conservation, Reuse and Storage Grant Program (established by Senate Bill 1069). The City received a report from HDR with descriptions of potential WaterSense conservation programs to pursue. The report describes various types of rebate programs and included cost-benefit analyses.
		The feasibility study will analyze the types of rebate programs including landscape rebates, washing machines, low flow and high-efficiency toilets, and weather-based irrigation controllers.	The City presented results to the Utilities Commission in 2010 after receiving approval of the report from the State. In 2011, the Utilities Commission approved the recommendations to add WaterSense-labeled high-efficiency toilet rebates and to partner with the Energy Trust for affordable indoor audits. The City implemented both programs in 2011 and the programs are ongoing. In 2013, the City expanded the rebate program to include mobile homes, condominiums, and town homes if the residence is owned, even if the residence is served by a common meter. In addition to a water audit and expertise in behavioral changes that the City provided to Calvary Lutheran Church, City staff provided \$1,500 in funding for toilet replacements. The retrofits

Section Requirement	Sub-section Requirement	2010 Benchmarks	2019 Benchmark Status
			reduced average daily usage an average of 470 gallons per day. The City currently offers rebates for water efficient toilets, weather-based irrigation controllers, and water efficient washing machines.
		The program will analyze the water savings and complete a cost benefit analysis of the different types of rebates including projected budgets for each organization.	The City monitored TVWD's ET controller pilot program. Based on what the City learned from TVWD and the rebate feasibility study, City staff decided to implement a similar ET program for City customers. In 2014, the City added \$200 residential rebates for WaterSense-labeled Weather-Based Irrigation Controllers. The ET program has been very popular. The City consulted with TVWD staff to set up the program. In 2014, the City also funded a WaterSense-labeled Irrigation Controller for International Paper. From 2014 – 2019, the City has issued rebates for weather-based irrigation controllers at several commercial and HOA properties.
		By 2012, obtain data, determine how well waterless urinals work in a school setting, and evaluate the feasibility of encouraging Hillsboro School District and other non-profit, industrial, or commercial sites to consider making the change.	The City interviewed Forest Hills (previously known as Westside Lutheran) on the effectiveness, satisfaction level, and maintenance issues related to the waterless urinals pilot project. Forest Hills is very happy with the three waterless urinals that were installed in 2009. There were no problems with any aspects, including odor and drain lines, and the satisfaction level on performance is very high. No clear correlations could be made between reduced bills or consumption and the installations due to school enrollment changing from year to year. However, it is known that the new equipment uses less water than traditional fixtures, so savings are occurring. The maintenance and cleaning of this equipment is greater than traditional fixtures. Thus, their application in high-use settings is not highly recommended. If a specific customer expressed interest and a high level of commitment, attempts to partner would be made. In 2014, the City funded two additional urinals for the school as part of the City's efforts to increase water conservation among its industrial, commercial, and institutional customers. No problems have occurred with any aspect, including odor and drain lines, and the satisfaction level on performance continues to be high.
	(d) Adoption of rate structures, billing schedules, and other associated programs that support and encourage water conservation;	Continue to promote conservation based rate structures.	The City continues to promote a conservation-based rate structure. The City's Irrigation customer class rate is set high to promote conservation and to reduce water demand peaks during the summer season. The City occasionally talks with third-tier customers (customers with high enough water usage that their water use is charged at a higher, third-tier rate) about their water usage and the impact of the three-tier rate structure on their water bill. The City educates these customers and provides tips for lowering water use to help them stay out of the third tier. After completing the AMR meter install in October 2018, all customers were transferred to monthly billing in May 2019 to encourage water conservation by allowing customers to see their bills sooner. New rates continue to be implemented every year.
		Conduct a rate study by 2013, and determine if the adopted rate structure had the expected conservation results on water use by each customer category.	The City completed its latest rate study in 2018, and is in its third year of implementing rate recommendations. Rate adjustments are recommended in the study and considered by the Utilities Commission for implementation on an annual basis (usually in January of each year). The City continues to have a three-tiered water rate system. The base rate was frozen for residential

Section Requirement	Sub-section Requirement	2010 Benchmarks	2019 Benchmark Status
			customers the last two years, with the rate increase applying to the consumption rate only, to give customers more control over their water charges and encourage them to pursue conservation measures. The Multi-Family Class had its rate structure changed to include a peaking factor, in order to encourage reduced peaking and reward multi-family complexes that conserve water during summer (peaking) months. The next rate study is planned for 2023.
	(e) Water reuse, recycling, and non-potable water opportunities; and	Include a preliminary feasibility study related to water reuse in the City’s high volume industrial areas in the next Hillsboro Water Master Plan in 2009.	<p>The City completed the Water System Master Plan in 2014. Appendix 1.1 includes Tech Memo 07 on "Water Reuse - Waste Stream Quantity and Quality Analysis," and Tech Memo 08 on "Water Reuse - Water Reuse Treatment Process Requirements." The Water System Master Plan identified two sources of wastewater for reuse purposes: treated effluent from Clean Water Service’s Rock Creek Advanced Wastewater Treatment Facility for domestic potable water supply, and the "process wastewater" stream from industries in the Hillsboro Dawson Creek area. The City continues to explore water reuse feasibility with Clean Water Services and other industrial customers.</p> <p>The City evaluated providing reuse water to a City park for irrigation, but the project was not implemented due to the significant infrastructure improvements identified.</p>

City of Forest Grove

**Exhibit 3-2. City of Forest Grove Water Conservation Progress Report**

Section Requirement	Sub-section Requirement	2010 Benchmarks	2019 Benchmark Status
OAR 690-086-150 (4) A description of the specific activities, along with a schedule that establishes five-year benchmarks, for implementation of each of the following conservation measures that are required of all municipal water suppliers:	(a) An annual water audit that includes a systematic and documented methodology for estimating any un-metered authorized and unauthorized uses	By 2011, improve water audit record keeping and consider ways of changing computer software to better compare and report water use.	In 2012, the City implemented improvements in water audit record keeping. Production and consumption reports are generated and used to analyze water loss.
	(b) If the system is not fully metered, a program to install meters on all un-metered water service connections	Continue to meter all connections.	The City continues to meter all connections.
	(c) A meter testing and maintenance program	Convert all meters to AMR meters within the next 5 to 7 years.	The City completed its conversion to AMR meters and uses AMR meters for all new customer connections
	(d) A rate structure under which customers' bills are based, at least in part, on the quantity of water metered at the service connections	Continue a volumetric rate for each customer class and continue the three-tier rate structure for the single-family customer category.	The City continues to use a volumetric rate for each customer class and a three-tier rate structure for the single-family customer category.
	(e) If the annual water audit indicates that system leakage exceeds 10 percent, a regularly scheduled and systematic program to detect leaks in the transmission and distribution system using methods and technology appropriate to the size and capabilities of the municipal water supplier;	Continue the current leak detection and repair program.	The City continues to implement its leak detection and repair program as described in the JWC's 2010 WMCP. The City completed a project in early January 2015 to repair a leak at the Forest Grove Water Treatment Plant. The leak was estimated at 60-70 gallons per minute. The City also recently completed City Water Treatment Plant Filter Leak repairs and repaired a leak on a 5 MG storage reservoir.
	(f) A public education program to encourage efficient water use and the use of low water use	Continue the current public education activities.	The City continues to implement the public education activities described in the JWC's 2010 WMCP. The City also distributes low flow showerheads, hose nozzles, and faucet aerators and offers toilet rebates.

Section Requirement	Sub-section Requirement	2010 Benchmarks	2019 Benchmark Status
	landscaping that includes regular communication of the supplier's water conservation activities and schedule to customers	By 2012, expand the website to include more water conservation information, including a link to ET data.	The City is still working to add more water conservation information to its website, including a link to ET data.
OAR 690-086-150 (6) If the supplier serves a population greater than 1,000 and proposes to expand or initiate diversion of water under an extended permit for which resource issues have been identified under OAR 690-086-0140(5)(i), or if the supplier serves a population greater than 7,500, description of the specific activities, along with a schedule that establishes five-year benchmarks, for	(a) A system-wide leak repair or line replacement program to reduce system leakage to 15 percent and if the reduction of system leakage to 15 percent is found to be feasible and appropriate, to reduce system leakage to 10 percent	Continue the current system-wide leak repair program.	The City continues to implement its system-wide leak repair program, as described in the JWC's 2010 WMCP. The City conducts sonic leak tests on 50,000ft of system distribution piping per year (approximately 12% of the total system).
	(b) Technical and financial assistance programs to encourage and aid residential, commercial, and industrial customers in implementation of conservation measures;	Within 5 years, evaluate expanding the current home energy audit program to include more water conservation consultation.	The City evaluated the current home energy audit program and decided not to include more water conservation consultation at this time. The City will focus its resources on its other water conservation measures instead.
	(c) Supplier financed retrofitting or replacement of existing inefficient water using fixtures, including distribution of residential conservation kits and rebates for customer investments in water conservation;	In 2010, evaluate the potential costs, market penetration, and water savings from expansion of the rebate program to also include toilets, landscape equipment, and weather-based irrigation controllers.	The City Council created a goal to provide a residential high-efficiency toilet rebate and implemented the program in 7/1/19 (\$525 distributed so far).
	(d) Adoption of rate structures, billing schedules, and other associated programs that support and encourage water conservation;	Continue providing conservation messages on water bills.	The City continues to provide water conservation messages in water bills.

Section Requirement	Sub-section Requirement	2010 Benchmarks	2019 Benchmark Status
implementation of each of the following measures; or documentation showing implementation of the measures is neither feasible nor appropriate for ensuring the efficient use of water and the prevention of waste	(e) Water reuse, recycling, and non-potable water opportunities; and	Continue to forward customer and business inquiries on water reuse and recycling to Clean Water Services.	The City continues to forward customer and business inquiries on water reuse and recycling to Clean Water Services.
		Continuing to recycle backwash water and to seek non-potable water use opportunities.	The City continues to recycle backwash water and to seek non-potable water use opportunities.
	(f) Any other conservation measures identified by the water supplier that would improve water use efficiency.	None.	None.

City of Beaverton

**Exhibit 3-3. City of Beaverton Water Conservation Progress Report**

Section Requirement	Sub-section Requirement	2010 Benchmarks	2019 Benchmark Status
OAR 690-086-150 (4) A description of the specific activities, along with a schedule that establishes five-year benchmarks, for implementation of each of the following conservation measures that are required of all municipal water suppliers:	(a) An annual water audit that includes a systematic and documented methodology for estimating any un-metered authorized and unauthorized uses	Continue to conduct an annual water audit and to participate in the JWC annual water audit program.	The City continues to conduct an annual water audit and to participate in the JWC annual water audit program. The City relocated and replaced the 36-inch master meter that was at Cornelius Pass Rd due to suspected errors in the old meter as the result of a lightning strike. The new magnetic meter is now located at the SE corner of Tualatin Valley Highway and SW 209th. The work was completed in early 2015 as part of the Reeds Crossing Waterline Project, which is a project to establish a connection between the JWC and the WWSP transmission systems.
	(b) If the system is not fully metered, a program to install meters on all un-metered water service connections.	Pilot an AMR program, and if feasible, replace approximately 10 percent of existing meters by 2015.	The City is fully metered and has approximately 18,500 meters. The City investigated an AMR program in 2010-2011 and found that the program would not have a reasonable economic benefit to the City under current pricing of AMR meters, including the field installation costs. The City also made contact over multiple years with PGE regarding the possibility of a joint fixed-network AMR system, which PGE was in the process of building for electrical power metering and data transfer. The City learned that PGE decided not to pursue the joint project in 2011. Since AMR was not found to be feasible for the City at this time, the City has been investigating a product called "Virtual Network," which is backed by Verizon and is supposed to be capable of retrofitting existing meters to achieve the equivalent of a fixed network automated meter reading system using cell phone technology.
	(c) A meter testing and maintenance program	Continue the current meter testing and maintenance program.	Continue the current meter testing and maintenance program, including annual testing of the largest meters.
		Continue the aggressive meter replacement program with a goal of replacing 700 residential meters annually, and commercial meters as needed.	The City replaced the following number of meters: 350 meters in 2010, 530 meters in 2011, 350 meters in 2012, 360 meters in 2013, and 440 meters in 2014. The City continues to replace 10-15 meters over 3 inches in diameter a year and replaces approximately 1,000 meters less than 3 inches in diameter each year.
	(d) A rate structure under which customers' bills are based, at least in part, on the quantity of water metered at the service connections	Conduct a rate study that will evaluate alternative rate structures intended to encourage water conservation. Present results of the study and recommended actions to the City Council by January 1, 2015.	The City completed a rate study in 2012 that evaluated rate alternatives and developed a rate model to test various rate modifications. The rate study determined that a "Tiered Rate Structure" is not in the best interest of the City at this time, because it would not be effective at helping to conserve water, would require a high administrative burden, and could not be carried out with the City's existing financial software. The City has implemented one recommendation from the study by increasing fixed monthly charges to improve revenue stability. The City's annual rates have increased approximately 5 percent per year in recent years by modifying base and commodity charges. Based on recommendations from an HDR study on System Development Costs, the City recently started reading meters monthly.



Section Requirement	Sub-section Requirement	2010 Benchmarks	2019 Benchmark Status
	(e) If the annual water audit indicates that system leakage exceeds 10 percent, a regularly scheduled and systematic program to detect leaks in the transmission and distribution system using methods and technology appropriate to the size and capabilities of the municipal water supplier;	Continue spending approximately \$1,000,000 annually over the next five years on repairs, replacements, and upgrades to existing water distribution mains, including replacement of service lines, valves, fire hydrants and customer meters.	The City continues to implement its annual capital improvements program to identify old and leaking mains and replacement/renewal projects of high priority water lines. The City replaces water lines based on the history of leaks in a particular water line and cost-effectiveness, and is beginning to consider the need to replace water lines based on corrosion potential. The City's budget continues to meet or exceed \$1 million for replacement/renewal of aging water distribution system facilities. Calls reporting leaks are logged and addressed by Public Works staff. The City contracts for leak detection surveys as needed.
	(f) A public education program to encourage efficient water use and the use of low water use landscaping that includes regular communication of the supplier's water conservation activities and schedule to customers	Continue to participate in local, JWC EEC, and regional public education and outreach activities as identified by the city and those particular committees.	The backbone of the City's conservation program is its participation in the long-running Regional Water Providers Consortium water conservation program, which has an aggressive media campaign and educational opportunities for the public. The City's annual water conservation budget is \$34,000, of which \$17,000 goes to the Consortium conservation program. The City continues to participate in local, JWC Education and Events Committee, and regional public education and outreach activities, such as the Children's Clean Water Festival. The City had 6 grade school water conservation performances and distributed conservation literature. The City annually staffs a conservation booth at large public gatherings, such as fairs and local farmers markets, where it provides conservation information and water savings devices. The City also provides water audits each year to large water customers. Conservation information and water savings devices are available to the public at City Hall and the City Public Library, as well.
OAR 690-086-150 (6) If the supplier serves a population greater than 1,000 and proposes to expand or initiate diversion of water under an	(a) A system-wide leak repair or line replacement program to reduce system leakage to 15 percent and if the reduction of system leakage to 15 percent is found to be feasible and appropriate, to reduce system leakage to 10 percent	Continue with an ongoing leak detection and distribution system replacement program to help keep unaccounted-for water rates below 10 percent.	The City has a leak detection and line replacement program, as described above. In addition, the City has asset-management software that helps City staff maintain the water system and stay aware of the age of water lines. The software tracks what the date of water line installation, location of installation, and waterline material. The following shows the number of miles of waterline replaced by year: 0.8 miles in 2010, 2.1 miles in 2011, 0.9 miles in 2012, and 0.2 miles in 2013. Since 2013, 2.9 miles of waterline has been replaced. The City's budget continues to meet or exceed \$1 million for replacement or renewal of aging water distribution system facilities.
	(b) Technical and financial assistance programs to	In 2008-2009, conduct a water audit for the Beaverton School District, one of Beaverton's top ten water customers.	The City completed the Beaverton School District water audit.



Section Requirement	Sub-section Requirement	2010 Benchmarks	2019 Benchmark Status
extended permit for which resource issues have been identified under OAR 690-086-0140(5)(i), or if the supplier serves a population greater than 7,500, description of the specific activities, along with a schedule that establishes five-year benchmarks, for implementation of each of the following measures; or documentation showing implementation of the measures is neither feasible nor appropriate for ensuring the efficient use of water and the prevention of waste	encourage and aid residential, commercial, and industrial customers in implementation of conservation measures;	Continue to offer two free water audits per year for large water users.	In 2011, the City completed a water audit for a homeowners association that evaluated the common area irrigation system and identified many areas in need of maintenance and repairs. The City continues to offer two free water audits per year for large water users.
	(c) Supplier financed retrofitting or replacement of existing inefficient water using fixtures, including distribution of residential conservation kits and rebates for customer investments in water conservation;	<p>Complete a feasibility study (in conjunction with the City of Hillsboro) on the most cost effective rebate programs within EPA's new WaterSense certification and labeling program by 2011.</p> <ul style="list-style-type: none"> <li>• The feasibility study will analyze the types of rebate programs including landscape rebates, washing machines, low flow and high-efficiency toilets, and weather-based irrigation controllers.</li> <li>• The program will analyze the water savings and complete a cost benefit analysis of the different types of rebates including projected budgets for each organization.</li> </ul>	The City completed the feasibility study in 2010 using funding from the Water Conservation, Reuse and Storage Grant Program (established by Senate Bill 1069). In 2010, the Beaverton City Council approved a WaterSense-based rebate program to replace washing machines and toilets with more water efficient models. Annual funding of the program has ranged between \$10,000 and \$20,000. The program has resulted in the following number of rebates (by fiscal year): 131 toilet rebates in FY 2012-2013, 135 toilet rebates in FY 2013-2014, and 114 toilet rebates and 10 washing machines rebates in FY 2014-2015, 2017-18: Toilet - 144, Washing Machine - 8 FY 2018-19: Toilet - 190, Washing Machine – 45.
	(d) Adoption of rate structures, billing schedules, and other associated programs that support and encourage water conservation;	Conduct a rate study that will evaluate alternative rate structures intended to encourage water conservation. Present results of the study and recommended actions to the City Council by January 1, 2015.	As previously described, the City completed a rate study in 2012 that evaluated rate alternatives and developed a rate model to test various rate modifications. The rate study determined that a "Tiered Rate Structure" is not in the best interest of the City at this time, because it would not be effective at helping to conserve water, would require a high administration burden, and could not be carried out with the City's existing financial software. The City has implemented one recommendation from the study by increasing fixed monthly charges to improve revenue stability. The City's annual rates have increased approximately 5 percent per year in recent years by modifying base and commodity charges. Based on recommendations from an HDR study on Service Development Costs, the City recently started reading meters monthly. The City has always billed monthly for sewer and storm drain charges, and started billing monthly for water usage in June 2013.
		Evaluate the opportunity to develop a program of providing information/messages on water bills to encourage water conservation.	Currently, mailed water bills do not include a graphic of water use, but the City includes approximately 2 conservation inserts per year in mailed water bills. The City plans to use new hard copy bills in Spring 2016, which will have space for small water conservation messages. The City's website for online payments began showing previous water use in customer water bills in August

Section Requirement	Sub-section Requirement	2010 Benchmarks	2019 Benchmark Status
			2015 and the City has initiated discussions about adding water conservation messages to water bills. As of March 2014, approximately 27 percent of City customers pay online, and that percentage is expected to increase over time. The City is currently exploring the option of offering billing messages for customers using the online payment website.
	(e) Water reuse, recycling, and non-potable water opportunities; and	Continue to forward customer and business inquiries on water reuse and recycling to Clean Water Services.	The City continues to forward customer and business inquiries on water reuse and recycling to Clean Water Services.
		Consider non-potable water use opportunities as they arise, such as for city irrigation.	The City recently annexed 540 acres of undeveloped land and expect up to 13,000 residents to reside there as land is developed. The City is planning to use an existing ASR test well to serve non-potable water (for irrigation, toilet flushing, etc.) to new customers (e.g. new high school, fire station, commercial sites, and high density housing) through a "purple pipe" water distribution system.
	(f) Any other conservation measures identified by the water supplier that would improve water use efficiency.	Expand the ASR program by adding approximately two new wells over the next 5-10 years.	The City became one of three entities participating in a new JWC ASR program in 2010. The JWC ASR program participants conducted a major ASR feasibility study in 2010 to evaluate a potential ASR program on Cooper Mountain with up to 14 wells. The potential ASR program would store up to 2.5 billion gallons of treated drinking water from plentiful winter river flows and the JWC would pump out the stored water for summer use. This program would conserve a large amount of water currently withdrawn from surface water impoundments that release water into the Tualatin River, a water quality limited stream as designated by Oregon DEQ. The JWC ASR program participants drilled two 14-inch diameter wells to 1,000-ft depths as ASR test wells in 2011. Both test wells were successful and showed a future pumping capacity of 12 mgd to meet summer peak use, which can be used to reduce demands on surface water sources during periods of low flow. The City also is preparing to update its Water System Master Plan in FY 2015-2016, which will include recommended efforts to reduce unaccounted-for water and to increase water conservation.
			The City is a member of the Consortium and has enjoyed the benefits of membership including conservation programming opportunities.
			The City's Conservation Program Specialist regularly attends trainings to learn about new programs and technology that can improve the City's conservation program. Trainings include American Water Works Association (AWWA) workshops/conferences and an annual WaterSmart Innovations conference.
			The City is researching the possibility of performing a conservation measures cost-effectiveness analyses, which would identify other conservation measures that will deliver cost-effective and high-impact water savings.

Section Requirement	Sub-section Requirement	2010 Benchmarks	2019 Benchmark Status
			The City has observed that new residential development has a higher peaking factor than older residential developments and anticipates future residential growth will also have greater summer demand by comparison. Therefore, the City is considering targeting outdoor conservation measures to customers in these higher peak areas.

Exhibit 3-4. TVWD Water Conservation Progress Report

Section Requirement	Sub-section Requirement	2010 Benchmarks	2019 Benchmark Status
OAR 690-086-150 (4) A description of the specific activities, along with a schedule that establishes five-year benchmarks, for implementation of each of the following conservation measures that are required of all municipal water suppliers:	(a) An annual water audit that includes a systematic and documented methodology for estimating any un-metered authorized and unauthorized uses	Continue to conduct annual water audits and to submit annual water audits to the JWC.	The 2014 water audit indicated that water loss was negative, which TVWD attributes to historical malfunctioning of its main supply meter from the Portland Water Bureau. This issue was known and in the process of being addressed by PWB during that time period. After replacement of the main supply meter was completed in 2015, water loss estimates have consistently been within industry guidelines. From 2015 through 2019 water loss ranged from a high of 7.0% to a low of 2.4%. Water loss in 2019 was 4.7%.
		Examine water use data to determine trends or abrupt changes.	TVWD examines water use data to determine trends for abrupt changes on an ongoing basis. TVWD completed a thorough investigation of District operations and found no issues in its billing system or the operation of its interties with other water systems. TVWD has worked with neighboring water agencies to verify intertie valves are accounted for and in the "closed" position, and has been performing system leak audits in specific areas of the District.
	(b) If the system is not fully metered, a program to install meters on all un-metered water service connections.	Install AMR meters for all commercial accounts by 2013.	TVWD has installed AMR meters on approximately 96 percent of its 3-inch to 10-inch commercial accounts, which represents over 292 meters. This includes commercial (119), irrigation (4), multi-family residential (153), and production (16) meters. Some of these meters have data logging capability to aid in leak detection, troubleshooting, and conservation efforts. Any remaining non-AMR meters 3-inch and larger will be replaced as they fail to test to specification or as parts become difficult to acquire. Fireline meters are omitted as these assemblies are owned by the customers.
		Evaluate the feasibility of expanding the AMR program, including the possible water conservation benefits, by 2015.	Based on an assessment of the benefits, costs, and feasibility of a broader scale AMR program, TVWD expanded its AMR program. TVWD has installed 21,478 AMR meters.
	(c) A meter testing and maintenance program	Continue the current meter testing and maintenance program.	TVWD has continued its current meter testing and maintenance program. TVWD tests, repairs, or replaces as necessary all meters greater than 2-inches in diameter every two years or less. The 12 remaining large, non-AMR meters will be replaced as they reach the end of their functionality, as parts become difficult to acquire, or as opportunity projects arise. TVWD tests small meters (2 inches or less) in response to customer inquiries or deficiencies noted by staff.
	(d) A rate structure under which customers' bills are based, at least in part, on the quantity of water metered at the service connections	Continue the two-tiered inclining block rate structure.	TVWD continues to have a two-tiered inclining block volume usage charge, known as Block 1 and Block 2, to incentivize conservation. TVWD has used this water rate structure consistently since it was implemented in 1994.

Section Requirement	Sub-section Requirement	2010 Benchmarks	2019 Benchmark Status
	(e) If the annual water audit indicates that system leakage exceeds 10 percent, a regularly scheduled and systematic program to detect leaks in the transmission and distribution system using methods and technology appropriate to the size and capabilities of the municipal water supplier;	Continue to periodically perform leak detection surveys of portions of its system, and respond to identified leaks.	From 2015 through 2019 water loss ranged from a high of 7.0% to a low of 2.4%. Water loss in 2019 was 4.7%.  TVWD continues to periodically perform leak detection surveys of portions of its system and to respond to identified leaks. TVWD has conducted several focused leak detection surveys since 2015. These surveys were conducted in isolated areas of the District to investigate specific, suspected leaks. Several different methods for leak detection are used, including: acoustical listening devices on valves, hydrants, and service lines; water quality testing to detect chlorine and fluoride; and investigating the presence of water in unexpected areas (e.g., surface water runoff occurring during periods of dry weather).
		Continue to educate customers about customer-side leak detection and repair and to notify customers of higher than normal usage.	TVWD continues to promote customer-side leak awareness through utility newsletters, its website, leak kits, participation in the Regional Water Providers Consortium’s “Fix-a-Leak” month-long campaign, and Customer Service staff actively investigating and contacting customers with unusual meter readings or high water usage.
	(f) A public education program to encourage efficient water use and the use of low water use landscaping that includes regular communication of the supplier's water conservation activities and schedule to customers	Work with local schools to develop new and creative programs that foster water stewardship.	TVWD continues to implement a comprehensive Youth Education Program, which provides water conservation materials, presentations, and activities to students at elementary schools and regional events to foster water stewardship. As part of that program, TVWD staff has developed two new presentations (“Water Jeopardy” and “How Clean Is Your Drinking Water?”). TVWD has an active and strong relationship with multiple schools in its service area. Staff also hosts booths at various science fairs.

Section Requirement	Sub-section Requirement	2010 Benchmarks	2019 Benchmark Status
OAR 690-086-150 (6) If the supplier serves a population greater than 1,000 and proposes to expand or initiate diversion of water under an extended permit for which resource issues have been identified under OAR 690-086-0140(5)(i), or if the supplier serves a population greater than 7,500, description of the specific activities, along with a schedule that establishes five-year benchmarks, for implementation of each of the following measures; or documentation showing implementation	(a) A system-wide leak repair or line replacement program to reduce system leakage to 15 percent and if the reduction of system leakage to 15 percent is found to be feasible and appropriate, to reduce system leakage to 10 percent	Continue the current leak detection and repair and water line replacement program.	From 2015 through 2019 water loss ranged from a high of 7.0% to a low of 2.4%. Water loss in 2019 was 4.7%. Regardless of system leakage being less than 10%, TVWD continues to implement a comprehensive leak detection and repair program that emphasizes leak detection surveys and immediate repair of identified leaks. Additionally, TVWD's ongoing capital improvement plan (CIP) has invested approximately \$18.4 million in mains replacement since 2014 (This excludes projects slated strictly for fire flow and includes County projects requiring relocations).  Miles of water line replaced by year: 2014 - 0.68 miles      2016 - 1.44 miles      2018 - 1.29 miles 2015 - 0.83 miles      2017 - 1.56 miles      2019 - 1.57 miles
	(b) Technical and financial assistance programs to encourage and aid residential, commercial, and industrial customers in implementation of conservation measures;	Evaluate the home water assessment pilot program by 2012 and determine if the program will be continued or expanded.	In 2012, TVWD reviewed the home water assessment pilot program and decided to continue this program along with four other regional water providers. However, TVWD subsequently decided to discontinue contracted home water assessments through Energy Trust of Oregon, and instead have TVWD staff provide indoor and outdoor water use assessments to TVWD customer upon request and when recommended by staff due to high water use. Since Fiscal Year 2015-2016, TVWD staff has provided 14 indoor and 72 outdoor water use assessments.
		Continue to promote the Commercial, Industrial and Institutional (CII) program and use it as a platform for influencing large water users to conserve.	Commercial, Industrial, and Institutional (CII) customers continue to have access to rebates for the installation of high-efficiency toilets, weather-based irrigation controllers, high-efficiency irrigation nozzles, and customer organized proposals. Water use assessment services are also available to commercial customers. <u>Number of CII rebates in Calendar Year 2010</u> Toilet rebate: 101, Weather-Based Irrigation rebates: 18, Cooling Tower rebate: 1, Assessments: Landscape 169 irrigation zones, and Indoor Assessments: 12. <u>Number of CII rebates in Calendar Year 2011</u> Toilet rebate: 122, Weather-Based Irrigation rebates: 3, Multi-team Multi-trajectory Rotating Nozzle rebate: 124, Cooling Tower Rebate: 1, Assessments: Landscape 148 irrigation zones, and Indoor Assessments: 10. <u>Number of CII rebates in Calendar Year 2012</u> HET: 83, Weather-Based Irrigation rebates: 11, Multi-stream Multi-trajectory Rotating Nozzle rebate: 134, Customer Organized Proposal rebate: 1, Assessments: Landscape 295 irrigation zones, and Indoor Assessments: 13.

Section Requirement	Sub-section Requirement	2010 Benchmarks	2019 Benchmark Status
of the measures is neither feasible nor appropriate for ensuring the efficient use of water and the prevention of waste			<p><u>Number of CII rebates in Calendar Year 2013</u> HET: 132, Weather-Based Irrigation rebates: 7, Multi-stream Multi-trajectory Rotating Nozzle rebate: 615, Customer Organized Proposal rebate: 1, Assessments: Landscape 4 sites, and Indoor Assessments:2.</p> <p><u>Number of CII rebates in Calendar Year 2014</u> HET: 154, Weather-Based Irrigation rebates: 3, Multi-stream Multi-trajectory Rotating Nozzle rebate: 725.</p> <p><u>Number of CII rebates in FY 2014-2015</u> Toilet: 468, Weather Based Irrigation Controllers: 12, Multi-stream Rotating Nozzles: 82.</p> <p><u>Number of CII rebates in FY 2015-2016</u> Toilet: 167, Weather Based Irrigation Controllers: 19, Multi-stream Rotating Nozzles: 0, Customer Organized Proposal rebate: 0.</p> <p><u>Number of CII rebates in FY 2016-2017</u> Toilet: 26, Weather Based Irrigation Controllers: 1, Multi-stream Rotating Nozzles: 0, Customer Organized Proposal rebate: 0.</p> <p><u>Number of CII rebates in FY 2017-2018</u> Toilet: 458, Weather Based Irrigation Controllers: 0, Multi-stream Rotating Nozzles: 0, Customer Organized Proposal rebate: 0.</p> <p><u>Number of CII rebates in FY 2018-2019</u> Toilet: 29, Weather Based Irrigation Controllers: 0, Multi-stream Rotating Nozzles: 0, Customer Organized Proposal rebate: 0.</p>
	Continue current efforts to market the use of evapotranspiration to be used in landscape irrigation practices.		<p>TVWD offers commercial and residential rebates to promote ET technology. TVWD offers workshops and presentations to educate customers and landscape professionals on ET technology. TVWD networks with manufactures and distributors to stay educated on new technologies and opportunities. The Water Efficient Demonstration Garden at TVWD headquarters incorporates ET technology to establish and apply irrigation schedules. TVWD has supported the continuous education of landscape construction professionals licensed through the Oregon Landscape Contractor's Board (LCB) and TVWD's Conservation Technician served as a member of the LCB Board from 2008-2013. In addition, TVWD presented to a variety of regional organizations during this time period, including but not limited to Washington County Master Gardeners (2019), Oregon Landscape Contractors Association Annual Expo (2017), and the Oregon Department of Transportation (2017).</p>



Section Requirement	Sub-section Requirement	2010 Benchmarks	2019 Benchmark Status
	(d) Adoption of rate structures, billing schedules, and other associated programs that support and encourage water conservation;	Continue the two-tiered inclining block rate structure.	TVWD continues to have a two-tiered inclining block volume usage charge, known as Block 1 and Block 2, to incentivize conservation. Billing statements have a small space available for brief conservation messages.
	(e) Water reuse, recycling, and non-potable water opportunities; and	Develop opportunities to work with CII customers that will encourage re-use, recycling, and water conservation and water efficiency.	<p>The District is solely a water provider; wastewater generated by the District’s customers is conveyed by the Cities of Tigard, Beaverton, and Hillsboro, and Clean Water Services (CWS) to regional treatment facilities operated by CWS. CWS is an industry leader in developing new and innovative methods for reuse of water conveyed to the treatment facilities. The District’s CII program also encourages commercial and production customers to recycle and reuse water, and to reduce their water consumption to the extent possible. As a regional participant in major water resource projects and the largest water supplier in Washington County, the District continues to support regional development of these efforts. Between FY 2013-2014 and FY 2018-2019 the District administered 2,064 CII rebates</p> <p>The Customer Organized Proposal Rebate program (COPR) provides rebates for water reuse and recycling projects, such as the elimination of single-pass cooling and improved cooling tower water treatment. The COPR is designed to be flexible and open enough to encourage innovative water reuse and recycling proposals from customers. No COPR rebates have been administered since 2015.</p>
	(f) Any other conservation measures identified by the water supplier that would improve water use efficiency.	None.	<p>TVWD has utilized several software tools to track the number of customers participating in the rebate programs since its inception. Tracking tools also estimate the potential conservation savings by performing cost-benefit analyses.</p> <p>TVWD is a member of: the Pacific Northwest Section-AWWA, Conservation Committee; Regional Water Providers Consortium Board and all committees; Alliance for Water Efficiency, WaterSense and Water-Efficient Products Committee; Irrigation Association, Smart Water Application Technology Technical Working Group; Oregon Landscape Contractors Association, and Landscape Expo Planning Committee. TVWD also is a partner with the EPA WaterSense program. TVWD staff is active in the development of regional conferences and training programs to ensure technical sessions in water conservation are represented.</p> <p>TVWD hosts various workshops, training sessions, and presentations that cover various topics including water efficient irrigation, evapotranspiration, soil composition, and seven steps to a water efficient landscape. TVWD staff efforts reach all customer classes, as well as landscape professionals and other trade ally groups. TVWD partners with private businesses collaborating to create long-term and sustainable changes in the landscape and irrigation products market.</p>



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### 3.3. Current Conservation Measures

*OAR 690-086-0150(3)*

#### 3.3.1. Regional Water Conservation Efforts

##### **JWC Events and Education Committee**

The JWC EEC was formed during the drought of 2001 to coordinate JWC partner conservation efforts.

The JWC EEC oversees public participation, joint public messaging, and outreach efforts in conservation and water science. Key objectives of the group include increasing name recognition for the JWC and educating Washington County customers about water conservation, backflow prevention, emergency preparedness, and the significance of the Tualatin Basin for water supply.

The JWC EEC has primarily used its website to reach its audience, along with public relations and occasional paid-media efforts. The annual events and website budget is \$25,000. The JWC EEC uses the [www.jwcwater.org](http://www.jwcwater.org) site to promote water conservation. The site also contains a link to the Regional Water Providers Consortium (RWPC) website, [www.regionalh2o.org](http://www.regionalh2o.org). (More information about the RWPC is included below.) The RWPC website is the primary water conservation website for the tri-county area (Washington, Multnomah, and Clackamas Counties.) All JWC partners are members in the RWPC, share in development costs for the RWPC website, and rely on links to its extensive information, rather than duplicating web development individually.

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

##### **Washington County Fair**

The JWC uses this event to promote its high quality drinking water and educational water programs, including water conservation, to the entire county. JWC distributes free, fresh, cold water from a distribution board known as the Hometown Tap to hot and thirsty fairgoers as a means to engage in discussions about water conservation. Fair booth staffers from Hillsboro, Forest Grove, Beaverton, and TVWD also hand out dog tags, sunglasses, and writing tablets promoting the JWC website. Displays always include a water conservation component and illustrate a water educational theme. Plans are to make the Washington County Fair a 10-day fair in the near future.

##### **Community Action Fairs**

The JWC participates in the Washington County Community Action Fair because it serves all of Washington County. The Fair's objective is to provide information and other forms of utility assistance to minorities and other low-income groups. The Fair changes venues every couple of

years and has been located in Hillsboro, Beaverton, and Aloha in recent years. The JWC staffs this event with at least one bilingual agency representative and hands out water-saving devices with tips in English and Spanish for lowering water usage.

### **Oregon International Air Show**

The Oregon International Air Show is an annual event held at the Hillsboro Airport. The event began in 1988, and has an annual attendance of 65,000. The JWC has played an important role at the Oregon International Air Show since 2010 by providing two Hometown Tap water distribution boards. The Hometown Tap provides free cold drinking water on-site to Air Show attendees. The JWC also staffs a table to provide information on the JWC and to distribute logoed items.

### **Earth Day Fairs: Genentech and Intel**

Genentech and Intel are among the largest industrial customers. JWC staffs a table at their employee Earth Day Fairs each year during Earth Week. Genentech and Intel staff live in all four partnering agencies, making these great events for JWC staff to attend. Outreach at these events are related to indoor conservation savings. JWC provides showerheads, bathroom and kitchen aerators, and leak detection tablets to attendees interested in saving water at home. The table is staffed by two JWC partner representatives. Although JWC has participated in these events for several years, Intel has put the Earth Day Fair on hold. If Intel decides to bring the fair back, we will partner in the event again.

The JWC serves a significant number of Spanish speaking customers and is working towards providing water conservation and outreach materials in both Spanish and English. In FY 2018/2019, as part of the RWPC's Strategic Plan initiative to increase accessibility of messaging and outreach materials, the RWPC undertook the following measures:

- **Added emergency preparedness messaging to the annual KUNP television campaign** so that it had conservation messaging for two months (July - August) and emergency preparedness messaging for one month (September) for a second year. The Consortium developed four new ads to use with the conservation campaign.
- **Developed a conservation-focused radio ad and purchased a month-long campaign on Bustos radio.** This was the first time that the Consortium's media campaigns included a Spanish radio buy.
- **Developed an Español section to the Regionalh2o.org website** that includes conservation and emergency preparedness information and resources.  
<https://www.regionalh2o.org/Español>
- **Developed and distributed two e-newsletters through a partnership with KUNP television.** The conservation issue was sent in June 2019 the emergency preparedness issue was sent September 2019. The e-newsletter has 25,000 recipients per issue.
- **Produced two how-to videos** "Como Encontrar una Fuga de Inodoro" (How to Check

Your Toilet for Leaks) and “Como Almacenar en Case de Emergencia” (How to Store Water in Case of an Emergency).

- **Collaborated with KUNP television, Community Engagement Liaisons (CELs), and other community partners** to translate conservation and emergency preparedness information and resources including two print pieces, [regionalh2o.org](http://regionalh2o.org), e-newsletters, and television campaign elements.
- **Collaborated with Oregon Landscape Contractors Association (OLCA) to develop two presentations in Spanish at their annual expo in December.** More than 75 people attended the two presentations “Protección de Reflujo y Prevención de Conexión Cruzada” (Backflow Protection & Cross Connection Prevention) and “Se Inteligente con Controladores de Riego Basados en el Clima con la Etiqueta WaterSense” (Get Smart with WaterSense Weather-Based Irrigation Controllers).

## Regional Water Providers Consortium

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

As members of the RWPC, water providers retain full authority to manage their individual water systems. The RWPC has many functions, including intergovernmental coordination, source water protection strategy development and implementation, water conservation program implementation, emergency planning and response coordination, and public education. The RWPC is made up of a Board, Executive Committee, Technical Committee, Emergency Preparedness Committee and Conservation Committee, a four-person conservation staff provided by the City of Portland. The RWPC’s Strategic Plan and most recent Annual Report can be found at [www.regionalh2o.org](http://www.regionalh2o.org).

The RWPC's current strategic initiatives for conservation and meeting water needs are as follows:

- Make best use of available water resources and partnerships to meet regional water needs as outlined in the Regional Water Supply Plan
- Provide programs and resources that help water providers meet water conservation requirements
- Provide public education and outreach materials that promote conservation, source water protection, and the value of water
- Anticipate and respond to changes in demand, population, and customer in public expectations
- Increase accessibility of messaging and outreach materials to diverse audiences and stakeholders

The RWPC's water conservation program consists of the following elements:

- **Outreach materials and conservation devices**
  - The RWPC staff, in collaboration with member agency staff, develops water conservation materials for the use of its member agencies and for RWPC specific events. Each agency receives a certain quantity of each item, with the option to order additional pieces. The RWPC then orders them in bulk, which achieves significant economies of scale. All materials are also accessible as pdf files on the RWPC website.
  - The RWPC regularly purchases various water conservation devices and supplies member agencies with items for distribution to customers, such as outdoor watering gauges and shower timers. Indoor and outdoor kits are also advertised to RWPC member customers.
  - Outreach materials consist of more than 25 print pieces, social media, e-newsletters, and a robust website that includes:
    - how-to videos, rebates information, a weekly water number that informs customers how many inches of water said they should apply to turf in a given week, and indoor and outdoor water conservation tips and resources tips and resources.
  - Information is also provided in Spanish.
- **School assembly programs and Children's Clean Water Festival Sponsor**
  - RWPC partners with Mad Science to provide students with school assembly shows along with activity booklets.

- The Clean Water Festival hosts roughly 1,400 4th grade students from the Portland Metro area in an event that teaches about the environmental and scientific impacts we have on water and water has on us. Experts from Oregon and Washington volunteer to teach 25-minute classes on water science and watershed ecology at Portland Community College's Sylvania campus. The RWPC, Hillsboro, TVWD, Forest Grove, and Beaverton provide funding to hold the event and are active members.
- **Community events and workshops**
  - Staff distribute outreach materials and devices to attendees.
  - 2018-2019 Events included:
    - Portland House and Outdoor Living Show
    - Children's Clean Water Festival
    - Association of Landscape Designers Garden Tour
    - Oregon Landscape Contractors Association Field Day (Presentations offered in Spanish and English).
- **Media campaigns**
  - The RWPC conducts two conservation-focused multi-media campaigns annually. The indoor-focused television campaign runs for about six-weeks each winter. The outdoor-focused campaign is a combination of television (English and Spanish language) and radio and runs three months each summer. In addition, the RWPC runs a regional website and social media presence throughout the year, which includes messaging, how to videos, and other resources for the public. The RWPC publishes the accomplishments of its multimedia campaigns and programs in its annual report each year on its website [www.regionalh2.org](http://www.regionalh2.org).
- **Development of outreach materials**

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

**Indoor Kit:**

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

**Outdoor Kit:**

- Two 2-inch rain gauges
  - One plastic hose nozzle with variable spray
  - One hose timer 5-120 minutes
  - One package of drought resistant plant seeds
  - Information sheet on evapotranspiration
  - Brochure on general outdoor conservation tips
  - Brochure on lawn planting and care
- **Outreach events.** The RWPC conservation staff, along with staff from member agencies, tend informational booths at numerous community and regional events that include:
    1. OLCA Exposition – Staff provides information on outdoor conservation programs to professional landscapers at the Oregon Landscape Contractors Association show in December.
    2. Numerous Nursery Events – Throughout the tri-county region, the RWPC sponsors water conservation themed events at various nurseries including Drake's 7 Dees, Al's Garden Centers, Farmington Gardens, and Portland Nurseries.
    3. Children's Clean Water Festival – The RWPC provides funding for this festival, as well as a kid-themed conservation activity for a booth in the Exhibit Hall.
  - **Website.** The RWPC website, [www.regionalh2o.org](http://www.regionalh2o.org), is a professionally-executed site devoted to conservation and emergency preparedness. This site's content was developed with feedback and input from the member agencies and RWPC staff. The site is assessed and upgraded regularly and there is a consultant dedicated to the site for over 20 hours per month. JWC member agencies are interactive in providing information and supporting the data needs of this website.
  - **School programs.** The RWPC staff contracts with vendors to develop and present water conservation programs at elementary schools in the region. Currently, there are two

programs, one for grades K-2 and one for grades 3-5. Each member agency is entitled to one free program per year at a school in its service area. The two shows offered by the RWPC rotate sponsorship year to year. Currently, Mad Science is touring and performing “Where’s the Water Watson” for K – 2nd grade and “What do you know about H<sub>2</sub>O?” for the upper grades.

- **Regional Collaboration.** Perhaps the most important function of the RWPC conservation staff is to facilitate ongoing and effective collaboration among the region’s conservation professionals and to ensure that all agencies will benefit from the RWPC’s programming. The RWPC members also benefit from pooling the resources of the individual agencies to reach a broader audience and develop more effective programs. The RWPC is a key component of water conservation outreach and marketing in the Portland metro region for all member agencies.

### **JWC’s Transmission Line Inspection Project**

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

- Assess pipe condition, including conducting a leak survey.
- Identify areas where the pipe’s mortar coating may be damaged.
- Excavate and visually inspect suspected areas of corrosion.
- Install cathodic protection and/or monitoring devices to facilitate future monitoring of corrosion potential.
- Recommend corrective measures if necessary.
- We have undertaken an update of the corrosion protection study. The draft report is currently under review.
- Part of the JWC Master Plan will be to establish a comprehensive assessment program.

### **3.3.2. JWC Efforts: Current Conservation Measures**

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

In addition to each JWC Member Agency’s individual conservation measures, the JWC’s rate structure encourages conservation. Each of the JWC Member Agencies pays for operations and maintenance expenses for the JWC Water Treatment Plant facilities, including administrative expenses, on a monthly basis. The charge is based on the amount of water use at the Member Agency’s master meter connections. Each Member Agency’s total metered water use is



multiplied by the operation and maintenance expense rate. The method for calculating the expense rate is based on a 12-month rolling average of the operational and maintenance costs. This rate structure encourages conservation since lower water use by a particular member agency or wholesale water customer results in lower payments owed to the JWC. The JWC will conduct a rate study in the next few years to update these charges as needed.

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

The following is a description of the current status of the JWC Member Agencies' conservation programming required under OAR 690-086-0150(3).

### **City of Hillsboro Conservation Highlights**

- The City has a three-tiered rate structure for the single-family residential and a higher cost per unit when a base volume is exceeded for the commercial, public entities, and non-profit, customer categories.
- The 2020 Water Department Budget includes \$2.3 million in Funded Depreciation funds for capital replacement projects. This money is used to replace aging and out-of-date water infrastructure.
- The City distributes free leak detection tablets, bathroom and kitchen sink aerators, showerheads, and shower timers at the utility billing office.
- The City's water conservation education program elements include several websites promoting water conservation, water conservation presentations and activities for youth, "how to" videos that help customers reduce water use inside and outside the home, distribution of devices and information that encourage community gardeners to conserve water, and outreach at local and regional events.
- The City now offers water audits for single family and multi-family residences.

### **City of Forest Grove Conservation Highlights**

- The City distributes indoor and outdoor water conservation items, including low flow showerheads, hose nozzles, and faucet aerators, to residential customers.
- In July of 2019, the City expanded its water-efficient toilet rebate program and \$525 in rebates have been given out since this time.
- The City includes water conservation messages bi-annually and graphs depicting customer water use over time in its water bills to encourage customers to be aware of their usage and to conserve water.

- The City bills water usage using a progressive three tiered increasing block rate structure for single-family and residential customers to encourage water conservation through economic incentive.
- The City is exploring the possibility of switching the City over to an Advanced Metering Infrastructure (AMI) meter system for improved monitoring and communications of water usage.

### **City of Beaverton Conservation Highlights**

- The City has secured a Water Infrastructure Finance and Innovation Act (WIFIA) grant from the EPA that is funding the conversion of all meters in the City to AMI meters. Approximately 5-10 percent of the City's AMR meters have already been converted to AMI.
- The City's budget exceeds \$1 million for replacement and repair of aging water distribution system infrastructure.
- The City is committed to public education about water conservation. The City has a full time conservation program coordinator and a budget of \$57,000 for conservation activities. The City is a member of the Regional Water Provider's consortium and the JWC's Education and Event Committee (EEC), and it works with these groups and independently to provide conduct water conservation outreach. Outreach includes television; radio; social media messaging campaigns; a comprehensive website focused on regional water conservation information, tools, and resources; school education programs tailored to different grade levels; and community outreach events and workshops.
- The City is developing a "purple pipe" program that would deliver water from ASR 3 via purple pipes to the SCM area. This project would help to offset surface water supply.
- The City is exploring the feasibility of storing treated stormwater in Well 3 to be used for irrigation in the SCM district. Stored water from Well 3 would be delivered via the purple pipe system and would help to offset potable demand.

### **TVWD Conservation Highlights**

- TVWD has replaced nearly all non-single family residential class meters 3-inch and larger with Badger ORION AMR water meters. Many of these meters have data logging capability to aid leak detection troubleshooting and conservation efforts.
- The Portland Water Bureau, in collaboration with TVWD, replaced both the 24-inch and 42-inch meters at the main Portland intertie on the Washington County Supply Line in 2015 and 2019, respectively. These improvements have corrected the annual water loss figures.

- TVWD has a commercial, industrial, and institutional (CII) water conservation program to reduce non-residential water use, which includes technical assistance and water efficiency incentives, giveaways of free water-efficient pre-rent spray valves, and financial assistance through the Customer Organized Proposal Rebate program.
- TVWD uses software tools to track the number of customers participating in its rebate programs since their inception and to estimate the potential conservation savings.
- Since 2014, the District initiated several new conservation outreach programs including: mail postcards with water conservation material, water conservation email outreach, and advertising of existing conservation programs through door-to-door outreach and open-house style events.

## 3.4. City of Hillsboro

### 3.4.1. Water Use and Reporting Program

*OAR 690-086-0150(2)*

The City of Hillsboro manages the water use measurement and reporting program for the JWC managed water rights and for the JWC's facilities. The JWC's water withdrawals are measured at two raw water meters in the raw water pipelines between the SHPP Intake and the JWC's WTP. Since the 2010 JWC WMCP, the raw and finished water meters were replaced to ensure the highest accuracy. The City of Hillsboro's water withdrawals at the Cherry Grove WTP are measured downstream of the WTP near the soda ash station. The City of Forest Grove tracks and reports water withdrawals at the Forest Grove WTP.

The water withdrawal measurements are used for reporting that complies with the measurement standards in OAR Chapter 690, Division 85. The JWC's water use records can be found on the OWRD webpage: [http://apps.wrd.state.or.us/apps/wr/wateruse\\_report/](http://apps.wrd.state.or.us/apps/wr/wateruse_report/).

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

Currently, all the meters that measure flow from the JWC transmission lines to the Member Agency are owned by the respective Member. Recently, the JWC began a process to transfer ownership of all of master meters related to the JWC water system from JWC Member Agencies to the JWC in order to standardize maintenance and record keeping.

### 3.4.2. Required Conservation Programs

*OAR 690-086-0150(4)*

OAR 690-086-150(4) requires that all water suppliers establish five-year benchmarks for implementing the following water management and conservation measures:

- Annual water audit
- System-wide metering
- Meter testing and maintenance
- Unit-based billing
- Water Loss Analysis
- 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.

#### Annual Water Audit

The City conducts annual water audits. The City calculates water loss as the difference between total water demand and total metered consumption. To calculate water loss, the City tracks annual water demand and metered water consumption. Water loss represents the sum of unmetered uses (e.g. hydrant flushing and distribution system flushing), system leakage, overflows, and inaccurate measurements at the production or customer meters. The City estimates the volume of water used for distribution system flushing and tracks the volume of water used for construction purposes. Contractors use a hydrant meter and pay for the metered water usage.

The City's water loss in 2019 was 1%. The City's accounting of water loss has improved since the 2017 Hillsboro WMCP as a result of City actions such as: replacing all sonic master meters with magnetic master meters and installing Automated Meter Reading (AMR) meters.

In addition, the City has taken steps towards beginning to use AWWA's M36 water loss analysis tool to enhance its water auditing practices. The Water Loss Analysis discussion below further describes the City's efforts to increase efficiency.

**Five-Year Benchmarks:** The City will continue to conduct annual water audits. The City will integrate an AWWA M36 water loss analysis into its water auditing practices.

## System-wide Metering

The City is completely metered. The City installs meters that are 2 inches or smaller and hires contractors to install larger meters on new connections. The City recently converted to an AMR system, replacing all existing meters with AMR meters. The City plans to install AMR meters at all new connections moving forward. These AMR Neptune meters are equipped with notification alarms that indicate a leak is present when a meter runs continuously, or may be present when a meter runs for 18 hours. The new AMR system is also capable of alerting customers and Water Department staff when meters fail to function properly.

**Five-Year Benchmarks:** The City will continue to install meters at all new connections.

## Meter Testing and Maintenance

The City manages the meter testing and maintenance program for the master meters that the City currently owns. The City has a biennial testing and maintenance program for meters less than three inches in diameter. The City tests meters three inches or larger annually, and it has a large meter replacement program that replaces 3 to 5 meters per year. Any meters that fail testing are promptly either rebuilt or replaced. The City has begun a program to add frequency testing program when testing sonic meters. Recently, the City replaced its sonic meters measuring raw water at SSFP and tests it annually. Replacement of these meters has resulted in more accurate water loss calculations.

**Five-Year Benchmarks:** The City will continue to implement its meter testing and maintenance programs and to follow manufacturer protocols for maintenance and calibration program for newly installed AMR meters.

## Water Rate Structure

The City charges its retail water customers a base rate based on meter size and a usage rate based on the volume of water consumed. The City has a three-tiered rate structure for the single-family residential customer category and a higher cost per unit when a base volume is exceeded for the multi-family, commercial, industrial, public entities, and non-profit customer categories. The net impact of these rate structures is that customers pay a higher unit cost for water use above what is considered essential to life/basic needs, which encourages customers to conserve water to save money, and in the case of commercial, public entities, and non-profits, the goal is to encourage those customers to reduce their summer peaks. The rates are based on analyses in a rate study completed in 2019 and are designed to bill each customer category fairly for its share of system demand. Appendix E shows the water rates for the City's customer classes as of January 1, 2020.

**Five-Year Benchmarks:** The City will continue to bill customers based on the volume of water consumed, with pricing structures set to encourage conservation, especially during peak season. The City will continue to regularly conduct rate studies.

## Water Loss Analysis

In 2019, the City's water loss was 1% of all water use. The City has numerous measures in place to minimize water loss.

The City has a comprehensive leak detection and repair program, which it recently enhanced. In 2016, the City bought \$40,000 worth of leak detection equipment, including 10 data loggers, a correlator set, and active listening devices. The City also bought a vehicle and has outfitted it with a canopy, the newly purchased equipment for the leak detection program, and other tools and equipment (e.g. wrenches, keys for opening and closing valves, and water quality equipment). In addition, the City is now dedicating two employees to the year-round leak detection program. These two employees use leak detection equipment to check areas for leaks, which is a daily responsibility. When they are informed of leaks needing investigation, the employees prioritize repairs based on urgency, then either complete their current task or immediately respond. They use such information as quarter sections and addresses to plan and track the leak detection survey work. They also estimate leakage amounts for all leaks and this estimated volume is used to track their potential water loss. Leaks are then fixed on a prioritized basis based on the risk of injury and property damage. Leaks deemed as having immediate risk to injury or property damage are considered an emergency and are responded to immediately. Less urgent leaks are addressed as soon as the more urgent leaks are repaired.

The City also uses its AMR program to flag both intermittent leaks and sustained leaks on the customer side of the meter. The City notifies the customer of the potential leak so the customer can take corrective action. The City also has a policy (adopted in a 1988 resolution, updated in 2019) to adjust the leak portion of a customer's bill if the customer repairs the leak within 30 days of it being reported and provides proof of repair, and the customer hasn't received another leak adjustment over a prior 18-month period. The program is designed to encourage customers to identify and repair leaks in a timely manner.

The City targets allocation of \$2.1 million per year in funded depreciation projects to replace high priority aging infrastructure, as well. (The actual dollar value budget varies each year based on revenue and overall expenditure projections). The City uses pipe age, tracked in GIS, to decide which part of the system is in the greatest need of replacement when funded depreciation projects are chosen annually.

From February 2016 to July 2019 the City surveyed 669 miles of pipeline and found and repaired 49 leaks. The survey began in areas suspected to have a high possibility of leaks, including the older areas of the distribution system. In addition, the City inspected all four distribution reservoirs for cracks and leaks in 2016.

**Five-Year Benchmarks:** The City will continue conducting leak surveys and utilizing its AMR meters in an effort to minimize water loss. The City will continue to budget for replacement of high priority aging infrastructure and will continue to inspect all four distribution reservoirs for cracks and leaks every five years.

## Public Education

The City's public education program utilizes a variety of approaches to encourage customers to conserve water. The City communicates regularly with its customers via brochures, bill inserts, City newsletters, websites, local outreach events, social media, and other media outlets. The City also organizes local water conservation programs and water education outreach activities. The elements comprising the City's public education program are described in greater detail below.

### Print and Media

The City's Water Department website ([www.hillsborowater.org](http://www.hillsborowater.org)) contains water conservation information, descriptions of the City's water conservation programs, water-efficiency rebate information, a weekly watering tool to help Hillsboro residents know how much to water during summer months, and teacher resources for water conservation education. The website also contains a link to the Regional Water Providers Consortium (RWPC) conservation website ([www.regionalh2o.org](http://www.regionalh2o.org)), which provides more detailed conservation tips and resources, web tools for assistance in water-wise planning, and water conservation.

The City provides a significant portion of the funding for RWPC Conservation Committee programs, served on the panel to select the web design firm for the RWPC website, and actively participates in web development for the site. In addition, the City has a water supply website ([www.hillsborowatersupply.org](http://www.hillsborowatersupply.org)) that includes water conservation content, and a sustainable gardening website ([www.hillsborogardening.org](http://www.hillsborogardening.org)) that suggests water-efficient planting guides and provides watering tips specific to our region. In 2016, the City hired a videographer who helped create "how-to" water conservation and other water education videos, including freeze protection and leak repair. Since 2016, several water conservation "how to" videos were added to the RWPC website and linked to the City's homepage. The City also has participated in several news segments about water conservation on local news stations.

### Youth Education

The City's youth education program consists of classroom lessons about water resources that integrate water conservation messages. The City tailors these school lessons to match proper developmental stages for students and to ensure that the lessons meet state benchmarks, curriculum guidelines, and Science, Technology, Engineering, and Math (STEM) requirements. This specific lesson targeting results in an improved level of acceptance from teachers and deepens the City's ability to reach more students in more schools. The following are examples of classroom lessons.

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

**Incredible Journey** – A curriculum activity that uses beads for graphing a water drop's journey through the water cycle. This presentation meets state STEM requirements.



### 3rd-5th (Primary Benchmarks: Communities, Environment, Water Cycle):

**Drop in the Bucket** – Another activity that meets STEM requirement that visually demonstrates how little fresh water is actually available in the world for drinking.

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

**Incredible, Edible Aquifer** – An activity that teaches about point source pollution and what happens if an aquifer is depleted due to overuse.

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

**Mad Science “Where’s the Water Watson?” and “What do you know about H<sub>2</sub>O?”** – Assembly programs that were developed by a joint venture between Mad Science, an organization that offers science programs, and the RWPC that teaches water science and conservation.

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

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

Since 2005, the City has hosted an annual calendar contest in which elementary school students enter water-themed drawings (primarily featuring water-wise tips) for a calendar. Themes have included “The Water Cycle” and “Having Fun with Water.” Announcements for the yearly contest also share information about other school programs that the Water Department offers including stage shows for school assemblies and in-class presentations. Teachers often call for a presentation and then encourage their students to participate in the contest by illustrating the new water facts and conservation tips they have learned.

### 6th Grade and Above:

**From Source to Tap** – This in-depth lesson teaches students to care about their water and their watershed. It emphasizes how water demands grow but sources typically don’t grow and how all life in a watershed is dependent on the supply. It also includes conversation about infrastructure, including why it is important that the City keep



water loss to a minimum, and to find and repair leaks in its transmission and distribution lines. The lesson ends with focus on the students and their water usage. How much water do they use? What kind of demands does that put on the system? Why is it important to find and repair leaks at home? What is the student's "water footprint" on the environment and finally, what actions can they take to save water?

**Water Quality Day** – An all-day event focused on water quality and public health that includes presentations on how drinking water is treated and culminates in a field trip to the JWC's water treatment plant.

**Water Audit Curriculum** -- The City developed a water audit curriculum that can be implemented over a three-week period in middle schools. This is a partnership with the Hillsboro School District and Adelante Mujeres – Chicas Program. The goal is to empower, excite, encourage and engage middle school girls in STEM education and future careers.

The Water Department has begun coordinating with other city departments to provide a "one-stop shopping" opportunity for teachers. A webpage and brochure are under development that will inform teachers of all educational programs available through the City. The goal of this collaborative effort is to increase promotional efficiency of City-offered programs, and should increase the number of teachers participating in water educational programs in their classrooms.

## Community (All Ages) Outreach

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

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

In 2018, the City installed a water-wise demonstration garden at the Jackson Bottom Wetland Preserve site. The garden at Jackson Bottom is interactive, allowing preserve visitors to learn about water-wise gardening through observation. Classes on water-wise gardening can also be held on site.

City staff also provides both child and adult-oriented learning opportunities to other community organizations. Those groups include Boy and Girl Scout troops, the American Association of Retired Persons, Chicas (Adelante Mujeres), community garden groups, and civic organizations. The presentations are tailored to the individual group, such as a “Seven Steps to Water-Wise Gardening” presentation for gardening groups and presentations/tours tailored to meet requirements for waterworks badges when working with Scout troops.

Each year, the City contributes \$1,000 and staff time to help coordinate the annual Children’s Clean Water Festival, a regional water educational learning opportunity for fourth graders that includes a variety of interactive conservation activities.

In 2017, the City finished construction of a Tualatin River Watershed Display. The Watershed Display is used in both classroom activities and outreach events to promote source water protection and conservation efforts in the Tualatin Basin.

The City is expanding its “Hometown Tap” program. Hometown Taps are placed throughout the City where people can fill their water bottles. All Hometown Taps have information about the City’s water system and water conservation tips posted. The City is creating a Seasonal Hometown Tap station that can be installed in a high event location in downtown Hillsboro that will remain on site from April to October. The artwork was created by a local artist that was selected by a committee comprised of City staff and downtown business members.

**Five-Year Benchmarks:** The City will continue its extensive public education and outreach programs. The City will explore the feasibility of developing a permanent Hometown Tap with educational displays at Gordon Faber Recreation Complex, a 7000-seat multipurpose sports complex that has seven full size baseball fields.

### **3.4.3. Additional Conservation Measures**

*OAR 690-086-0150(5)*

OAR 690-086-0150(5) 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 meets both of these criteria.

## **Technical and Financial Assistance Programs**

The City set aside \$10,000 in its conservation budget each year from 2010-2015 to offer technical and financial incentives to commercial, multi-family, non-profits, and industrial customers throughout the City (ICI (Industrial, Commercial and Institutional) Program). In 2016, this budget increased from \$10,000 to \$20,000 to provide more conservation assistance to non-residential customers, especially in the area of outdoor irrigation. The City continues to offer financial and technical assistance to these customers on a case by case basis. Exhibit 3-5 is a table summarizing the ICI projects that occurred from 2014 to 2019 and associated costs.

**Exhibit 3-5. Industrial Commercial and Institutional Rebate Projects 2014-2019**

<b>Year</b>	<b>Toilet (Count)</b>	<b>Toilet (Cost)</b>	<b>Washing Machine (Count)</b>	<b>Washing Machine (Cost)</b>	<b>Irrigation Controller (Count)</b>	<b>Irrigation Controller (Cost)</b>	<b>Mulch, Native Plants, Other (Count)</b>	<b>Mulch, Native Plants, Other (Cost)</b>	<b>Total Rebates (Count)</b>	<b>Total Rebates (Cost)</b>
<b>2014</b>	5	\$375	0	\$0	0	\$0	0	\$0	5	\$375
<b>2015</b>	6	\$450	1	\$50	1	\$249	0	\$0	8	\$749
<b>2016</b>	13	\$975	0	\$0	1	\$2,500	0	\$0	14	\$3,475
<b>2017</b>	1	\$75	0	\$0	4	\$9,221	0	\$0	5	\$9,296
<b>2018</b>	0	\$0	0	\$0	5	\$10,427	0	\$0	5	\$10,427
<b>2019</b>	0	\$0	0	\$0	1	\$2,500	1	\$2,500	2	\$5,000
<b>Total</b>	25	\$1,875	1	\$50	12	\$24,897	1	\$2,500	39	\$29,322

In 2019, the City partnered with a 200-unit apartment complex to check all units for toilet leaks, replace inefficient showerheads and replace bathroom and kitchen aerators. This resulted in an immediate estimated savings of 3,454,000 gallons per year.

In 2011, the City partnered with the Energy Trust of Oregon on an indoor water and energy audit program for residential customers. In 2014, the audit program changed from including a site visit to operating completely online. After the partnership with the Energy Trust ended, the City provided staff with specialized training in water auditing and then expanded its audit program in 2019 to include both free indoor and outdoor audits to residential customers conducted by City staff. These audits include checking for leaks, replacing showerheads and faucets with more efficient models and reviewing the Utility Bill with the customer.

The City has provided technical and financial assistance to the Hillsboro School District and Intel, its largest institutional and industrial customers. In 2008, the Pacific Northwest Section of AWWA deemed the City's School Audit Program the best non-residential conservation program run by a middle-sized agency. For Intel, the City hired a consultant (SBW Consulting) to provide a list of implementation recommendations, along with a cost/benefit analysis for which recommendations had the quickest payback. Intel is currently planning to expand their water reuse plant in order to reduce their water use further. In addition to providing the audit and recommendation report, the City and consultant also installed low-flow showerheads, low-flow faucet aerators, water-efficient toilets, and water-efficient pre-rinse spray heads on Intel's four campuses. This resulted in an immediate savings of 322,000 gallons per year.

In addition to providing a water audit and sharing expertise in behavioral changes, the City also provided Calvary Lutheran Church \$1,500 in funding for toilet replacements. Hillsboro Water Department staff conducting the audit also discovered a significant leak. The retrofits and the leak repair reduced daily usage an average of 470 gallons per day, or 17,155 gallons per year – to less than half of the amount of water the church had been using before the audit.

The City assisted with funding for a WaterSense-labeled irrigation controller that waters based on evapotranspiration (ET) rates. In 2014, the City also funded a WaterSense-labeled Irrigation Controller for International Paper. In 2015, the City provided financial assistance to Avamere Rehabilitation Center for the replacement of water-chilled compressors for air-chilled compressors, which produces an estimated savings of 1.3 million gallons per year for the compressors and a 25% reduction in outdoor water use for the controller.

The City has also partnered with many Home Owner Associations (HOAs) and multi-family management companies to update irrigation controllers and other water-using technology. In 2015/2016 fiscal year, the City provided financial assistance (and some technical assistance as needed) to Avamere, Avana at Orenco Station, Brookwood HOA, and The Parks at Laurel Oaks HOA for the replacement of regular irrigation controllers with WaterSmart irrigation controllers. These replacements are estimated to result in 25% outdoor water savings in future years for the complexes.

The City continues to partner with its Parks Department to provide technical assistance and water saving devices. After completion of a successful weather station venture, the Water

Department and Parks Department worked together again in 2010, along with local high school students, on the City's very first demonstration garden project at Dairy Creek. The Water Department provided educational materials, water-conserving tools (such as rain gauges, soaker hoses, hose nozzles, water-wise seeds and aqua spikes) along with a load of compost for amending the soil to improve its water-holding capabilities. The garden had a very successful first year, and provided water-wise gardening examples for the entire community.

The success of the City's first community garden project at Calvary Lutheran Church led the City to provide assistance to other community gardens and to school gardening programs. The City subsequently began providing compost, water-wise gardening educational information, rain gauges, aqua spikes, and planting brochures to David Hill and Sonrise Community Gardens. In 2011, the City partnered with City View Charter School and 4-H group on a water-wise educational garden, contributing compost and materials. In 2013, the City developed a partnership with Jackson Bottom to establish a water-wise demonstration garden and provided \$10,000 for the project. The City completed the garden in 2018, but continues to provide annual funding for maintenance and plants.

In 2015, the City installed water-wise planting strips surrounding its new parking lot for the Shute Park Aquatic and Recreational Center (SHARC). The new parking strips demonstrate a water-wise, non-grass alternative for parking strips to SHARC users and other members of the public.

The City has been partnering with the Parks Department to audit and make water conservation improvements at local parks. This includes a full audit of the irrigation system, changing irrigation spray heads to more efficient heads, providing mulch and posting signs to educate the public about the conservation improvements that took place. The partnership will continue to offset the annual rate increase. The City is one of our top 10 water users in the city, so water conservation is extremely important.

**Five-Year Benchmarks:** The City promotes itself as a water efficiency resource for the community, and will continue to set aside budget each year to offer technical and financial incentives to both residential and non-residential customers (known as the ICI Program). The City will continue to offer water saving devices to all classes of customers. The City will continue to offer residential water audits, and will explore offering water audits to additional customer classes. Staff will work closely with its ICI customers, including multi-family customers, to find innovative ways to reduce water use at those facilities through improved technology and maintenance. The City will also continue to seek opportunities to promote water-wise gardening techniques at community garden events and to develop new community and school water-wise gardens and outdoor areas, such as parking strips. The City will continue to provide City parks with technical and financial assistance that supports irrigation improvements.

## **Supplier Financed Retrofit or Replacement of Inefficient Fixtures**

The City has a washing machine rebate program, toilet rebate program, weather based irrigation controller program, and provides free water-saving devices.

In 2010, the City used funding from OWRD's Water Conservation, Reuse and Storage Grant Program (established by Senate Bill 1069) to complete a WaterSense Rebate Feasibility Study to identify the most cost-effective rebate programs within the EPA's WaterSense certification and labeling program. The study's final report included descriptions and cost-benefit analyses of potential WaterSense conservation programs to pursue. In 2011, the Utilities Commission approved the recommendations to add WaterSense-labeled high-efficiency toilet rebates and to partner with the Energy Trust for affordable indoor audits.

The City implemented both study-recommended programs in 2011 and the programs are ongoing, however, the Energy Trust program has since evolved away from staff-intensive in-home inspections and has introduced a less intrusive process providing a do-it-yourself guide online. The City updated its program again in 2019 to include both indoor and outdoor home audits. The City also reviews the customer's utility bills with them during the free home audits. If customers understand how to read their utility bills, see how much water they are using, and how much that water use is costing them, they may be encouraged to take actions to conserve water.

The City currently offers a \$50 washing machine rebate, \$75 toilet rebate, and \$200 weather based irrigation controller rebate. From FY 2012/2013 through December 2019, the City has given out 5,143 rebates at a cost to the City of \$335,976. The high-efficiency toilet rebate program has given out 4,005 rebates for replacements of non-high efficiency toilets at a cost to the City of \$300,375 to date. In 2013, the City expanded the rebate program to include mobile homes, condominiums, and town homes if the residence is owner-occupied, even if the residence is served by a common meter. The City also has also issued toilet rebates for various local businesses, as part of its ICI technical assistance program. Overall, the rebate program has been very popular and the City has continued to increase its conservation budget to match the rebate demands from the community. The current budget for the three rebates is \$60,000.

As mentioned above, the City provided water-saving devices to the Hillsboro School District and Intel for the replacement of toilets, showerheads, faucet aerators and pre-rinse sprayheads. The City also provides water-saving devices at local events and uses a water-saving devices display board (designed by the City) for event, which allows customers to only take the specific devices that they want to install rather than handing out kits. Devices available include: leak detection tablets, bathroom and kitchen faucet aerators, water-efficient showerheads, and shower timers. The City does not currently track number of devices distributed.

The City ran a waterless urinal pilot project with Forest Hills Lutheran School, as described above. Waterless urinals have been successful at the school due to the dedication of maintenance staff and the relatively low volume of use. The success of waterless urinals depends highly on those two factors. Consequently, the City is willing to partner with and

provide waterless urinal funding to ICI applicants that have urinals with low volumes of use and that demonstrate dedication to waterless urinal maintenance.

As previously described, the City also hired SWB Consulting to conduct urinal audits at several older Hillsboro School District schools. Instead of doing costly urinal replacements, SWB Consulting recommended throttling the shutoff valves on the existing urinals to cut the water requirements for flushing urinals approximately in half, an action that essentially carries no cost. In addition, the City provided some funding for toilet replacements at older schools in the Hillsboro School District.

Finally, the City monitored TVWD's evapotranspiration (ET) controller pilot program, and based on TVWD's experience and the 2010 WaterSense Rebate Feasibility Study, the City decided to implement a similar ET program. In 2014, the City began offering residential customers rebates of up to \$200 for WaterSense-labeled weather-based irrigation controllers. The ET program has been very popular. Since the start of the program, the City has provided 176 residential controller rebates at a cost to the City of \$30,019.

**Five-Year Benchmarks:** The City will continue to explore the feasibility and effectiveness of offering a rebate for Smart Water Monitoring devices to their residential customers. The City will continue to offer rebates to customers for replacement of high water use fixtures and/or devices with those that are engineered to be more water-efficient. The rebate program operates with some flexibility regarding what market transformations are needed to increase the availability of water efficient devices, along with consistency in Washington County with other water providers. The City will continue to offer free water saving devices, such as low-flow faucet aerators and low-flow showerheads.

## **Rate Structure and Billing Practices that Encourage Conservation**

The City continues to promote a three-tiered conservation-based rate structure for the single-family residential class. City staff will provide an account review and offer advice on ways to conserve water whenever a customer expresses interest. When the City suspects that a customer has a leak, the City notifies them about the high water usage, or continuous flow at the meter, and suggests that the customer check for a leak using instructions provided on the Department webpage. The City talks regularly with customers and provides tips for lowering water use to help them keep their water usage under the amount that bills at the third-tier rate.

In 2019, the City finished installing AMR meters and moved all customers to monthly billing. The more immediate feedback on water usage provides customers the opportunity to reduce usage a month earlier than in the past, which can be particularly helpful in summer. A customer who would have received a bill in September for July/August usage, now will see July usage in August and may decrease usage, or call for conservation assistance, especially if outdoor watering has landed the customer in the third billing tier.

Improvements were made to customer utility bills, making them a more effective communication tool. The bills include graphs that show 13 months of past usage, enabling



customers to compare water use to the same month the previous year and to recent months. Notes promoting conservation, or providing water efficiency tips are often placed on the customer bills, and sometimes customer conservation programs are promoted more in-depth using bill stuffer format. Finally, customers are notified when excessive use suggests that a customer account may be experience a water leak. These notifications are separate from the utility bills, but part of the utility bill program.

Customers calling Utility Billing to conduct business are put into a queue where they listen to prerecorded messages as they wait for a customer service representative. There is always at least one message promoting conservation programs for the queued customers, and all messages are recorded in English and Spanish.

**Five-Year Benchmarks:** The City will continue to have a three-tiered water rate system for the single family residential class to promote water use efficiency and to bill customers monthly. The City will continue to include graphs showing past usage and to include water conservation information in water bills. The City will also continue to explore the best ways to help their customers understand their water bills.

## **Water Reuse, Recycling, and Non-potable Opportunities**

Clean Water Services (CWS) manages the water reuse program in Washington County. Wastewater from customers in the City's municipal water system is reclaimed by CWS at the Rock Creek Wastewater Treatment Facility.

The City's 2014 Water System Master Plan Appendix 1.1 includes Technical Memo 07 on "Water Reuse - Waste Stream Quantity and Quality Analysis," and Technical Memo 08 on "Water Reuse - Water Reuse Treatment Process Requirements" . These memos identified two sources of wastewater for reuse purposes: treated effluent from Clean Water Service's Rock Creek Advanced Wastewater Treatment Facility for domestic potable water supply, and the "process wastewater" stream from industries in the Hillsboro's Dawson Creek area. The City is exploring these water reuse opportunities and is encouraging customers, especially industrial water users, to investigate water reuse options. The City especially encourages the elimination of single-pass cooling, and provides technical assistance on improving cooling tower efficiencies on request. Intel is currently working on a plan to expand its on-site water reuse treatment facility and other industrial customers are exploring on-site water reuse, as well.

In addition, the City's system for cataloging and tracking non-municipal water rights may reveal non-potable water opportunities. As described in Section 2, when City Departments are purchasing or selling property, the Water Department is now contacted to perform a search for appurtenant water rights and assist with the land exchange if needed. The City's Water Department provides education, guidance, administrative support, and contracting with water rights consultants to other City Departments. The other City Departments then inform the Water Department of completed land acquisitions, at which point the Water Department begins tracking any appurtenant water rights. During this process, the Water Department will be evaluating the potential for non-potable water opportunities related to the new non-municipal water rights.

**Five-Year Benchmarks:** The City will continue to actively seek out opportunities for water recycling and non-potable opportunities. The City will continue to review newly acquired non-municipal water rights for potential non-potable water use opportunities.

## Other Conservation Measures

The City is a member of the Regional Water Providers Consortium and the Alliance for Water Efficiency, and City staff is active on the Conservation Committee of the Pacific Northwest Section of the American Water Works Association (AWWA). Nationally, the City is a promotional partner with the EPA's WaterSense Program.

The Hillsboro Conservation Program Specialists regularly attends trainings to learn about new programs and technology that will improve the City's conservation program. Trainings include AWWA workshops/conferences and an annual WaterSmart Innovations conference. The Conservation Program Specialist and another staff member became a G3 Certified Watershed Wise Landscape Professional.

**Five-Year Benchmarks:** The City will continue to be a member of the Regional Water Providers Consortium, the Alliance for Water Efficiency, and an active participant on the Conservation Committee of the Pacific Northwest Section of the AWWA. The Conservation Program Specialist will continue to attend trainings and conferences that provide education and insight to potentially grow and enhance existing City conservation programs. The City will use GIS to map locations of rebate approvals in the City. As part of this effort, the City will complete a process to integrate data between different departments, such as Planning, Finance, and Water.

Exhibit 3-6 presents a summary of the City's 5-year water conservation benchmarks.

### Exhibit 3-6. Hillsboro Five-Year Water Conservation Benchmark

Conservation Measures	Five-Year Benchmarks
Annual Water Audit	Continue to conduct annual water audits.
	Integrate an AWWA M36 water loss analysis into its water auditing practices.
System-wide Metering	Continue installing meters at all new connections.
Meter Testing and Maintenance	Continue to implement meter testing and maintenance program
	Continue to follow manufacturer protocols for maintenance and calibration program for newly installed AMR meters.
Water Rate Structure	Continue to bill customers based on the volume of water consumed, with pricing structures set to encourage conservation, especially during peak season.
	The City will continue to regularly conduct rate studies.

Conservation Measures	Five-Year Benchmarks
Water Loss Analysis	Continue to conduct leak surveys utilizing AMR program meters in an effort to minimize water loss.
	Continue to budget for replacement of high priority aging infrastructure.
	Continue to inspect all four distribution reservoirs for cracks and leaks every five years.
Public Education	Continue extensive public education and outreach programs.
	Explore the feasibility of developing a permanent Hometown Tap water system with educational displays at Gordon Faber Recreation Complex and highly attended event areas.
Technical and Financial Assistance Programs	Continue to set aside budget each year to offer technical and financial incentives to both residential and non-residential customers.
	Continue to offer technical and financial assistance to all classes of customers including free indoor and outdoor water conservation devices.
	Continue to offer residential water audits, and explore offering water audits to additional customer classes.
	Work closely with ICI customers, including multi-family customers, to find innovative ways to reduce water use through improved technology and maintenance.
	Continue to seek opportunities to promote water-wise gardening techniques at community garden events and to develop new community and school water-wise gardens and outdoor areas.
	Continue to provide City Parks with financial and technical assistance that supports irrigation improvements.
Supplier Financed Retrofit or Replacement of Inefficient Fixtures	Explore the feasibility and effectiveness of offering Smart Water Monitors to customers.
	Continue to offer rebates to customers for replacement of high water use fixtures and/or devices with those that are engineered to be more water-efficient.
	Continue to offer free water saving devices.

Conservation Measures	Five-Year Benchmarks
Rate Structure and Billing Practices that Encourage Conservation	Continue to have a three-tiered water rate system for the single family residential class to promote water use efficiency, bill customers monthly, include graphs showing past usage, and include water conservation information in water bills.
	Explore the best ways to help customers understand their water bills.
Water Reuse, Recycling, and Nonpotable Opportunities	Review newly acquired non-municipal water rights for potential non-potable water use opportunities.
	Continue to actively seek out opportunities for water recycling and non-potable opportunities.
Other Conservation Measures	The Conservation Program Specialist will continue to attend trainings and conferences that provide education and insight to potentially grow and enhance existing City conservation programs.
	The City will use GIS to map locations of rebate approvals in the City. As part of this effort, the City will complete a process to integrate data between different departments, such as Planning, Finance, and Water.
	Continue to be a member of the Regional Water Providers Consortium, the Alliance for Water Efficiency, and an active participant on the Conservation Committee of the Pacific Northwest Section of the AWWA.

## 3.5. City of Forest Grove

### 3.5.1. Water Use and Reporting Program

*OAR 690-086-0150(2)*

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

## 3.5.2. Required Conservation Programs

*OAR 690-086-0150(4)*

OAR 690-086-150(4) requires that all water suppliers establish five-year benchmarks for implementing the following water management and conservation measures:

- Annual water audit
- System-wide metering
- Meter testing and maintenance
- Unit-based billing
- Water Loss Analysis
- Public education

### Annual water audit

Forest Grove conducts an annual audit and submits the results to the JWC. Hillsboro then submits the combined audit report to OWRD for the JWC member agencies. The City measures water loss as the difference between: (1) Forest Grove water treatment plant demand plus delivered flow from JWC water treatment plant, and (2) water sold to customers. The calculation is based on monthly records. Water loss ranged from 9% to 15% between 2015 and 2019, and was 15% in 2019. The Water Loss Analysis discussion below describes suspected sources of water loss and approaches to reduce water loss.

**Five-Year Benchmark:** The City will continue its annual water audits. The City will implement actions to improve the ease of accessing and reporting consumption data.

### System Metering

Forest Grove is completely metered with AMR meters. The City is considering upgrading its system to AMI meters, which would increase customer access to consumption data by allowing them to see their water usage in real time.

The City is also in the process of replacing two of its master meters. This project will be completed in January 2020 and will help improve the accuracy of the City's system wide water audits.

**Five-Year Benchmark:** Forest Grove will continue to meter all connections. Forest Grove will finish replacing two of its master meters. Forest Grove will continue to explore the possibility of converting the City's system to AMI meters.

## Meter testing and maintenance

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

**Five-Year Benchmark:** The City will continue its regular meter testing and replacement program.

## Rate structure

Forest Grove has a volumetric rate for each of the four customer classes (single-family residential, multi-family residential, commercial, and industrial). The single family rate (which accounted for an average of 46 percent of total consumption from 2008 through 2018) is a three-tier increasing-block structure. Appendix F presents Forest Grove's water rates as of July 1, 2019.

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

## Water Loss Analysis

Forest Grove's water loss was 15.0 percent in 2019. Forest Grove suspects that leaks in old water lines in the Gales Creek service area are contributing to the elevated water loss percentage. Improvements in water production and consumption accounting practices, such as closer alignment of production and consumption meter readings, could also potentially reduce water loss.

Forest Grove is working diligently to address water loss in its system. In 2018, the City finished fixing leaky filters at the Forest Grove WTP and fixed leaks in the City's main storage tank. Fixing these two sources of water loss should immediately lead to significant water loss reduction. Twelve percent of Forest Grove's distribution system (approximately 50,000 linear feet of pipe) is sonically leak tested annually. Approximately 1 percent of the distribution is replaced on an annual basis. The Gales Creek service area will be a focus area for a leak detection.

Forest Grove understands that OAR 690-086-0150(4)(e)(A) and (B) requires it to provide a description and analysis identifying potential factors for loss and selected actions for remedy to OWRD within two years of approval of this WMCP, and if the selected actions do not reduce water loss to less than 10 percent within five years of approval of the WMCP, the City will have to take additional leak detection and repair measures.

**Five-Year Benchmarks:** Within two years of approval of this WMCP, the City shall provide OWRD with a description and analysis identifying potential factors for the water loss and selected actions for remedy. If the selected actions do not reduce water loss to less than 10 percent within five years of approval of the WMCP, the City will either develop and implement a regularly scheduled and systematic program to detect and repair leaks in the transmission

and distribution system or develop and implement a water loss program consistent with AWWA standards.

## Public Education

Forest Grove holds an annual open house at which there is a water conservation table and indoor and outdoor conservation fixtures are distributed (low-flow shower heads, hose nozzles, and faucet aerators). In addition, the City participates in various events coordinated by the RWPC and JWC EEC (see above). In addition, the City offers two RWPC school presentations per year. Conservation information is included with water bills bi-annually. The city's website also includes conservation information and tips, which were most recently updated in 2018.

**Five-Year Benchmark:** The City will continue to hold its annual open house, actively participate in RWPC and JWC EEC events, and update its website when appropriate.

### 3.5.3. Additional Conservation Measures

*OAR 690-086-0150(5)*

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

#### Technical and financial assistance

Water-efficient showerheads, faucet aerators, hose nozzles, dye tablets for detecting toilet leaks, outdoor watering gauges, and shower timers are made available at the Forest Grove's Engineering office on a first-come first-served basis and some items are available at water conservation events.

In addition, Forest Grove has implemented a leak repair incentive program. If a leak that has resulted in a bill increase is identified and repaired by the resident, the city will investigate the issue on a case-by-case basis and re-rate consumption over the customer's typical usage from a comparable month at the current industrial rate, up to a maximum of six months.

**Five-Year Benchmark:** Forest Grove will continue to offer home energy audits that include fixture giveaways and will continue to offer free water conservation items.

#### Supplier Financed Retrofits and Replacement of Inefficient Fixtures

As described above, Forest Grove offers free water-efficient faucet aerators, showerheads, and hose nozzles at its Engineering office. Forest Grove provides a rebate for water-efficient toilets and heat pump water heaters in partnership with FGL&P. Forest Grove is also currently exploring the feasibility of implementing a rebate program for weather-based irrigation controllers.

**Five-Year Benchmark:** Forest Grove will continue to provide rebates for water-efficient washing machines, water heater pumps, and toilets. Forest Grove will explore the feasibility of implementing a rebate program for weather-based irrigation controllers.

### **Rate structures and billing schedules**

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

**Five-Year Benchmark:** Forest Grove will continue to utilize its volumetric rate structure and continue to provide conservation messages with billing inserts.

### **Water reuse and recycling**

Clean Water Services (CWS) is working with DEQ and exploring new water reuse opportunities. Clean Water Services' Forest Grove Wastewater Treatment Facility serves portions of Forest Grove and all of Cornelius and Gaston. The facility produces Class C recycled water which is applied at storage ponds adjacent to the facility. Some recycled water is used to irrigate two acres of native plants at a nursery.

During the dry season, the Forest Grove Wastewater Treatment Facility pumps all wastewater to the Rock Creek Advanced Wastewater Treatment Plant for higher level of treatment. Forest Grove has a conventional filter water treatment plant that requires frequent backwashing of the filters. The backwash water is sent to a settling pond. In 2006, a "recycle" line was added to the settling pond so the water can be put back through the water treatment plant for distribution.

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

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

### **Other Conservation Measures**

Forest Grove is a member of the AWWA and RWPC.

**Five-Year Benchmark:** Forest Grove will continue to participate in the AWWA and RWPC.

Exhibit 3-7 presents a summary of the City's 5-year water conservation benchmarks.



**Exhibit 3-7. Summary of 5-year conservation benchmarks**

<b>Conservation Measures</b>	<b>Five-Year Benchmarks</b>
Annual Water Audit	Continue annual water audits
System-wide Metering	Replace two master meters
	Explore switching the City to an AMI system
Meter Testing and Maintenance	Continue regular meter testing and replacement program
Water Rate Structure and Billing Practices that Encourage Conservation	Continue volumetric rate structure for each customer class
Water Loss Analysis	Within two years of approval of this WMCP, the City shall provide OWRD with a description and analysis identifying potential factors for the water loss and selected actions for remedy. If the selected actions do not reduce water loss to less than 10 percent within five years of approval of the WMCP, the City will either develop and implement a regularly scheduled and systematic program to detect and repair leaks in the transmission and distribution system or develop and implement a water loss program consistent with AWWA standards.
Public Education	Continue to hold an annual open house, participate in RWPC and JWC EEC events, and update the City website when appropriate
Technical and Financial Assistance Programs	Evaluate expansion of the current home energy audit program to include more water conservation consultation
Supplier Financed Retrofit or Replacement of Inefficient Fixtures	Continue to provide rebates for low-water-use washing machines, dishwashers, and toilets
	Explore the feasibility of implementing a rebate program for weather based irrigation controllers
Rate Structure and Billing Practices that Encourage Conservation	Continue to utilize a volumetric rate structure and continue to provide conservation messages with billing inserts
Water Reuse, Recycling, and Nonpotable Opportunities	Continue to forward customer and business inquiries on water reuse and recycling to CWS, continue to recycle backwash water, and seek non-potable water use opportunities

## 3.6. City of Beaverton

### 3.6.1. Water Use and Reporting Program

*OAR 690-086-0150(2)*

The water withdrawal measurements are used for reporting that complies with the measurement standards in OAR Chapter 690, Division 85. The City's water use records can be found on the OWRD webpage: [http://apps.wrd.state.or.us/apps/wr/wateruse\\_report/](http://apps.wrd.state.or.us/apps/wr/wateruse_report/).

The City participates in a water use measurement and reporting program associated with JWC-managed water rights and also has implemented a program for the City's facilities and water rights. The metering at the JWC Water Treatment Plant is described in the Hillsboro section.

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

The City reports on water use to OWRD annually for the following City facilities and water rights: Old City of Beaverton Well 1, Hanson Road Well/ASR 1, Willamette River right (Permit S-54940), ASR No. 2, and ASR No. 4.

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

### 3.6.2. Required Conservation Programs

*OAR 690-086-0150(4)*

OAR 690-086-150(4) requires that all water suppliers establish 5-year benchmarks for implementing the following water management and conservation measures:

- Annual water audit
- System-wide metering
- Meter testing and maintenance
- Unit-based billing

- Water Loss Analysis
- Public education

## 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, either metered or estimated. The water audit also includes analysis of the water supplier's own water use.

The City conducts annual water audits. The City calculates water loss as the difference between total water demand and total metered consumption. Water loss represents the sum of unmetered uses (e.g., hydrant flushing and distribution system flushing), system leakage, overflows, and inaccurate measurements at the production or customer meters. The City conducts an annual water audit for internal purposes and for JWC's annual water audit program.

The City's water loss was approximately 6.7 percent in FY 2018/2019. The Water Loss Analysis discussion below explains the City's efforts to increase efficiency.

**Five-Year Benchmarks:** The City will continue to conduct annual water audits.

## System-wide Metering

All of the City's 21,000 connections are metered and all new customers are metered as they are added to the City's utility roll. During the last 10 years, the City has considered upgrading its system using Automated Meter Reading (AMR) technology. To date, only the newly annexed and underdeveloped SCM area is metered with AMR. The City was recently awarded a WIFIA grant from the EPA to fund the conversion of all meters in the City to AMI meters in the next 7 years. All AMR meters that have already been installed will be converted to AMI meters and all new meters installed will be AMI meters. Approximately 5 to 10 percent of the City's current AMR meters have already been converted to AMI.

**Five-Year Benchmarks:** The City will continue to meter all connections. Over the next five years, the City will work towards the seven year goal of converting all meters to AMI meters.

## Meter Testing and Maintenance

The City has a robust meter testing program. Until recently, the City annually tested all meters that are 3 inches and larger. When meters' readings deviated from the manufacturers' recommended standards, meters were either replaced or repaired. The City also had an ongoing replacement program for those meters based on age, and replaced approximately 10 to 15 per year. During replacement, magnetic flow meters were installed that are known for their long-term accuracy. The City also replaced smaller meters at a rate of approximately 1,000 per year, which equates to an approximately 20-year replacement schedule for the entire system. Now that the City will begin converting all meters to AMI, any meters that deviate from

manufacturers recommended standards will be replaced with AMI meters. Once AMI meters are installed, the City will follow manufacturer's specifications for meter testing and maintenance and will also track AMI meter data for signs of functioning meters.

**Five-Year Benchmarks:** The City will follow manufacturer's specifications for AMI meter testing and maintenance. The City will track meter data for signs of malfunctioning meters and will replace any malfunctioning meters promptly.

## Water Rate Structure

The City charges its water customers a base charge that is based on meter size and a usage rate that is based on the volume of water consumed. Appendix G shows water rates for the City's customer classes as of July 1, 2019. The City regularly considers modifications to its water utility rate structure. During the most recent rate review, the City determined that a progressive tiered rate structure (i.e. inclining block rate) was not feasible at that time. In mid-2013, the City began reading all meters monthly instead of bi-monthly and began sending customers' water bills monthly. One of the advantages of a monthly billing cycle is that customers receive feedback on their water use up to one month earlier, thereby allowing customers to adjust habits (e.g., peak season water use) more quickly as needed.

**Five-Year Benchmarks:** The City will continue to bill customers based, in part, on the volume of water consumed on a monthly basis. The City will continue to assess its rate structure in the future for modification to adequately fund the operation and maintenance of its water system, including consideration of a progressive tiered-rate structure (i.e. inclining block rate) in the next five years.

## Water Loss Analysis

The City's water loss does not exceed 10 percent (6.7 percent in FY 2018/2019). To minimize water loss, the City maintains a leak detection and repair program to help ensure leakage remains low. The City continues to fund annually a capital improvements program that allows for the replacing or repairing of high priority water lines. Lines selected for repair or replacement are those with a history of leaks and those where significant leaks are identified. The City identifies water line leaks using visual observations and acoustic detection technology. Since 2013, the City has replaced 15,356 linear feet of existing pipeline. The City's budget continues to meet or exceed \$1 million for replacement or renewal of aging water distribution system facilities. Calls from customers reporting leaks are logged and addressed by the Public Works staff in a timely manner.

**Five-Year Benchmarks:** The City will continue to conduct its leak detection program. The City will continue to budget for replacement of high-priority aging infrastructure that contributes to leaks.

## Public Education

The City's public education program uses a variety of approaches to encourage customers to conserve water. The City has a robust conservation program, devoting 0.3 full-time equivalent (FTE) to conservation in the form of a water conservation program coordinator position, and it enjoys the benefits of memberships and participation in the Regional Water Provider's Consortium (Consortium) and JWC's Education and Event Committee (EEC). The City's 2018-2019 water conservation budget was \$62,000 plus \$14,000 in staff time, of which a significant portion goes toward the Consortium's conservation program. The remaining funds go to the City's rebate program, multi-media shows, devices, outreach and educational materials, and other items and activities as explained below.

As a member of the Consortium, the City benefits from the Consortium's conservation services. For example, the City is able to offer eight elementary schools water conservation performances annually that the Consortium makes available through a contract with Mad Science. The City's conservation program coordinator participates on the Consortium's conservation committee, helping to develop and promote the Consortium's program for the benefit of Beaverton and the other Consortium members.

The City participates in regional and local public education and outreach events. These are sponsored by the Consortium, JWC, and the City. Through Consortium sponsorship, the City staffs booths at the annual Children's Clean Water Festival and the annual Home and Garden Show. JWC's EEC also sponsors events, as previously described. The City staffs booths at a variety of City-specific events as well, including Picnic in the Park, farmers markets, Bay Tree Lighting Ceremony, and an annual Public Work's Week public event. At these events, the City provides conservation information and distributes printed material and water savings devices. The water savings devices offered by the City at these events or other locations include showerheads, faucet aerators, toilet tablets, shower timers, and rain gauges.

**Five-Year Benchmarks:** The City will continue its public education program and continue to participate in the Consortium and JWC's EEC.

### 3.6.3. Additional Conservation Measures

*OAR 690-086-0150(5)*

OAR 690-086-0150(5) 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 5-year schedule to implement several additional conservation measures. The City meets the latter criterion.

## Technical and Financial Assistance Programs

The City provides technical and financial assistance to its water utility customers. This assistance comes in two primary forms, as described below.

- Free watering gauges are provided by the City to customers upon request to help customers measure irrigation volumes and to prevent overwatering.
- Informative brochures provided by the City and described on the Consortium's website (linked from the City's website) discuss irrigation techniques to homeowners to assist in efficient water use during peak season. Other water savings techniques can be found on these webpages as well, including toilet leak testing and repair.

The City is also considering contracting with other JWC members to perform free irrigation audits at its multi-family customers' sites. These other members have acquired technologies and gained knowledge to allow the staff to perform these audits and also may be willing to perform these audits in Beaverton's service area.

**Five-Year Benchmarks:** The City will continue to provide technical and financial assistance to both residential and non-residential customers. Specifically, the City will continue to offer water-saving devices (e.g., water gauges) and offer information that promotes water conservation self-assessments. The City will explore opportunities to offer additional technical assistance in the form of free irrigation audits to its multi-family customers.

## Supplier Financed Retrofit or Replacement of Inefficient Fixtures

The City manages a successful residential water efficiency rebate program initiated in 2002 that now focuses on indoor and outdoor water conservation. Under the program, residential users can receive \$75 rebates for replacing older inefficient toilets with high-efficiency toilets (1.28 gallons per flush) and \$50 for replacing washing machines with select high-efficiency models. Residents also can receive a \$50 rebate for installing a WaterSense Weather-Based Irrigation Controller to help reduce irrigation water waste. This controller rebate program was initiated in 2017.

In fiscal year 2017-2018, the City distributed 144 toilet rebates, 8 washing machine rebates, and 15 irrigation controller rebates. In fiscal year 2018-2019, the number of irrigation controller rebates distributed increased to 20. Overall, the rebate program has been popular and the City has continued to increase its conservation budget to match the rebate demands from the community.

The City also distributes free water-saving devices, such as water-efficient faucet aerators and showerheads, to customers at specific locations in the City and upon request.

**Five-Year Benchmarks:** The City will continue to offer rebates and incentives to customers to retrofit or replace inefficient fixtures. The City will continue to offer water-saving devices.

## Rate Structure and Billing Practices that Encourage Conservation

The City continues to promote conservation through its rate structure. The City bills all customer classes based on the quantity of water used—the rate for the 2019-2020 fiscal year is \$3.57 per hundred cubic meter. Customers' bills also include a base charge that is based on meter size. In 2013, the City began reading all meters monthly instead of bi-monthly, improving customers' feedback of water consumption and thereby allowing customers to adjust use in a timely manner. For example, a customer who would have received a bill in September for July/August usage under bi-monthly billing now obtains July usage in their August bill, allowing them to have an impact on usage during peak season.

City personnel can provide an account review and offer advice on ways to conserve water whenever a customer expresses interest. When the City suspects that a customer has a leak, the City notifies the customer about the high water usage and suggests that the customer check for a leak using instructions provided on the City's webpage.

The utility bills received by customers include past usage volumes, enabling customers to compare water use to the same month of the previous year.

**Five-Year Benchmarks:** The City will continue to charge for water based on the volume of water used as means to promote water use efficiency. The City will continue to bill customers monthly.

## Water Reuse, Recycling, and Nonpotable Opportunities

The City is developing a "purple pipe" program in the SCM area to meet irrigation demands. To date, the City has installed 1.5 miles of purple pipe. The City estimates that it will ultimately install up to 12 miles of purple pipe, which will serve residential irrigation systems and a high school irrigation system. Over the past two summers, the purple pipe system has had a total demand of approximately 13.33 MG. ASR 3 will supply the SCM using the City's native groundwater right. Historically, ASR 3 has met all water quality standards, however, a higher level of manganese affects taste of the water. Using the water for irrigation allows the City to reduce demand on its surface water supplies.

A separate project initiated by CWS, the regional stormwater and wastewater service provider, is being developed to inject stormwater into the City's Well 3 for irrigation use in the SCM area. CWS and OWRD have provided funding to the City to study the feasibility of this project. OWRD awarded the City and CWS \$700,000 for stormwater diversion, treatment, and injection into ASR wells. Stormwater, once captured, would be injected into Well 3 in the winter and pumped and distributed as irrigation water to the SCM area in the summer. If implemented, the City hopes to offset the entire irrigation demand of the SCM area at full build out of the area (approximately 8,000 homes). Water pumped from Well 3 would be distributed in purple pipes.

**Five-Year Benchmarks:** The City will continue to develop and pilot test a stormwater capture project with CWS and continue to develop their purple pipe project in the SCM area.



## Other Conservation Measures

The City performs the following additional conservation measures:

- The City is a member of the RWPC and has enjoyed the benefits of membership including conservation programming opportunities.
- The City's Conservation Program Specialist regularly attends trainings to learn about new programs and technology that can improve the City's conservation program. Trainings include American Water Works Association (AWWA) workshops/conferences and an annual WaterSmart Innovations conference.
- The City is researching the possibility of performing a conservation measures cost-effectiveness analyses, which would identify other conservation measures that will deliver cost-effective and high-impact water savings.
- The City has observed that new residential development has a higher peaking factor than older residential developments and anticipates future residential growth will also have greater summer demand by comparison. Therefore, the City is considering targeting outdoor conservation measures to customers in these higher peak areas.

**Five-Year Benchmarks:** The City will continue to be a member of the Consortium and offer the services provided through membership to its customers. The Conservation Program Specialist will continue to attend trainings and conferences that provide education and insight to potentially grow and enhance existing City conservation programs. The City will consider performing a conservation measures cost-effectiveness analyses to identify new conservation measures for implementation. The City will consider implementing measures targeting customers in areas with higher peaking factors.

Exhibit 3-8 presents a summary of the City's 5-year water conservation benchmarks.

### Exhibit 3-8. Summary of 5-year water conservation benchmarks

Conservation Measures	Five-Year Benchmarks
Annual Water Audit	Continue to conduct annual water audits over the next 5 years
System-wide Metering	Continue to meter all connections
	Over the next five years, the City will work towards the seven year goal of converting all meters to AMI meters.
Meter Testing and Maintenance	The City will follow manufacturer's specifications for AMI meter testing and maintenance.
	The City will track meter data for signs of malfunctioning meters and will replace any malfunctioning meters promptly



Conservation Measures	Five-Year Benchmarks
Water Rate Structure	Continue to bill customers based, in part, on the volume of water consumed on a monthly basis
	Continue to assess rate structure for modification in order to adequately fund the operation and maintenance of the City's water system, including consideration of a progressive tiered-rate structure
Water Loss Analysis	Continue to conduct leak detection program
	Continue to budget for replacement of high-priority aging infrastructure
Public Education	Continue public education program and participation in the Consortium and JWC EEC
Technical and Financial Assistance Programs	Continue to provide technical and financial assistance to residential and non-residential customers by continuing to offer water saving devices and information that promotes water conservation.
	Explore a free irrigation audits program for multi-family customers
Supplier Financed Retrofit or Replacement of Inefficient Fixtures	Continue to offer rebates and incentives to customers to retrofit or replace inefficient fixtures.
	Continue to offer water saving devices
Rate Structure and Billing Practices that Encourage Conservation	Continue to charge for water based on the volume of water used as means to promote water use efficiency.
	Continue to bill customers monthly.
Water Reuse, Recycling, and Non-potable Opportunities	Continue to develop and pilot test a stormwater capture project with CWS
	Continue to develop the purple pipe project in the SCM area

Conservation Measures	Five-Year Benchmarks
Other Conservation Measures	Continue to be a member of the Consortium and offer the services provided through membership to its customers
	The Conservation Program Specialist will continue to attend trainings and conferences that provide education and insight to potentially grow and enhance existing City conservation programs.
	Consider performing a conservation measures cost-effectiveness analyses to identify new conservation measures for implementation

## 3.7. TVWD

### 3.7.1. Water Use and Reporting Program

*OAR 690-086-0150(2)*

The District has a water use measurement and reporting program that complies with the measurement standards in OAR Chapter 690, Division 85. The District's water use records can be found on the OWRD webpage: [http://apps.wrd.state.or.us/apps/wr/wateruse\\_report/](http://apps.wrd.state.or.us/apps/wr/wateruse_report/).

Water enters the District's supply system at four primary locations: two from the JWC (Cornelius Pass and 75th Ave) and two from the City of Portland (primary connection at the Portland WCSL meter at Beaverton-Hillsdale Hwy and the primary Metzger service area meter at Florence Lane). The District has magnetic meters at each of these four locations and these meters are on the District's SCADA system. The SCADA system reports water demand in one-minute intervals and these data are summarized for the District's annual water use reporting to OWRD.

### 3.7.2. Required Conservation Programs

*OAR 690-086-0150(4)*

OAR 690-086-150(4) requires that all water suppliers establish 5-year benchmarks for implementing the following water management and conservation measures:

- Annual water audit
- System-wide metering
- Meter testing and maintenance
- Unit-based billing
- Water Loss Analysis
- Public education

#### Annual Water Audit

TVWD performs an annual water audit that incorporates a comprehensive data set, including total demand (volume of water purchased that enters the distribution system), total volume of water consumed by customers through metered service connections, wheeled water (i.e., water that's moved through the District's water distribution system for Portland Water Bureau and City of Beaverton customers), and non-revenue uses, such as pipeline flushing and hydrant usage. Annual water audits are currently performed based on fiscal years (e.g., 2014 data is from July 2013 through June 2014).

From 2015 through 2019, water loss ranged from a high of 7.0% to a low of 2.4%. Water loss in 2019 was 4.7%.

As described in Section 2, the Portland supply meter is owned by the PWB. The District worked with PWB in July of 2015 to replace a 24-inch bore mag meter and a 42-inch insertion mag meter at this location in 2019. Currently, the majority of flow is routed through the 24-inch bore mag meter, which was installed in 2015. The 42-inch insertion mag meter is intended to be used during high flows when the capacity of the smaller meter is exceeded. The replacement of both meters will help improve the accuracy of the District's water audits.

Since 2015, TVWD has also verified that emergency water intertie valves with neighboring water agencies are in the 'closed' position and has performed system leak audits in specific areas of the District. Additional actions that TVWD is taking to increase efficiency are described below under Water Loss Analysis.

**Five-Year Benchmarks:** TVWD will continue to perform a comprehensive annual water audit in order to continually assess water loss from all potential causes. TVWD will continue to track usage by customer class to evaluate consumption trends.

## System-wide Metering

The District's system is fully metered including all permanent connections to the Portland Water Bureau, the Joint Water Commission, and the District's groundwater or aquifer storage and recovery wells. The District installs Badger ORION Automatic Meter Read (AMR) meters in all new customer meter installations. When new meters are initially installed, they are provided with non-AMR meters for approximately 6 months. This is the period during which activity around the meter (i.e., site construction) has a greater potential to damage the meter. After the high activity period, an AMR meter is installed for final use.

TVWD has installed AMR meters on approximately 96 percent of its 3-inch to 10-inch commercial accounts, which represents 292 meters. This includes commercial (119), irrigation (4), multi-family residential (153), and production (16) class meters. Meters installed since 2016 have data logging capability to aid in leak detection, troubleshooting, and conservation efforts. Any remaining non-AMR meters 3-inch and larger will be replaced as they fail to test to specification or as parts become difficult to acquire. Fireline meters are omitted as these assemblies are owned by the customers. To date, the District has installed approximately 21,478 AMR meters throughout its system.

**Five-Year Benchmarks:** The District will continue to install AMR in all new meter installations or as metering devices fail to perform to District specifications. Additionally, the District is evaluating the use of Advanced Metering Infrastructure (AMI) for consideration in the development of a long-term meter reading strategy.

## Meter Testing and Maintenance

TVWD tests, repairs, or replaces as necessary all meters greater than 2-inch in diameter every two years or less. The District has replaced nearly all large meters with new AMR models. Only

12 meters of this size classification remain to be replaced. These remaining meters are still performing within specification. The District also tests meters 2-inch or less in response to customer inquiries or deficiencies noted by staff. When non-AMR meters need to be repaired, the District will replace the meter with a new AMR meter.

**Five-Year Benchmarks:** The 12-remaining large, non-AMR meters will be replaced as they reach the end of their functionality, as parts become difficult to acquire, or as opportunity projects arise. The meter testing program will continue to test large meters every two years or less and small meters (2-inch or less) upon request.

## Water Rate Structure

The District continues to use base charge billing, which is determined by meter size. This is followed by a two-tiered block volume usage charge, known as Block 1 and Block 2. The District developed this water rate structure to incentivize conservation and has used this method consistently since implementation. TVWD customers continue to receive their bills shortly after their meter is read on a bi-monthly basis. Billing statements show water use over the previous 18 months, provide a breakdown of Block 1 and Block 2 usage and rates, and at times include a conservation message. Appendix H presents the District's base charges and block volume charges.

In addition, the District periodically reviews the rate structure. This occurred most recently in 2016 and 2017 through the use of a TVWD Rate Advisory Committee utilizing residential and commercial customers as active Committee members. This process reaffirmed the conservation-based billing structure and identified future measures for consideration, such as monthly billing.

**Five-Year Benchmarks:** The District will continue its current rate structure and bi-monthly billing schedule along with providing periodic conservation messages and recent water use in billing statements. The District is also in the process of procuring a new customer information system (i.e., billing software) with implementation scheduled for completion during the 2021-2022 fiscal year. This change is expected to offer increased flexibility for customer billing and messaging.

## Water Loss Analysis

From 2015 through 2019, TVWD's water loss ranged from a high of 7.0% to a low of 2.4%. Water loss in 2019 was 4.7%.

The District dedicates substantial resources towards minimizing water loss, including a comprehensive leak detection and repair program that emphasizes leak detection surveys and immediate repair of identified leaks, AMR record review, and customer education.

TVWD has conducted several focused leak detection surveys since 2015. The District conducted these surveys in isolated areas of the District in an attempt to investigate specific, suspected leaks. Several leak detection methods are used, including: the use of acoustical listening devices on valves, hydrants, and service lines; water quality testing for chlorine or fluoride; and visual

observations of water in unexpected places. If a leak is detected in the distribution system, the District repairs the leak immediately, schedules a repair, or records and monitors the leak in future leak detection surveys. The action taken depends on the severity of the leak. Additionally, TVWD's ongoing capital improvement plan (CIP) has invested approximately \$18.4 Million in mains replacement since 2014 to address priority areas and reduce water loss through preventative actions.

The District reviews data from AMR meter residential consumption records on a bi-monthly basis and AMR meter commercial consumption records on a monthly basis for water consumption changes that may indicate a leak at a customer's premises. Residential AMR meters are read digitally using handheld devices. Meters 3-inches or greater are the new generation of Badger ORION AMR meters that are read digitally and also have a data logging capability that allows the District to capture flow readings at one hour intervals. A reading that is greater than two times the reading for the same period during the previous year, or is greater than two times the last reading, results in the customer's inclusion on a "High Read" exception list of meters with suspected leaks that need to be investigated. District staff may be sent to the service address to verify a suspected leak and the District contacts the customer if a leak is found. Badger ORION data logging meters have been very helpful in diagnosing leak conditions on non-residential meters 3-inches and larger. District staff is able to analyze time and flow values that provide clues about where to look to confirm the presence of a leak, such as in an irrigation system known to run at 5:00AM and at a specific theoretical flow rate for each zone. This method is a reliable approach for detecting leaks in most cases, but for sites like large multi-family complexes or production facilities, this method is used to indicate that further investigation is warranted.

In addition, the District uses its Website, newsletters, billing messages, post cards, emails, educational videos, and events, such as the RWPC's "Fix-a-Leak" month-long campaign effort each year, to educate customers about leak detection and repair. The District also promotes leak detection and repair through a similar month-long effort promoted by the Regional Water Provider Consortium (RWPC). The District recently won a PNWS-AWWA Excellence in Communication Award for an educational video titled "Game of Seasons" that aimed to help customers prevent leaks due to frozen pipes by weather proofing their homes. TVWD also offers a "Leak Kit" to customers upon request to help them identify leaks.

**Five-Year Benchmarks:** The District will continue its efforts to minimize water loss, including: conducting leak detection surveys, regularly inspecting fire hydrants with acoustical listening devices, repairing leaks, replacing mains and implementing other activities identified in the District's Capital Improvement Program, reviewing AMR data, implementing special messaging campaigns through newsletters and TVWD's website, and offering "Leak Kits".

## Public Education

The District promotes water conservation through print and electronic media, community outreach efforts, school programs, and regional partnerships. The District has been recognized for its public education efforts with various industry awards. Specific details about these efforts are provided in the following sub-sections.

### Print and Electronic Media

Conservation information and materials are provided to customers in the District's front lobby area, within bi-monthly billing statements, on its recently updated website, and in customer newsletters. Additional details about each include the following:

- The front lobby contains a kiosk with water conservation brochures, information on rebates, water conservation themed calendars, and Water-Efficient Plants for the Willamette Valley booklets that describe native and naturalized, non-invasive, water-efficient plants that can be used effectively in local landscaping.
- In August of 2019, TVWD launched an updated website. The District's new website provides information about the importance of water conservation for the District and its customers, actionable information on leak detection and repair, indoor and outdoor conservation, technical assistance available for commercial customers, rebates for water efficient devices, and tips on water-efficient landscape design.
- The website also provides links to water conservation resources, such as the Environmental Protection Agency's (EPA) WaterSense program, the Regional Water Providers Consortium (RWPC), and the Alliance for Water Efficiency.
- As noted previously, TVWD's bi-monthly billing statements contain seasonal conservation messages and the District also sends its residential customers the bi-monthly Water Words newsletter, produced jointly by the District and Clean Water Services. This newsletter generally includes both water conservation and water quality messages.

In addition, TVWD's web site provides contact information for the District's Conservation Program, enabling customers to correspond directly with District conservation staff.

### Community Outreach

TVWD has conservation staff that speak regularly to public groups interested in learning about water efficiency in residential, commercial and multi-family settings. The District also has a Speaker's Bureau that presents District policies and leads discussions with customer groups, businesses, and organizations. Topics discussed include the Willamette Water Supply Program – TVWD and its partners new source in 2026 – various regional water resources, and District budgeting and rate planning processes. Further topics include water efficiency, conservation, sustainability, and emergency preparation and system resilience.

The District also maintains a Water Efficient Demonstration Garden at its headquarters property. The garden provides a hands-on demonstration tool to teach water efficient principles and practices in landscape design, installation, and maintenance. The garden incorporates interpretive signage and brochures about several key landscaping options designed to promote conservation. These include:

- Native and naturalized non-invasive plants;
- Weather-based irrigation technology; and
- High efficiency multi-stream nozzles and drip irrigation systems

In addition, the garden has a plaza that serves as an outdoor classroom for District staff to hold water conservation events to provide useful information to local students, landscape professionals, and residential and commercial customers.

TVWD recognizes the value of continuous education for landscape contractors and supports best management practices for efficient irrigation system design, installation, and maintenance with an emphasis on weather-based irrigation control technology. Therefore, the District collaborates with the Oregon Landscape Contractor's Board (LCB), the Oregon Landscape Contractors Association (OLCA), and other regional water providers to provide low or no-cost educational workshops and technical session programs for landscape contractors that satisfy the LCB's continuing education requirement.

## **School Programs**

The District has a comprehensive Youth Education Program that provides water conservation materials, presentations, and activities to students at elementary schools and regional events. Presentation themes include the natural water cycle, the path of drinking water from the source to the customer's home, conservation and efficiency, and a variety of water quality topics. The District also contracts with professional actors for school presentations about water conservation.

The District also provides staff for information booths at various science fairs and is an active partner in the annual Children's Clean Water Festival. In addition, TVWD has an annual Conservation Calendar Contest for local elementary school students, which has received national recognition. The TVWD Conservation Calendar has a water conservation theme and provides student produced artistic tips on how to use water wisely.

## **Partnerships**

The District is active in conservation planning and implementation through regional, statewide, and national partnerships and affiliations. TVWD is represented on the Board and committees of the RWPC and through this consortium, is an active member of the OLCA along with the Landscape EXPO Planning Committee. TVWD Conservation staff are also active members of the Water Conservation Committees, a committee of the American Water Works Association, Pacific Northwest Section (AWWA-PNWS). A significant effort of this committee has been



working with Lane Community College (LCC) to develop a 2-year Associate of Science Program to promote development of the skills needed to work in the municipal water conservation industry.

Nationally, the District is a promotional partner with the EPA's WaterSense Program and is an active member of the Alliance for Water Efficiency's WaterSense and Water Efficient Products Committee of the national AWWA Water Conservation Committee. TVWD's Conservation Technician is also a Certified Landscape Irrigation Auditor by the Irrigation Association (IA) and participates on the IA's Smart Water Application Technology (SWAT) Technical Working Group.

## Awards

TVWD has received numerous communication awards for its public education efforts, including:

- Nominated for a City-County Communications and Marketing Association (3CMA) Savvy Award
- PNWS-AWWA Excellence in Communication Awards (2019) for the following:
  - TVWD's Game of Seasons – Winter Preparedness video
  - TVWD's Gold Plan Backflow Program
  - TVWD's National Preparedness Month Water Storage and Emergency Kit Hands-on Demonstration
- Regional Water Providers Consortium's Water Conservation Awards

**Five-Year Benchmarks:** The District will continue to use a variety of tools to reach customers, including bill inserts, website updates, various social media platforms, attending public events and facilitating tours, and providing high-value youth education programming. The District will also remain an active member of the RWPC to enhance regional communications and work with local water providers on outreach strategies related to conservation and emergency preparedness.

### 3.7.3. Additional Conservation Measures

*OAR 690-086-0150(5)*

OAR 690-086-0150(5) 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.

## Technical and Financial Assistance Program

The District offers a “Welcome Kit” to all new customers and a “Leak Kit” is available upon request to help customers reduce water use. Key details of each kit include the following:

- The “Welcome Kit” provides customers the opportunity to request high efficiency showerheads, bathroom aerators, kitchen aerators, toilet leak test tablets, and conservation brochures free of charge; and
- The “Leak Kit” helps customers identify leaks and other potential reasons for high water bills, such as inefficient fixtures or leaking toilet tanks.

These materials are also provided to customers at community events. Showerheads, aerators, toilet dye tablets, and education brochures are all available in the District’s front lobby to customers as well, free of charge.

In addition to the residentially focused assistance above, the District has a commercial, industrial, and institutional (CII) water conservation program to reduce water use by its non-single-family residential customers. The CII program includes the following elements:

- Technical assistance and water efficiency incentives for facility and property managers that service lavatories, landscape irrigation systems, production kitchens, and unique business processes;
- Conservation staff provide recommendations for improving both indoor and outdoor water efficiency on the District’s website, upon request from customers, or in person at District headquarters or the customer’s property;
- The District offers rebates for upgrading to water efficient fixtures and equipment which is described under Supplier Financed Retrofit or Replacement of Inefficient Fixtures;
- Production kitchens that use older inefficient pre-rinse spray valves are provided new efficient models free of charge when they participate in the District’s free commercial water use assessment program; and
- Customers may request financial assistance from the District for innovative capital improvement projects to improve water efficiency by applying for the Customer Organized Proposal rebate.

The District offers indoor water use assessments to its CII customers, and if an analysis of water records suggests that outdoor water use may be a source of inefficiency, the District also offers irrigation assessments at no charge. An overall goal of the program is to emphasize how improving water use efficiency can save money.

Each summer, the District asks its customers to voluntarily limit water application to 1-inch of water per week for turf areas and less for areas with trees and shrubs. To encourage participation, the District provides a link to the [RWPC’s Weekly Watering Number](#) on its website that describes how to program an irrigation controller to apply 1-inch of water per week and

make weekly schedule adjustments based on local weather conditions. The RWPC also provides free watering gauge kits to customers upon request or at public outreach events. These gauges can help determine the application rate of irrigation systems and set an effective 1-inch base schedule.

**Five-Year Benchmarks:** The District will continue to provide indoor and outdoor water use assessment upon request and promotion of these efforts. The District will continue the other elements of its technical and financial assistance program as detailed above.

### **Supplier Financed Retrofit or Replacement of Inefficient Fixtures**

The District offers rebates for upgrading to water efficient fixtures, equipment, and processes. The specific details of the rebate include the following elements:

- Up to \$75 per fixture to replace inefficient flush valves, toilets, and urinals with EPA WaterSense labeled fixtures;
- Up to \$50 for residential customers (i.e., house, condominium, duplex/multiplex, or manufactured home with a single or master meter) to install or retrofit a WaterSense labeled weather-based irrigation controller;
- Up to \$400 per controller (up to a \$2,500 maximum rebate) for non-residential commercial, industrial, or institutional customers to install weather-based irrigation control (based on the number of zones per controller; \$200 for 1-6 zones, \$250 for 7-12 zones, \$300 for 13-18 zones, \$350 for 19-24 zones, and \$400 for 25+ zones);
- Up to \$96 for customers to replace inefficient irrigation sprinkler nozzles with multi-stream rotating nozzles (up to \$3 per nozzle, limit of 32 nozzles); and
- Up to \$5,000 for commercial, industrial, and institutional customer organized proposals for water efficiency projects (Customer Organized Proposal Rebate (COPR) program). For COPR rebates, the customer provides the District with a proposal that describes the type of project and the estimated water savings, which the District will evaluate for merit and rebate incentive level.

Exhibit 3-9 shows the number of rebates distributed by the program to date since fiscal year 2013/2014.

**Exhibit 3-9. Rebates distributed by program since fiscal year 2013/2014**

TVWD Rebate Program	Number of Rebates Administered							
	FY 2013- 2014	FY 2014- 2015	FY 2015- 2016	FY 2016- 2017	FY 2017- 2018	FY 2018- 2019	Jul-19	Total
<b>Residential Rebate Program (Inception Date)</b>								
Clothes Washer (May 2002)	70	D/C	D/C	D/C	D/C	D/C	D/C	70
HET Toilet (November 2005)	1704	1455	1400	1073	1106	804	45	7,587
Weather Based Irrigation Controller (June 2006)	17	37	95	81	58	86	21	395
Multi-Stream Rotating Nozzles (July 2011)	148	158	236	186	33	71	12	844
	<b>Sub-total</b>							<b>8,896</b>
<b>B.I.G. Rebate Program (January 2006)</b>								
Toilet/Flush-Valve Rebates	151	468	167	26	458	29	2	1,301
Weather Based Irrigation Rebates	6	12	19	1	0	0	0	38
Multi-Stream Rotating Nozzles (July 2011)	643	82	0	0	0	0	0	725
	<b>Sub-total</b>							<b>2,064</b>
	<b>Grand-total</b>							<b>10,960</b>

Note: D/C means discontinued.

**Five-Year Benchmarks:** The District will continue to fund all of the current rebate programs. As the WaterSense program continues to evolve and more products are added to the labeling program, the District will evaluate incorporation of these new products into rebate programs.

### Rate Structure and Billing Practices that Encourage Conservation

As previously described, the District continues to use base charge billing, which is determined by meter size. This is followed by a two-tiered block volume usage charge, known as Block 1 and Block 2. The District developed this water rate structure to incentivize conservation and has used this method consistently since implementation. TVWD customers continue to receive their bills shortly after their meter is read on a bi-monthly basis. Billing statements show water use over the previous 18 months, provide a breakdown of Block 1 and Block 2 usage and rates, and at times include a conservation message.

**Five-Year Benchmarks:** The District will continue its current rate structure and bi-monthly billing schedule along with providing periodic conservation messages and recent water use in billing statements. The District is also in the process of procuring a new customer information system (i.e., billing software) with implementation scheduled for completion during the 2021-2022 fiscal year. This change is expected to offer increased flexibility and opportunity for improved customer billing and messaging.

## Water Reuse, Recycling, and Non-potable Opportunities

The District is solely a water provider. Wastewater generated by the District's customers is conveyed by the Cities of Tigard, Beaverton, and Hillsboro, and Clean Water Services (CWS) to regional treatment facilities operated by CWS of Washington County. CWS is an industry leader in developing new and innovative methods for reuse of water conveyed to the treatment facilities. As a regional participant in major water resource projects and the largest water supplier in Washington County, the District will continue to support regional work to develop these efforts.

The District promotes water reuse and recycling among its customers, as well. The District's Commercial, Industrial and Institutional (CII) program encourages commercial and production customers to recycle and reuse water, and to reduce their water consumption. The COPR provides rebate opportunities for water efficiency improvements for commercial applications, such as the elimination of single-pass cooling and improved cooling tower water treatment. Furthermore, the COPR is designed to be flexible and open enough to encourage innovative water reuse or recycling proposals from customers for their unique industrial processes.

**Five-Year Benchmarks:** The District will continue to support regional efforts in developing innovative methods for reuse of water. The District will continue working with CII customers to support projects that improve production water efficiency through reuse and recycling.

## Other Conservation Measures

### *Tracking Tools*

The District has used several software tools to track the number of customers participating in the rebate programs since their inception and to estimate the potential conservation savings. Analyses conducted using these tools indicate that the District's conservation programs have been very successful. Software tools used to track results include in-house developed applications and the Alliance for Water Efficiency's Water Conservation Tracking Tool. The in-house tool is a comprehensive spreadsheet which allows the District to track all conservation rebates, assessments, device giveaways, and education and outreach programs. Savings estimates per participating customer for each measure are built into the spreadsheet and the District calculates a diminishing return based on what part of the fiscal year the measure is implemented. Analysis of water savings produced from rebates provided to Commercial, Industrial, and Institutional customers found that the average water savings was approximately 20 percent.

### *Pilot Programs*

The District actively looks for opportunities to test new conservation methods and technology. Various pilot programs have been explored and implemented, and these programs have focused largely on irrigation technology and evapotranspiration (ET) based irrigation scheduling.

### *Customer Service & Conservation Staff*

The District's mission is to provide the TVWD community quality water and customer service. Staff provides assistance to customers with concerns about high bills, general conservation questions, and water efficient fixture and device questions. The District also hosts various workshops, trainings, and presentations. Conservation staff are available to all customer classes to encourage water conservation, as well as landscape professionals, plumbers, and other trade-ally groups and regional colleagues. The District views the involvement of private businesses as critical to implementing efficient, long-term, and sustainable changes in the landscape and plumbing markets. The District also networks regularly with manufacturers and distributors of water conservation products to stay informed about new technologies and opportunities for District customers.

**Five-Year Benchmarks:** The District will continue its efforts to provide high quality customer service and facilitate customer engagement and participation in water conservation efforts. The District will continue its current efforts to market the use of advanced irrigation technology in landscape irrigation and promote best landscaping practices using its Water Efficient Demonstration Garden, as well as performing cost-benefit analyses of various conservation programs and methods for both customers and the District.

Exhibit 3- 10 presents TVWD's five-year conservation benchmarks.

#### **Exhibit 3-10. Conservation Five-Year Benchmarks**

Conservation Measures	Five-Year Benchmarks
Annual Water Audit	Continue to perform a comprehensive, annual water audit in order to continually assess water loss from all potential causes
	Continue to track usage by customer class to evaluate consumption trends
System-wide Metering	Install AMR in all new meter installations or as metering devices fail to perform to District specifications
	Continue evaluating the use of Advanced Metering Infrastructure (AMI) for consideration in the development of a long-term meter reading strategy
Meter Testing and Maintenance	Continue to test large meters every two years or less and small meters (2-inch or less) upon request
	The 12-remaining large, non-AMR meters will be replaced as they reach the end of their functionality, as parts become difficult to acquire, or as opportunity projects arise
Water Rate Structure and Billing Practices that Encourage Conservation	Continue current rate structure and bi-monthly billing schedule along with providing periodic conservation messages and recent water use in billing statements
	The District is also in the process of procuring a new customer information system (i.e., billing software) with implementation scheduled for completion

Conservation Measures	Five-Year Benchmarks
	during the 2021-2022 fiscal year. This change is expected to offer increased flexibility and opportunity for improved customer billing and messaging.
Water Loss Analysis	Continue its efforts to minimize water loss, including: conducting leak detection surveys, regularly inspecting fire hydrants with acoustical listening devices, repairing leaks, replacing mains and implementing other activities identified in the District's Capital Improvement Program, reviewing AMR data, implementing special messaging campaigns through newsletters and TVWD's website, and offering "Leak Kits"
Public Education	Continue to use a variety of educational tools to reach customers, including bill inserts, website updates, various social media platforms, attending public events and facilitating tours, and providing high-value youth education programming
	Remain an active member of the RWPC to enhance regional communications and work with local water providers on outreach strategies related to conservation and emergency preparedness
Technical and Financial Assistance Programs	Continue to provide indoor and outdoor water use assessment upon request, promote these efforts, and continue other elements of the technical and financial assistance program
Supplier Financed Retrofit or Replacement of Inefficient Fixtures	Continue to fund all of the current rebate programs
	As the WaterSense program continues to evolve and more products are added to the labeling program, the District will evaluate incorporation of these new products into rebate programs
Water Reuse, Recycling, and Nonpotable Opportunities	Continue to support regional efforts in developing innovative methods for reuse of water
	Continue working with CII customers to support projects that improve production water efficiency through reuse and recycling
Other Conservation Measures	Continue efforts to provide high quality customer service and facilitate customer engagement and participation in water conservation efforts
	Continue current efforts to market the use of advanced irrigation technology in landscape irrigation and promote best landscaping practices using Water Efficient Demonstration Garden
	Continue performing cost-benefit analyses of various conservation programs and methods for both customers and the District

## 4. JWC Curtailment Plan

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### 4.1. Introduction

Curtailment planning is the development of proactive measures to reduce demand during water supply shortages. Shortages may be due to prolonged drought or natural disasters (e.g. flooding, landslides, earthquakes, and contamination); or mechanical or electrical equipment failure including power outages; or events not under control of the JWC (e.g. intentional malevolent acts). Curtailment needs to be considered when demands exceed supplies, and no alternative supplies are available through the JWC or its partners that will meet demands for the duration of the shortage.

The JWC's current curtailment plan was updated in 2017 following winter supply limitations experienced by the JWC. The JWC recognized that an expanded curtailment plan was needed to address demand reductions when water treatment plant (WTP) capacity is limited, as well as to address winter supply limitations. Depending upon the situation, resolution of capacity limitation issues may be handled individually or jointly by agreement between the partners. Limitations to the WTP's capacity does not automatically require curtailment measures, but begins a discussion among the JWC partner agencies: cities of Hillsboro, Forest Grove, Beaverton, and TVWD to determine the availability of alternate supplies for the duration of the shortage.

The General Manager may need to impose mandatory reductions in water availability to JWC partners in an emergency situation. JWC does not have direct authority to regulate member agencies' actions within their own systems. Ultimately, on-the-ground curtailment implementation will be delegated to and implemented by the individual member agencies. Triggers and responses by individual partners will vary due to differing conditions and additional water sources available to JWC partners that may negate or reduce the need for individual partners to curtail. Each JWC partner agency may be required to initiate and implement the progressive stages of their individual curtailment plans based on the status of supply, projected demands, and alternative sources of available supply for their systems. These actions should be communicated with the other JWC partners to facilitate coordinated messaging between partners and limit community confusion.

In addition to the JWC providing a curtailment plan, each JWC Member Agency has provided its individual curtailment plan in this WMCP. Each JWC member agency is required to have a curtailment plan prepared that meets the state's requirements under OAR 690-086-0160. The individual plans are based on their specific water system characteristics, such as varying customer category objectives and alternate supply options.

The JWC expects each agency to implement the appropriate curtailment stages to reduce their demand to the allotments available. Furthermore, the JWC's agreement with wholesale customer the City of North Plains stipulates that the City of North Plains will immediately adopt the same or similar conservation or curtailment measures as those imposed on JWC members



during curtailment events, and that the City of North Plains will develop its own curtailment plan that complies with measures imposed by JWC members and will establish a water conservation program.

## **4.2. Joint Water Commission**

### **4.2.1. History of System Curtailment Episodes**

*690-086-0160 (1)*

Despite several incidents of JWC supply shortages in the past, the JWC has not had to implement mandatory curtailment to date. Those supply incidents are described in greater detail below, but all were handled by operational adjustments and negotiations for alternative supplies with JWC partners. The JWC and its member agencies excel at working together to find alternatives to curtailment while being able to meet the water supply needs of all partners. Curtailment is considered a last resort to achieve decreased demand, but the JWC has a plan to employ curtailment if necessary. Summaries of JWC water supply issues that nearly called for the JWC to implement curtailment protocols are detailed below.

#### **Water Supply Incidents from 1990 to 1999**

During the 1990s, the JWC Water Treatment Plant (WTP) experienced incidents that impacted supply/capacity, including: loss of power due to a car hitting a power pole near the WTP, loss of power due to a windstorm, severe raw water quality impacts due to the 1996 floods which affected numerous regions in Oregon, and disruption of deliveries to partners due to a transmission line leak on the WTP site. The incidents all reduced the ability of the JWC to supply water. At that time, there was only one reservoir on Fern Hill with 20 MG available storage, less stored water for emergency backup supply than is available today.

These power supply disruptions led to new JWC response agreements with PGE, and construction of a second finished water pumping station with a supporting power transformer station. In March 2016, a backup power facility was brought online at the WTP. The generators are capable of running the WTP at 50% of current peak capacity, which would be able to fully serve the partners for a large portion of the year, based on average demands.

#### **Drought Incident in 2001**

The JWC experienced its first source water shortage in the summer of 2001. This experience is described in brief here and in full detail in the JWC's 2010 WMPC. JWC is generally regulated off its natural flow water rights on the Tualatin River beginning in late May to early June until mid-October. JWC relies primarily on stored water releases from Hagg Lake and Barney Reservoir during this period.

For the first time since construction of Scoggins Dam was completed in 1977, Hagg Lake did not fill in 2001, reaching only 54 percent of its storage capacity. Several JWC member agencies (the Cities of Hillsboro, Beaverton, and Forest Grove) hold contracts with the Bureau of Reclamation

(BOR) for the use of stored water in Hagg Lake that also specify curtailment measures. Based on BOR contract conditions, the JWC partner cities of Hillsboro, Beaverton, and Forest Grove received only about 76% of their normal water allocations from Hagg Lake in 2001. Clean Water Services (CWS) and Tualatin Valley Irrigation District received only 27% and 47%, respectively, of their normal water allocations. Discharge changes at Scoggins Dam were made twice a day, seven days a week to closely match the timing of water orders, avoid waste, and maintain natural flow in the Tualatin River.

In the same year, Barney Reservoir only reached 55% of its storage capacity. After accounting for dead pool storage and releases for fish flows to the Trask River (15% of the available storage), the Barney Reservoir Joint Ownership Commission partners (Hillsboro, Forest Grove, Beaverton, TVWD, and CWS) were allotted only 54% of normal full pool allocations.

The JWC and Barney Reservoir Joint Ownership Committee (BRJOC) partners used a combination of leasing, alternative source options and agreements, and voluntary curtailment to meet summer 2001 demands on the JWC water system. Portland Water Bureau (PWB) had full supplies in both Bull Run and the Columbia River Wellfield. They offered assistance with coordination of regional supply, and provided an alternate source for Tualatin Valley Water District and the City of Beaverton. TVWD allowed Clean Water Services (CWS) to use some of its allocated water in the Barney Reservoir to meet streamflow demands, and CWS paid TVWD the difference between the cost of JWC water and the more expensive PWB water in exchange. It also helped that the summer weather of 2001 was cooler and wetter than usual. No mandatory curtailment was necessary.

### **North Transmission Line Leak in 2013**

On July 24, 2013, a leak was discovered in the North Transmission Line (NTL), which runs along Evergreen Road. The leak was on a section of pipe between 273rd Ave and Sewell Ave, just north of the Hillsboro Airport. Approximately 7,000 feet of pipe was isolated which took 12 hours to dewater. The total response period was 81 hours, with staff and the contractor working around the clock for three consecutive days.

Interconnections delivering water from the JWC to the City of Hillsboro and TVWD service areas were impacted by this event. Hillsboro remained in close contact with industrial users in the immediate area throughout the event. Since the impacted area is normally a high pressure zone, the pressure had to be normalized with the rest of the city and fed by the JWC's South Transmission Line (STL) and Hillsboro's Evergreen Reservoir. TVWD continued to serve their customers through a similar approach, utilizing their interconnection on the STL.

The transmission line was taken out of service for approximately 24 hours. As a result of careful coordination and communications, no customers experienced an interruption to service in either the Hillsboro or TVWD service areas.

## **Summer Supply Incident in 2015**

An abnormal onset of early summer weather, with a record number of days exceeding 90 degrees, caused customer demands to skyrocket. In anticipation of possible shortages for the City and TVWD, the JWC approved leases of stored water and treatment plant capacity at its July 2015 meeting. The summer continued hot and dry, and demands on the WTP were often near its maximum capacity, but all agencies were able to supply their customers without needing curtailment measures.

## **Winter Supply Incident in 2015**

Western Oregon received a record amount of rain from December 7 to 11, 2015. The heavy rain flooded the Tualatin River, and in some places, the flooding was worse than the flood of 1996. This flooding raised water turbidity and changed the chemistry of the raw water entering the WTP, creating significant challenges for treating the water to safe drinking water standards. The more intense treatment required a slower WTP process; production declined to under 20 mgd.

During this time, demands on the WTP were over 20 mgd. Based on the decreased WTP production capacity, the demands of some partners exceeded their ownership percentage of the available capacity. Throughout the week, as the WTP continued to experience treatment challenges, and Fern Hill Reservoirs and the Cities' in-town storage continued to deplete, it became unclear if the City of Hillsboro would continue to meet demands without some measure of mandatory curtailment since the City of Hillsboro does not currently have any alternate supply sources. City of Beaverton voluntarily turned on one ASR well the first day of the event to reduce demands on the WTP and provide more water to the partners, especially the City of Hillsboro. As the event continued, it appeared that the City of Hillsboro might need to curtail its own customers' water usage. On the third day, TVWD shifted demand onto its PWB supply and ASR well, and the City of Beaverton agreed to turn on a second ASR well, to further lessen their JWC system demand. (The City of Beaverton and TVWD used ASR wells developed under LL #002, not the JWC's ASR LL #019.)

TVWD and the City of Beaverton were meeting their customer demands with these alternate sources, and the City of Forest Grove was still able to meet its customer demands with its share of the reduced JWC WTP capacity that was available. As raw water quality improved, the WTP increased production levels, and by the fourth day of the event, the WTP was again producing enough water to begin refilling the storage reservoirs. The City of Hillsboro did not need to curtail. The event was over by the beginning of the following week, with normal WTP production capacity restored and all partners returning to their normal demand levels at the WTP.

## **Storm Event in 2018**

Similar to December 2015's event an "atmospheric river" dropped an enormous amount of water into the Tualatin Watershed. Rainwater is notoriously hard to treat to drinking water standards because of its naturally low pH and alkalinity. To add to the problematic water chemistry, this was also the first large rainstorm of fall, which is referred to as a "flush" because

a large amount of organic material is swept into the river. The entire “flush” happened in a 24-48 hour period. To further complicate matters, due to the low levels of Hagg Lake and Barney Reservoir after the long dry summer there was no release from either reservoir to supplement river flows. This meant that all river flow increase was directly the result of rainfall and rainfall runoff. On December 19<sup>th</sup>, a 70 cfs release from Hagg Lake (Scoggins Reservoir) was made for Stimsons Lumber Mill. This implies that Stimsons was likely releasing water from one of their log ponds and the release was made to keep them in compliance with their permit.

The rapid and extreme changes to the incoming water chemistry resulted quickly in improper coagulation, which led to poor sedimentation basin performance eventually resulting in high turbidity water flowing to the filters. The filters were unable to handle the high turbidity water, which resulted in a turbidity spike in the finished water. JWC operators, concerned that water would soon not meet drinking water standards turned off the Water Treatment Plant (WTP) while they worked to figure out the correct treatment chemistry. Meanwhile, Fern Hill Reservoir supplemented demands for all partners except TVWD. Over the course of the 3-day emergency event, reservoir levels dropped to the lowest ever (less than 13 feet). Furthermore, the JWC requested that partners curtail demands and switch sources if possible, which led to the JWC Member Agencies taking the following curtailment actions:

- Hillsboro relied on in-system storage reservoirs to minimize demand on JWC, eliminated inspection and construction flushing, asked industrial customers to voluntarily reduce their demands, and closely monitored fire events.
- Forest Grove used their WTP and in-system storage to minimize demand on JWC.
- Beaverton stopped ASR injection and mobilized their ASR system to significantly decrease their demand on JWC.
- TVWD relied on Portland supply, and did not take JWC supply during the event.

Immediate remedial actions taken at the WTP included turning on a caustic soda feed to the rapid mix, which had solved a similar chemistry problem in a similar December 2015 storm event. However, staff saw very limited improvement from this measure this time around, and so continued to look for solutions. Incoming raw water was reduced to a single pipeline from the raw water intake. Staff had to keep pumping and treating water until filterable water was produced. Until that time, staff sent flume water directly to the drying beds and overflow, instead of treating the highly turbid water with the filters. A large diesel pump, which was purchased after the 2015 event, was utilized during this time (continuously for days) to minimize the amount of overflow.

## **Algae Bloom Event in 2019**

In the spring of 2019, JWC water quality staff first observed an algae bloom at Hagg Lake near Scoggins Dam while conducting routine sampling. Immediately, staff began ramping up monitoring per the JWC Algal Response Plan and determined that the dominant species was *Aphanizomenon flos aquae*, a species of potentially toxin cyanobacteria. Based on the JWC Algal

Response Plan, as well as recommendations by the Oregon Health Authority (OHA), JWC staff collected samples for toxic analysis, and determined that there were low levels of the toxin microcystin present at two of the four locations sampled in the reservoir, but no toxins were present in Scoggins Creek downstream of the reservoir outlet or in the JWC raw water. Continued sampling of algal speciation, enumeration, and associated toxins showed a brief increase in enumeration of *Aphanizomenon flos aquae*, followed by a steady decline over the course of the following weeks. All subsequent toxin samples in the reservoir were either at the detection limit or non-detects and toxins were never detected in Scoggins Creek downstream of the reservoir or in the JWC raw water. This event lasted approximately 5 weeks from the initial observation to when cell densities were observed at low enough levels to return to routine monitoring as defined by the JWC Algal Response Plan.

Although this event did not require curtailment, in the event of the detection of toxins at the JWC raw water intake it is possible that curtailment may be necessary depending on the time of year, severity of the algal bloom, and the treatment plants capabilities to properly treat raw water to remove specific toxins. The WTP has the ability to add powdered activated carbon (PAC), which is effective at removing cyanotoxins. For example, if cyanotoxins are detected in the source water and at the JWC intake operators at the WTP may initiate the addition of PAC as a precaution. Dosing of PAC to effectively remove cyanotoxins often requires large amounts of PAC, which may require the WTP to decrease production. This may result in curtailment, depending on demand, storage, and the dose of PAC needed.

## **Storm Event Analysis**

In response to the 2018 Storm Event and 2019 Algae Bloom Event, the JWC commissioned a Storm Event Analysis to review what happened and to provide recommendations to improve storm event preparedness and response. The Storm Event Analysis was finalized in October 2019 and adopted by the JWC on January 10, 2020. The JWC has already begun implementing many of the recommendations.

## **South Transmission Line Leak in 2019**

On November 17, 2019, a leak on the 45-inch South Transmission Line (STL) was reported on SW Tongue Lane, in rural Washington County. The STL delivers water to southern portion of Hillsboro's service area, TVWD, and is the main supply line to Beaverton. Crews were able to isolate the leak and completed repairs on November 22<sup>nd</sup>. There was no loss of water service to customers as the leak was isolated and water was supplied to the remainder of the STL through the NTL-STL intertie.

## **Current Capacity Limitation**

The JWC's current capacity limitation is the production capacity of the JWC WTP, which has been rated at 85 mgd for peak day capacity. The WTP's production capacity is lower during the winter season due to impacts of colder temperatures on treatment process, and capacity can

further decrease during the winter season due to water quality events. Production capacity can be impacted at any time due to equipment failures.

## **40 Years of Continuing Reliability Improvements**

Since its beginning in 1976, the JWC has continued to plan and budget for improvements to increase capacity and reliability of the JWC water system. Past improvements that now benefit the JWC system include:

- Barney Reservoir Expansion project
- Multiple WTP expansions (the most recent completed in 2019 to expand the WTP capacity from 75 mgd to 85 mgd)
- Additional finished water storage
  - Construction of a second JWC Fern Hill Reservoir in 2006. This added an additional 20 MG of finished water capacity to the system for a total of 40 MG.
- Installation of back-up electricity
  - The WTP in cooperation with PGE added a back-up power generator onsite in 2016
- Improvements to water quality treatment
  - The WTP added a powdered activated carbon (PAC) feeder in 2008 to improve treatment of organics
  - The JWC added sedimentation basin plate settlers
- Seismic reinforcement
  - The JWC's Fern Hill Reservoir 1, was seismically upgraded in 2006.
  - The construction of the second JWC Fern Hill Reservoir included seismic hardening and wrapping with rebar in 2007.

In addition, the JWC is planning to add emergency interties at the following locations:

- Emergency Intertie between TVWD and JWC North Transmission Line (NTL) at Cornelius Pass and Highway 26
- Emergency Intertie between the Willamette Water Supply (WWS) and JWC NTL at Cornelius Pass and Highway 26
- Intertie between the WWS Line and JWC South Transmission Line at Cornelius Pass and Tualatin Valley Highway.

JWC partners have taken individual actions to improve reliability and increase emergency preparedness as well. TVWD and Beaverton have added Aquifer Storage and Recovery (ASR)

wells; Hillsboro has increased in-town storage with the addition of Crandall Reservoir, has seismically reinforced the 24th Street Reservoir, and has increased storage time by adding chlorine feeders to all of its in-town reservoirs. Forest Grove has made improvements to its water treatment plant as well. Hillsboro, Beaverton, and TVWD are also in the process of building infrastructure to use the Willamette River as an additional water supply source.

## **4.2.2. Notifications of Source Water Availability**

### **Before Release Season**

The JWC notifies its member agencies of the status of storage in Barney Reservoir and Hagg Lake consistently throughout the year. JWC provides its member agencies storage curves for both reservoirs at the semi-monthly JWC Operations Committee meetings and the quarterly JWC Board meetings, and also makes the reports accessible to partners on the web.

The Bureau of Reclamation announces the official storage available to contract holders ahead of storage releases. If applicable, the JWC will contact the Bureau of Reclamation to confirm the levels of water supply and the reduction schedules for each JWC member agency with contracted water in Scoggins Dam (Hagg Lake).

The General Manager informs the Operations Committee and the Management Committee by April 15 if the potential for a water shortage has been identified. (If the potential shortage is not known until a later date, the GM then makes immediate notification to the committees.)

The Operations Committee is notified when the Watermaster determines the regulation of several JWC-related natural flow water rights that impact the start and end dates of the release season.

If a potential shortage is identified after April 15th, the JWC Managing agency requests each JWC agency to provide a seasonal forecast of amount of JWC water needed during release season. (This is the starting point, if discussion of curtailment scenarios and potential solutions needs to begin.)

At the start of release season, JWC provides the storage allocations to each member agency that is allocated storage in Barney Reservoir, has a contract with the Bureau of Reclamation in Hagg Lake, or has a lease agreement with another JWC member agency.

### **During Release Season**

When supplies are being provided from Barney Reservoir and/or Hagg Lake, each JWC agency is required to forecast the amount of water that they will need (commonly referred to as a “call for releases”) in accordance with notification requirements outlined in the JWC Operations Manual.

JWC provides weekly release reports to the member agencies that include the previous week’s daily releases, the allotments of those release volumes charged to each member agency, status of remaining storage, and efficiency of capture of stored water. The frequent distribution of the



release reports has made them a valuable resource for storage and release tracking and has helped increase the efficiency of stored water releases in relation to customer demands.

The JWC issues notices of potential shortages in each member agency's allotment during the release season when supplies are reduced or demands are unusually high.

### **4.2.3. Curtailment Event Triggers and Stages**

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

#### **Curtailment Triggers**

Limitations to the WTP's capacity or reductions in supply do not automatically trigger imposition of curtailment measures, but begin a discussion among the JWC partner agencies to determine if partners would be willing to voluntarily reduce their demand by switching to alternate water supply sources. The JWC Managing Agency, through the JWC Operations Committee, has updated the Operations Manual, which distinguishes between normal supply disruptions and when to evoke the curtailment plan provided here. The Operations Manual will work in harmony with the Curtailment Plan, and strive for equitable solutions for all partners. Staff will make sure that the plans reference each other as needed.

Examples of events that could cause the JWC Curtailment Plan to be activated include, but would not be limited to, the following:

#### **Supply Disruption and Capacity Limitations – Short-Term**

- Mechanical or electrical malfunction of critical pumping facilities at the JWC's intake or water treatment plant.
- Interruption of local utility electrical service for an unknown or extended period of time.
- Transmission line break resulting in supply disruption to one or more partners.
- Unplanned water quality or other treatment issues that slow JWC WTP production below partner demands in which the timeline for recovery from the condition is uncertain and the risk of total reservoir depletions, at projected rates of production and demand, is high.
- Short-term increase in total partners' demand beyond JWC WTP production capabilities, due to an unforeseen circumstances such as extreme hot weather conditions, fire, or loss of a secondary supply. (This condition would be for short-term shortages, and not long-term shortages, such as one caused by drought.)

#### **Drought Conditions and/or Source Water Scarcity - Peak Season**

- Abnormal weather conditions during the storage season, or other conditions, make it unlikely that Barney Reservoir and/or Hagg Lake will fill to their full capacities preceding the summer release season.



- High demands result in drawdown of reservoir supplies at a rate indicative that supplies will not last the duration of release season.
- Loss by any partner agency of an alternate supply source for an entire peak season.

### **Extreme Supply Disruption – Long-Term**

- Catastrophic natural disaster, such as an earthquake, watershed fire, landslide, or volcanic eruption.
- Terrorist act that damages individual critical facilities and/or extensive portions of the JWC's transmission system, and/or lifelines such as electrical power and chemical deliveries.

## **4.2.4. Curtailment Stages**

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

This curtailment plan for the JWC is designed to be initiated and implemented in progressive stages. The JWC's curtailment plan has four distinct stages, as shown in Exhibit 4-1, each of which is triggered by one or more of the listed events:

#### Exhibit 4-1. Curtailment Plan Stages 1 through 4

Curtailment Stages	Potential Initiating Conditions
Stage 1 Advisory Temporary Water Shortage Alert (Short-Term Voluntary)	<p>Short-term<sup>1</sup> interruption of electrical service affecting water treatment and distribution;</p> <p>Harmful algal blooms (HAB) clogs filters and impairs performance or occurrence of a cyanotoxin producing bloom; in which Powder-Activated Carbon (PAC) may need to be added;</p> <p>Minor mechanical or electrical malfunction in pumping facilities or treatment plant;</p> <p>Minor damage to raw or treated water transmission mains (e.g., leaking joint requiring repair); or</p> <p>Forecasts of below-normal<sup>2</sup> levels of stored water in Barney Reservoir and Scoggins Dam (Hagg Lake) that may fall below the historical 25th percentile in the peak season.</p>
Stage 2 Voluntary Long-Term Water Shortage Alert (Long-Term Voluntary)	<p>Forecasts of below-normal<sup>2</sup> levels of stored water in Barney Reservoir and Scoggins Dam (Hagg Lake) that may fall below the historical 10th percentile in the peak season.</p> <p>Forecasts of drought conditions for the peak season.</p>
Stage 3 Mandatory Severe Water Shortage (Long-Term Mandatory)	<p>One of JWC's summer supplemental sources (Barney Reservoir and Scoggins Dam/Hagg Lake) are 50% of full capacity at the start of release season, resulting in a significant reduction<sup>3</sup> of JWC's water supply capacity;</p> <p>High demands result in drawdown of reservoir supplies at a rate indicative that supplies will not last the duration of release season;</p> <p>Loss by any partner agency of an alternate supply source for an entire peak season; or</p> <p>Failures in the pumping facilities, treatment plant or transmission mains that require a lengthy repair time.</p>

Curtailment Stages	Potential Initiating Conditions
Stage 4 Emergency Critical Water Shortage (Critical Mandatory Restrictions)	<p>Extensive damage to transmission, pumping or treatment processes caused by natural disaster (i.e. earthquake) or terrorist act;</p> <p>Both of JWC’s summer supplemental sources (Barney Reservoir and Scoggins Dam (Hagg Lake) are below 50% of full capacity, resulting in a severe reduction of the JWC’s water supply capacity;</p> <p>Interruption of electrical service to the WTP for an unknown or extended period of time.</p> <p>Localized transmission line break resulting in supply disruption.</p> <p>Unplanned water quality or other treatment issue that slows JWC WTP production below partner demands in which the timeline for recovery from the condition is uncertain and the risk of total reservoir depletions, at projected rates of production and demand, is high.</p> <p>Short-term increase in total partners' demand beyond JWC WTP production capabilities, due to an unforeseen circumstances such as extreme hot weather conditions, fire, or loss of a secondary supply. (This condition would be for acute short-term shortages, and not long-term shortages, such as one caused by drought.)</p>

<sup>1</sup> “Short-term” interruption means an interruption with an expected end. For example, a power outage expected to last one week would be probable cause for Stage 1 curtailment. The decision to initiate curtailment would depend on the time of year, likelihood that power will be restored in the predicted timeframe, and the likelihood that the JWC can maintain backup power for the duration of the outage. In this case, the JWC could avoid curtailment by using the back-up generators at the water treatment plant, backup fuel supplies, and the JWC Member Agency storage.

<sup>2</sup> “Below normal” levels means that water levels fall slightly outside the normal drawdown curve. However, the JWC could avoid curtailment if alternate supplies are made available that put source supplies back into normal ranges. For example, the reservoirs were between the 25th and 10th percentile in the 2015-2016 release season, but curtailment was not necessary. In addition, if alternate supplies are expensive, the JWC may choose to promote voluntary curtailment in order to reduce dependency on alternative supplies and to reduce costs.

<sup>3</sup> “Significant Reduction” means that the JWC’s water supply capacity cannot be made up through alternative means, so mandatory curtailment is necessary to reduce demand levels to ensure that water supplies don’t run out. However, the JWC could avoid mandatory curtailment if alternate supplies are made available that put source supplies back into normal ranges.

## 4.2.5. Curtailment Plan Implementation

*OR 690-086-0160(4)*

### Curtailment Response

It is important to note that curtailment response includes a range of options. It does not necessarily mean that reductions in demand on the JWC system will be required for all partners. Utilizing available JWC assets or other alternative water supply sources are the agreed-upon first choice for managing source and peak capacity issues. A coordinated curtailment response that provides sufficient water to all JWC partners may be achievable without the need for individual partner agencies to impose voluntary or mandatory restrictions on their customers. Measures that impact customers will only need to be implemented if JWC partners cannot meet one or more partners' needs through negotiation and sharing of resources.

### Objectives

JWC will do the following to ensure a coordinated response in a curtailment trigger situation:

- Present member agencies with information about the status of WTP capacity limitations, individual agency ownership percentages, and agencies' current demands on capacity.
- Present member agencies with information about the status of source water availability and releases from stored water.
- Present member agencies about the current physical and chemical water quality parameters, as well as notify member agencies when water quality parameters exceed decided upon trigger levels relevant to operational decisions.
- Provide a forum for negotiation of alternative or shared supply sources between JWC members.
- Require each JWC member agency to develop and adopt a customer curtailment plan and submit it to the JWC for inclusion in the JWC Water Management and Curtailment Plan (WMCP), in accordance with ORS 690-086.
- Coordinate unified public messaging related to curtailment and conservation measures and requirements. If curtailment is only needed by some of the partners, messages will still be coordinated to minimize confusion and/or impacts to customers of the JWC partners not implementing curtailment.
- Meet State requirements for curtailment when the Governor issues a drought declaration and orders curtailment plan implementation in accordance with ORS 536.720. See the Drought Declaration discussion at the end of Section 4 for details.

## JWC System Components

There are a variety of emergency situations that could cause the need for curtailment, and the method for determining curtailment percentage for each JWC partner will be based on the system component affected. It is important to remember that JWC partners have agreed to always try and avoid curtailment through partner negotiation of assets, but formal curtailment methodology will be helpful in determining how much additional water one partner may need to negotiate with other partners.

- Source Water Curtailment (Curtailment caused by lack of source water):
  - As previously described in Summary of 2001 Drought section, supply reductions in Hagg Lake are stipulated in BOR contracts.
- Water Treatment Plant Curtailment (Curtailment caused by decrease in treatment capacity severe enough to be less than demands on the system for a prolonged period that Fern Hill Reservoirs and in-town storage facilities may not be able to cover.)
  - Curtailment will be based on ownership percentage in the Water Treatment Plant
- Electrical Power Failure Curtailment (Curtailment due to power failure for a prolonged duration that Fern Hill Reservoirs and in-town storage facilities may not be able to cover)
  - If curtailment is necessary to meet partner water demands, it will be based on percentage ownership of the back-up power generator
- Transmission Line Failure (Service from one or more transmission line is disrupted, and any remaining transmission line(s) still in service are unable to meet partner demands.)
  - Curtailment percentage will be based on percentage of ownership in the remaining transmission line(s) in operation.

## Curtailment Stages

### Stage 1: Advisory - Temporary Water Shortage Alert

#### *Supply Disruption and Capacity Limitations – Short-Term*

1. The JWC Managing agency will notify the member agencies of the expected duration of the event and available finished water in storage, as soon as that information is known. The JWC will also notify wholesale customers if they are affected by the event.
2. The JWC Managing agency will request projected water demands from each member agency for the projected duration of the event.
3. JWC staff will optimize available JWC assets and utilize Fern Hill storage to the extent practical.

4. The JWC Managing agency may request JWC member agencies to voluntarily reduce or shift their demands to other supplies. If these actions result in costs to those agencies, compensation for those costs may be negotiated between the agencies.
5. Member agencies shall keep the other JWC agencies apprised of activities and messaging for their individual agency curtailment efforts. Affected agencies may request assistance and coordination for public messaging and outreach efforts from the JWC Events and Education Committee (EEC).
6. The JWC shall notify and potentially coordinate with Washington County Public Health and Oregon Health Authority.
7. If disruption is caused by a transmission line break, and the break does not affect all partners, and if curtailment by other partners does not improve the situation for the partner that is affected by the line break, partners do not have to curtail to assist the affected partner. However, if the affected partner requests assistance, the Managing agency will assist affected partner(s) with alternate supply and/or curtailment efforts, and will also make the emergency water distribution system available to affected partner(s), upon request.

*Drought Conditions and/or Source Water Scarcity – Peak Season*

1. Source water scarcity issues that affect Barney Reservoir will be coordinated through the Barney Reservoir Joint Ownership Commission (BRJOC), which includes all the JWC partners and Clean Water Services (CWS). Any decisions regarding curtailment of Barney Reservoir source water must include all BRJOC partners. Although CWS is not normally part of the JWC EEC, if curtailment is necessary due to Barney source scarcity, a CWS representative will be invited to participate with the EEC in any coordinated messaging and outreach efforts. Any outside coordination and possible curtailment negotiation with Oregon Department of Fish and Wildlife will also be handled by the BRJOC Managing Agency.
2. Source water scarcity issues that affect Hagg Lake will be primarily coordinated through the Joint Water Commission, although secondary coordination with the Tualatin Valley Irrigation District (TVID), Clean Water Services, and the Federal Bureau of Reclamation may be required. Curtailment due to Scoggins' Dam future remediation or seismic improvements will be coordinated through Clean Water Services and a working group partnership, and may be done as a separate agreement from what is outlined in this curtailment plan – assuming such curtailment is pre-organized as part of the improvement project.
3. JWC staff will continue to participate in, and coordinate through, the Tualatin River Flow Management Committee. This committee discusses operations that could impact flows, flow monitoring, and share information to proactively manage storage, instream flows, and diversions. Its members include the Oregon Water Resources Department's local Watermaster, JWC, CWS, TVID, Lake Oswego Corporation, Washington County Parks and Recreation, and Washington County Emergency Management.

4. The JWC Managing agency will notify the member agencies of the expected duration of the event and available stored water supplies and available finished water in storage.
5. The JWC Managing agency will request projected water demands from each member agency for the projected duration of the event.
6. The JWC Managing agency will develop stored water use scenarios based on various estimated peak season demand levels.
7. JWC staff will optimize available JWC assets and utilize Fern Hill storage capacity to the extent practical.
8. The JWC Managing agency may request JWC member agencies to voluntarily reduce or shift their demands to alternate sources. If these actions result in costs to those agencies, compensation for those costs may be negotiated between the agencies.
9. Partners that have available excess stored water and/or capacity may receive requests from partners needing water to lease excess stored water and/or additional capacity to other partners in need. Leasing protocols are found in the JWC Water Service Agreement.
10. Member agencies shall keep the other JWC agencies apprised of activities and messaging for their individual agency curtailment efforts. Affected agencies may request assistance and coordination for public messaging and outreach efforts from the JWC Events and Education Committee (EEC).
11. Communication efforts will be coordinated by the JWC Public Information Officer (PIO) if mandatory curtailment is required of all JWC partners. The JWC EEC will provide a summary and schedule of any proposed cooperative public outreach campaign and schedule to the Operations and Management Committees for review and approval. JWC maintains an emergency communications budget that covers short-term communication efforts, but each agency may be requested to provide additional funds for a longer-term, peak-season public outreach campaign, depending on the elements of the proposed campaign.
12. The JWC shall notify and potentially coordinate with Washington County Public Health and Oregon Health Authority.

## **Stage 2: Voluntary - Long-Term Water Shortage Alert**

### *Supply Disruption and Capacity Limitations – Short-Term*

The same actions described under Stage 1 apply to this stage, as well.

### *Drought Conditions and/or Source Water Scarcity – Peak Season*

The same actions described under Stage 1 apply to this stage, as well.

## **Stage 3: Mandatory - Severe Water Shortage**

### *Supply Disruption and Capacity Limitations – Short-Term*

Actions described in the previous stages may apply to this stage, as well. The following actions may also be taken.

1. The JWC Managing agency may order mandatory curtailment from all partners if voluntary efforts do not solve JWC supply or capacity issues.
2. Communication efforts will be coordinated by the JWC Public Information Officer (PIO) if mandatory curtailment is required of all JWC partners.
3. The JWC shall notify and potentially coordinate with Washington County Public Health and Oregon Health Authority.

*Drought Conditions and/or Source Water Scarcity – Peak Season*

Actions described in the previous stages may apply to this stage, as well. The following action may also be taken.

1. The JWC may order mandatory curtailment from all partners if voluntary efforts do not solve JWC supply or capacity issues.
2. Communication efforts will be coordinated by the JWC Public Information Officer (PIO) if mandatory curtailment is required of all JWC partners.

The JWC shall notify and coordinate with Washington County Public Health and Oregon Health Authority.

**Stage 4: Emergency - Critical Water Shortage**

*Supply Disruption and Capacity Limitations – Short-Term*

Actions described under previous stages of curtailment may apply to this stage, as well. The following action may also be taken.

The JWC General Manager may declare an emergency if all partners and wholesale customers are affected. The JWC can require individual member agencies and/or wholesale customers to reduce demand on the JWC system if those members are exceeding their percentage of supply/capacity availability.

*Drought Conditions and/or Source Water Scarcity – Peak Season*

Actions described in the previous stages may apply to this stage, as well. The following actions may also be taken.

The JWC General Manager may declare an emergency if all partners and wholesale customers are affected. The JWC may request individual member agencies and wholesale customers to reduce demand on the JWC system if those members are exceeding their percentage of supply/capacity availability. Curtailment amounts are based on percentage of ownership in the JWC component that is causing the scarcity issue.

*Extreme Supply Disruption*

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



1. The JWC Managing agency will invoke its Emergency Response Plan, and procedures in that plan supersede procedures in this plan if they are in conflict.
2. JWC will follow procedures 4-12 listed above under the Stage 1 “Drought Conditions” section.
3. JWC will initiate activation of the JWC Department Operations Center (DOC), and of the Hillsboro Emergency Operations Center (EOC) if it has not already been activated, within the Incident Command System. (The General Manager may declare a State of Emergency at this point as well.)
4. JWC will notify the member agencies of the expected duration of the event (if known) and the status of supply.
5. JWC will complete a damage assessment as soon as possible and provide critical information on facility damage and treatment capacity to member agencies and Hillsboro EOC. Resources will be requested through the Hillsboro EOC.
6. JWC will coordinate with the Washington County Office of Consolidated Emergency Management for regional support in extreme events, and implement any needed support from the Oregon Water/Wastewater Agency Response Network mutual aid agreements, and seeking federal aid from the Federal Emergency Management Agency and the National Guard.
7. Communication efforts between JWC member agencies, wholesale customers, basin partners, regional partners (RWPC members), and Washington County emergency communicators (including a Joint Information Center, if one is set up by the county) will be coordinated by the JWC Public Information Officer (PIO).
8. Recovery from an extreme event will be directed by the JWC Disaster Recovery Plan, outlined in the JWC Emergency Response Plan.

#### *Aquifer Storage and Recovery (ASR) Wells*

For ASR wells operating under the JWC Limited License, the following curtailment language that was included in the Agreement regarding ASR Management (dated 2013) will apply:

*“The Parties agree that the production of potable water, storage and transmission by the JWC System, as defined in the Water Services Agreement, is primarily for the direct and immediate needs of all members of the JWC and will have priority over production storage and transmission of water for ASR purposes. If the JWC System experiences an emergency, construction, or maintenance event where by water production by the JWC System is interrupted, reduced or otherwise curtailed, then the JWC Managing Agency may suspend provision of water for the ASR Program until the circumstances are resolved.”*

ASR wells not licensed through the JWC Limited License Agreement and instead licensed by individual JWC partners with the State, will operate at the complete discretion of the owner. The JWC Managing Agency will coordinate with individual ASR owners, as needed, on potential impacts of injection if curtailment is a consideration during non-peak (injection) season, but does not have authority to require individual partner action regarding such ASRs.

## Authority and Protocols

Actions of this plan that are handled by system optimization and agreements between the member agencies can be taken under direction of the JWC General Manager. Emergency response will be coordinated by the JWC General Manager and the Senior Program Manager in charge of JWC treatment processes at the Water Treatment Plant.

If a decision or emergency declaration must be made immediately, the JWC General Manager has authority to make emergency response decisions as Incident Commander. The JWC Operations Committee will be notified and consulted as soon as possible when a potential curtailment situation develops. The JWC will consult the Curtailment Decision Tree and will make operational recommendations to the JWC General Manager, who will then consult the JWC Management Committee for approval on the recommended approach. The General Manager may convene an emergency meeting of the Commission if needed.

The JWC's Water Service Agreement gives the JWC General Manager the authority to impose mandatory reductions in treated water supply from the JWC WTP to partner agencies and wholesale customers in an emergency situation that affects one or all partners.

After a declaration of emergency by the JWC General Manager, and approval by the JWC Management Committee, all partner agencies will be informed of any mandatory curtailment action required by the JWC, along with a timeline to achieve such reduction. Individual partner agencies are responsible for decisions and implementation of mandatory curtailment for their customers.

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

Enforcement of the Curtailment Plan, along with remedies and penalties for overuse are addressed in the JWC's Water Service Agreement, which is being updated to include crisis curtailment enforcement and agreement on the use and ownership of the back-up power generator. Disagreements on curtailment actions that cannot be settled through collaborative effort will be settled as outlined by the JWC's Water Service Agreement.

Voluntary curtailment messaging can be coordinated and/or implemented by the JWC EEC, or by individual agencies, depending on agreed upon preference. JWC partners should notify other member agencies prior to implementation of curtailment actions.

The Operations Committee will exercise the Curtailment Plan as part of their exercises for the JWC Emergency Response Plan.

## Drought Declaration

If a declaration of a drought is declared for Washington County by the Governor per ORS 536.720, the Oregon Water Resources Commission may order political subdivisions within any drainage basin or subbasin to implement a water conservation or curtailment plan or both, approved under ORS 536.780. The conservation and curtailment elements of this WMCP meet these requirements.

If the JWC and its member agencies are within a drought area declared by the Governor, the JWC and its member agencies will consider whether curtailment measures are needed to meet system demands. If ordered to implement a water conservation or curtailment plan during a declared drought, the JWC and its member agencies would comply by implementing the water conservation and curtailment provisions of this WMCP. Alternatively, the JWC could petition for a State exemption from implementing its curtailment plan if it can demonstrate to the State (using historic and current data) that the JWC is not experiencing a water shortage that impacts the ability of its partner agencies to meet the demands of their customers (e.g. JWC has adequate stored water supply at Barney Reservoir and Hagg Lake, or partners are able to tap additional supply availability from ASR or from other sources). Regardless of whether curtailment is needed, the JWC and its member agencies will encourage customers to conserve water.

### 4.2.6. Curtailment Decision Tree

*The Joint Water Commission (JWC) water system is producing water, but cannot meet full water demands, either due to supply disruption or lack of capacity in water infrastructure.*

#### **Are any partners exceeding their rightful available capacities? (Yes/No)**

**Yes** – Exceeding partner(s) must take action to address deficiency. Options include using an alternative source if one is available, negotiating for a lease (water supply or infrastructure capacity) or another acceptable arrangement with a JWC partner, or go into some form of customer curtailment. Actions related to “Supply Disruption and Capacity Limitations” of the Protocol section in the Curtailment Plan are triggered for impacted partner(s) only.

**No** – All partners must reduce their JWC demand to a sustainable amount through crisis. Curtailment plan is triggered for protocol section regarding “Supply Disruption and Capacity Limitations” for all partners.

#### **Are alternative supplies available to one or more JWC partner(s) that will allow them make additional water/infrastructure capacity available to another partner? (Yes / No)**

**Yes** – Partners without alternative supplies may be able to negotiate with JWC partners that have alternative supplies for additional water or infrastructure capacity in the JWC system. Negotiations will likely include financial compensation for use of asset.

**No** – All partners must reduce JWC demand to a sustainable amount and customer curtailment must be considered by partner(s) with no alternative method to meet demand. Curtailment

plan is activated for all partners under protocol section titled, “Supply Disruption and Capacity Limitations.”

*The JWC water system has been incapacitated in some way and the ability to serve water to a part or all of the JWC service population has been severed.*

**Is it possible to serve the system from an alternative source through an interconnection with another water system?**

**Yes** – Partners will work together to get water into the system as quickly and efficiently as possible, using whatever means at their disposal. Negotiations for financial compensation will be handled as quickly as possible, but the emergency need of the community takes precedence. The Curtailment Plan is activated, and mandatory actions under “Extreme Supply Disruption” are enacted. Other actions will be considered and implemented if necessary.

**No** – JWC can dispatch its emergency water distribution system to the area without water service, or to a designated area which is accessible by the majority affected population. JWC will also call and request additional water supplies from ORWARN, if warranted by the situation. The Curtailment Plan is activated using protocols under “Extreme Supply Disruption.”

*Either one or both of JWC’s summer supplemental sources (Barney Reservoir and Hagg Lake) do not fill, resulting in a reduction of JWC’s water supply capacity. Or, weather conditions cause transfer to supplemental sources at an early date.*

**Looking at historical demand scenarios, how likely is it that JWC does not have enough water to meet summer season demands?**

**Likely** – Historic demand records indicate that summer source water will run out before an average release season would end. Curtailment Plan is triggered and protocol for mandatory actions under “Source Water Scarcity Protocol” are activated.

**Not Likely** – Historic demand records indicate that summer source water is adequate for an average release season length. If demands escalate changing the supply forecast, staff alerts General Manager who can decide if Curtailment Plan should be triggered.

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## 5. Water Supply

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

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

### 5.1. Delineation of Service Areas

*OAR 690-086-0170(1)*

Exhibit 2-2 shows the JWC's current and future water service area during this WMCP 20-year planning period. The future water service area is the area between the current water service area boundaries and both the Metro Urban Growth boundary and Urban Reserve boundary for Washington County, which is an area that will be served by various JWC Member Agencies. Although the Metro UGB boundary and Urban Reserve boundary for Washington County account for growth beyond the 20-year planning period of this WMCP, these boundaries provide the best representation of the area where the JWC Member Agencies need to be prepared to serve water within the next 20 years given that near-term JWC Member Agency future service areas are in flux and the water providers do not make the decisions regarding what areas will be opened to expansion. Additional information about the anticipated future service areas of individual JWC Member Agencies is available in the 2017 City of Hillsboro WMCP, 2018 City of Beaverton WMCP, and 2015 TVWD WMCP.

## 5.2. Population Projections

*OAD 690-086-0170(1)*

Exhibit 5-1 presents population projections for each JWC Member Agency, and the JWC's wholesale customers, North Plains and Western Lutheran School. The JWC projects that its entire service area population will reach 505,609 in 2030 and 559,472 in 2040. The analyses used to develop the population projections are described below.

**Exhibit 5-1. JWC Population Projections**

Year	Hillsboro	Forest Grove	Beaverton	TVWD	Wholesale	Total
2020	104,043	25,379	91,338	218,514	3,682	442,956
2021	104,964	25,877	92,238	222,218	3,858	449,155
2022	105,901	26,375	93,153	225,957	4,043	455,429
2023	106,847	26,880	94,085	229,739	4,238	461,789
2024	107,810	27,387	95,028	233,558	4,442	468,225
2025	108,785	27,901	95,988	237,418	4,657	474,749
2026	109,642	28,384	96,849	241,023	4,883	480,780
2027	110,517	28,871	97,717	244,655	5,120	486,879
2028	111,391	29,360	98,597	248,323	5,369	493,040
2029	112,287	29,853	99,492	252,027	5,631	499,290
2030	113,190	30,350	100,399	255,763	5,907	505,609
2031	113,978	30,818	101,207	259,237	6,197	511,437
2032	114,772	31,286	102,021	262,734	6,501	517,314
2033	115,549	31,747	102,817	266,177	6,821	523,111
2034	116,273	32,197	103,574	269,516	7,157	528,717
2035	117,003	32,651	104,340	272,875	7,510	534,379
2036	117,573	33,055	104,955	275,835	7,882	539,299
2037	118,151	33,462	105,579	278,806	8,272	544,270
2038	118,731	33,869	106,210	281,795	8,682	549,287
2039	119,317	34,278	106,849	284,794	9,113	554,352
2040	119,911	34,688	107,498	287,809	9,566	559,472

As shown in Exhibit 5-2, the City of Hillsboro's projected service area population consists of the populations projected within the City's In-Town service area, the City's Upper System service area, and the wholesale customer service area of the LA Water Cooperative, and the Cities of Gaston and Cornelius. The population projections within the City's In-Town service area, the City's Upper System, and the City of Cornelius are based on forecasts developed by the Portland State University Population Research Center (PRC) completed June 2019 (based on 2019 water service area boundaries). LA Cooperative's population projections are based on its annual growth rate from 2010 through 2016 of 0.5% applied to the 2018 estimated population of 2500. The City of Gaston's population projections are based on its average annual growth rate from 2010 through 2018 of approximately 2.8% applied to the 2018 estimated populations of 655, according to the 2018 PRC Report.

**Exhibit 5-2. City of Hillsboro Population Projections**

Location	Projected	
	2030	2040
City of Hillsboro (In-Town)	96,467	101,690
Hillsboro Upper System	1,937	1,935
LA Water Co-Op	2,655	2,791
Gaston	891	1,179
Cornelius	11,240	12,316
<b>Total</b>	<b>113,190</b>	<b>119,911</b>

The projected populations for the City of Forest Grove, the City of Beaverton, and TVWD are based on the forecasts developed by the Portland State University Population Research Center (PRC) completed June 2019.

The City of North Plain’s projected populations utilize an average annual growth rate of approximately 4.97% and a 2019 baseline population estimate of 3,285. Westside Lutheran School currently has an estimated population of 230 students and teachers.

### 5.3. Demand Projections and Water Supplies To Meet Projected Demands Approach

As described in Section 2, the JWC has natural flow water rights for municipal water supply from the Tualatin River and its tributaries, water rights for the use of stored water from Barney Reservoir and Scoggins Reservoir, and ASR. JWC Member Agencies also have non-JWC water rights for municipal water supply from the Clear Creek watershed (Forest Grove), groundwater (Beaverton and TVWD), ASR (TVWD, Beaverton and Hillsboro), and the Willamette River (Hillsboro, Beaverton, and TVWD). To reiterate, the Willamette River is not a JWC source, and will not serve all JWC Member Agencies. The JWC water supply will remain the largest available source for the Cities of Hillsboro, Beaverton, and Forest Grove.

The JWC water supply year has two seasons, the peak season (May-October) and the non-peak season (November-April), with different demands and available sources of supply during each season. As a result, two separate demand projections need to be developed, 1) maximum day demand (MDD) projections that represent the greatest demands anticipated in the peak season and 2) average day demand (ADD) projections that represent the typical demands anticipated in the non-peak season. The MDD for the peak season and the ADD for the non-peak season. Water supplies needed to meet those two demand projections need to be addressed for both seasons listed above.



## 5.4. Demand Forecast

OAR 690-086-0170(3)

### 5.4.1. JWC Demand Projections

To develop the JWC's demand projections, each JWC Member Agency developed its own demand projections and provided them to the JWC, which the JWC then compiled. Each JWC Member Agency determines which of its water sources to use to meet that demand.

#### MDD Projections in the Peak Season

The JWC's MDD considers the MDD of each JWC Member Agency and wholesale customers from all sources, not just demand on the JWC system. The JWC's MDD occurs during the peak season of May through October. Exhibit 5-3 presents the MDDs of the individual JWC Member Agencies, wholesale customers, and their combined total, which is 210.26 cfs (135.91 mgd) in 2030 and 237.94 cfs (153.8 mgd) in 2040. The JWC calculated MDDs as described under Demand Projections Methodology below.

**Exhibit 5-3. MDD Projections, 2030 and 2040**

	2030		2040	
	MDD (mgd)	MDD (cfs)	MDD (mgd)	MDD (cfs)
Hillsboro	49.08	75.92	58.26	90.12
Forest Grove	11.03	17.07	13.13	20.31
Beaverton	19.99	30.93	21.13	32.69
TVWD	54.25	83.92	58.72	90.84
Wholesale	1.56	2.42	2.57	3.98
<b>Total</b>	<b>135.91</b>	<b>210.26</b>	<b>153.8</b>	<b>237.94</b>

#### Adjusted ADD Projections in the Non-peak Season

To determine the demand that the JWC must be prepared to meet in the non-peak season of November through April, the JWC considered: ADD, water demands for ASR injections, variability in non-peak season demand, and the JWC's daily diversions at the SHPP Intake. The ADD of each JWC Member Agency and its wholesale customers, as described under Demand Projections Methodology below, was summed. That ADD total was added to the maximum injection rate authorized for ASR LL-002, ASR LL-019, and ASR LL-027. Next, a multiplier of 0.9 was applied to reflect the fact that maximum day demand from December through April historically has occurred in December and has been approximately 90 percent of the ADD. Finally, a peaking factor of 1.15 was applied to reflect the variability of the JWC's diversions at

the SHPP Intake throughout the course of a day, which was based on an analysis of the diversion data. Between the 0.9 and 1.15 multipliers, the maximum demand anticipated during the non-peak season is 1.035 times the ADD. Exhibit 5-4 presents the factors accounted for when calculating the adjusted ADD anticipated during the non-peak season and the estimated adjusted ADD total, which is 162.61 cfs (105.11 mgd) in 2030 and 178.79 cfs (115.57 mgd) in 2040.

**Exhibit 5-4. Adjusted Average Day Demand (ADD), 2030 and 2040**

Demand Factors	2030		2040	
	ADD (mgd)	ADD (cfs)	ADD (mgd)	ADD (cfs)
Hillsboro	28.73	44.44	34.51	53.39
Forest Grove	5.52	8.53	6.56	10.15
Beaverton	10.52	16.28	11.12	17.21
TVWD	26.41	40.86	28.62	44.28
Wholesale	0.71	1.10	1.17	1.81
<b>User Total</b>	<b>71.89</b>	<b>111.21</b>	<b>81.99</b>	<b>126.84</b>
ASR LL-002 Max Injection	12.50	19.34	12.50	19.34
ASR LL-019 Max Injection	11.66	18.04	11.66	18.04
ASR LL-027 Max Injection	5.51	8.52	5.51	8.52
<b>ASR Total</b>	<b>29.67</b>	<b>45.90</b>	<b>29.67</b>	<b>45.90</b>
<b>User + ASR Totals (Total ADD)</b>	<b>101.56</b>	<b>157.11</b>	<b>111.66</b>	<b>172.74</b>
<b>90% of Total ADD (Dec)</b>	<b>91.40</b>	<b>141.40</b>	<b>100.50</b>	<b>155.47</b>
<b>Total with WTP Daily PF (1.15)</b>	<b>105.11</b>	<b>162.61</b>	<b>115.57</b>	<b>178.79</b>

## 5.4.2. Demand Projections Methodology

### Hillsboro

The City of Hillsboro Water Department (City) prepared a 2018 update to its water demand projections (Demand Projections Update Report, April 2018). The objectives of this update were to:

- Reflect changes in water usage characteristics associated with recent development;
- Capture the range of potential growth related to economic development; and,
- Identify the factors that most impact demand and analyze the sensitivity of demand to those variables.

The demand projection update used statistical analysis of historical water usage to define relationships between customer demand and influencing variables, such as temperature, precipitation, and rates (i.e., price). These relationships were then used to project future demands per account based on potential changes to the influencing variables. This approach was taken where feasible and then complemented by traditional methods for projecting components of demands for which the historical relationships were not as relevant (e.g., future industrial use, which depends more upon type of development rather than other influencing variables). Traditional methods included land use based techniques, where water usage factors (e.g., in gallons per acre per day) were applied to projected future growth in land area to be served by the City. This approach also accounted for demands of wholesale customers and included a water loss factor.

The 2018 water demand projection update incorporates future demands associated with redevelopment of Downtown Hillsboro, the development of South Hillsboro (SoHi) over the coming 20 years, the anticipated development of North Hillsboro (NoHi) and, further in the future, additional Future Growth Areas (FGA) on the outskirts of the City (See Exhibit 2-2).

### Forest Grove

Forest Grove is currently beginning the process to update its Water Master Plan, which will produce updated demand projections within the next couple of years. In the meantime, Forest Grove based the demand projections in this WMCP on the demand projections developed for the 2010 JWC WMCP, which were based on Forest Grove's 2000 WMP with updated water demand trends, population forecasts, and per capita demand factors.

As stated in the 2010 JWC WMCP, water use projections for the 2000 WMP included both land use analyses and population projections. Key forecasting factors in the WMP included an annual population growth rate of 2.23 percent and an average day per capita water demand of 199 gpcd. Master plan demand projections were updated using the same methodology but using a revised growth rate of 2.65 percent and a lower per capita demand of 160 gpcd. That reduction in per capita demand was attributed to successful conservation efforts. Demand

forecasting included approximately 160 residential water customers outside Forest Grove's city limits. Buildout for Forest Grove's service area was estimated to occur in 2034. Based on historical trends, the MDD to ADD peaking factor was 2.0. In this WMCP, the ADD and MDD projections also include the demand that could be met by Forest Grove's Clear Creek water supply (which is not managed by the JWC); the JWC must plan to provide supply in case this source becomes unavailable.

## Beaverton

Beaverton's demand projections come from its 2018 Water System Master Plan and align with its 2018 WMCP, but were extended for two years to synchronize with the planning period of this WMCP. The demand projections considered the following variables and made assumptions about each:

- **Growth Scenario and Schedule.** Of the three growth scenarios that the City considered, the City selected the Medium scenario to represent service area future growth and the schedule of this growth. This scenario was selected on the basis of the City's knowledge of growth trends and regional and local plans for land development.
- **Average Day Demand (ADD).** To forecast ADD, the City applied a per capita demand figure to future population estimates. The City estimated future ADD based on an average per capita demand of 103 gpcd.
- **Per Capita Use.** The City's per capita usage of 103 gpcd was based on historical usage from all customer classes and was used to estimate future ADD. It is assumed that this per capita usage will remain the same over the planning period.
- **Peaking Factor.** Peaking factors were estimated and applied to ADD over time to estimate future MDDs through the planning period. The WSMP applied unique peaking factors to each of the City's current and future pressure zones over the planning period, with an average value of 1.9. Note that a peaking factor of 2.0 is assumed for areas anticipated to be served in the final years of the WMCP planning period (2037/2038 and thereafter), and was applied to the Tile Flats (west and north of Urban Reserve 6B) area. However, given that the Tile Flats area is anticipated to add to demand only in the last years of the City's planning period, the effects of this peaking factor of 2.0 are negligible on overall demand.
- **Customer Make-Up.** Beaverton utilized the percent of customers in each billing class for fiscal year 2014/15 (single family residence with 41.4 percent, apartment and multifamily with 28 percent, commercial with 21.1 percent, fire and irrigation with 8.5 percent and public facility with 0.9 percent), and assumed that these percentages are still current and will remain the same during the planning period.

Additional details, including service area development assumptions, are available in Beaverton's 2018 WMCP.

## TVWD

TVWD's demand projections come from its 2018 Water Master Plan (WMP) Update, which made updates to the 2015 Water Master Plan, including adjusting demand curves to begin in 2018 while keeping the trendline the same as the 2015 WMP. For the 2015 WMP, TVWD developed low-, medium-, and high-demand scenarios to: 1) account for the uncertainty that is inherent in demand projections as a result of the numerous factors and assumptions involved, and 2) better depict the range of possible future demands. TVWD considered the following variables and made assumptions for each: demographic growth scenarios, Equivalent Dwelling Units (EDUs) per account, EDU water use, water loss, MDD/ADD peaking factors, and a large water user demand. TVWD selected a medium demand projection to account for uncertainties associated with future growth and water demand including, but not limited to demographic growth, EDUs per account, EDU water use, water loss, long-range weather forecasts, and large user demand projections. TVWD's projected MDD decreases in 2025 and again towards the end of the planning horizon due to customers being transferred to City of Beaverton water service.

## 5.5. Meeting Projected Demands with JWC and ASR Sources (Schedule to Exercise Permits and Comparison of Projected Need to Available Sources)

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

### Non-peak Season Water Sources and Projected Adjusted Average Day Demands

As described in Section 2 and shown in Exhibit 2-63 (Typical Water Right Use), during November through April the JWC typically does not use its secondary rights for use of stored water. This calculation excludes recovery of ASR water given that water is injected into the aquifer rather than withdrawn during the non-peak season. Thus, the non-peak water sources must also meet the ASR injection demands.

Currently, the JWC has access to up to 26 cfs under Permit S-54737 under the final order approving the 2010 JWC WMCP. The JWC has determined that it will need access to an additional 18 cfs under Permit S-54737, for a total of 44 cfs, during the planning period of this WMCP. This calculation does not consider the JWC's pending Application S-88506, which would authorize use of up to 44 cfs from the Tualatin River from December through April, because it has not yet been approved by OWRD and it would not provide additional water supply (i.e.; it will not be additive to the amount of water used under Permit S-54737).

The JWC's Water Treatment Plant Facility Plan (updated April 2018) described expanding the WTP from 131.5 cfs (85 mgd) to 163 cfs (105 mgd) within approximately 20 years, which is similar to the planning horizon for this WMCP. Therefore, the JWC is seeking access to 44 cfs of "green light water" under Permit S-54737, the difference between the estimated expanded JWC WTP capacity of 163 cfs and the 119.46 cfs of JWC natural flow surface water rights currently accessible for use in the non-peak season. The 44 cfs of "green light water" under Permit S-54737 would enable the JWC to meet up to 163 cfs out of 178.8 cfs of the projected

adjusted ADD in the non-peak season in 2040. (As previously described, the 178.8 cfs incorporates the WTP Daily PF of 1.15.) Over the next 10 years, the JWC will monitor actual and projected demands in order to determine if additional non-peak season supplies are needed. The JWC and JWC Partner Agencies could also coordinate to reduce ASR injections during high demand periods in the non-peak season, thereby lowering total demand to be within the JWC existing water supplies.

### **Peak Season Water Supply Sources and Projected Maximum Day Demands**

As described in Section 2 and shown in Exhibit 2-63 (Typical Water Right Use), most of the JWC's natural flow water rights are typically regulated off in the peak season (June through October), and as a result, the JWC largely relies on the use of stored water to meet MDDs in the peak season.

In a typical year, the JWC's combination of available natural flow rights and secondary rights for the use of stored water provide up to 152.7 cfs (98.69 mgd) of surface water during the peak season. In addition, the JWC's ASR LL-019 authorizes the recovery of stored water at a rate of up to 62.3 cfs (40.3 mgd), Beaverton/TVWD's ASR LL-02 authorizes the recovery of stored water at a rate of up to 22.3 cfs (14.4 mgd), and Hillsboro's ASR LL-027 authorizes the recovery of stored water at a rate of up to approximately 11.5 cfs (7.5 mgd). These natural flow and secondary rights, in combination with the ASR limited licenses, authorize the use of up to 248.8 cfs (160.8 mgd).

For planning purposes, the JWC is not including the following sources of supply as being available to meet the peak season MDD: the City of Hillsboro's, City of Beaverton's, and TVWD's Willamette River water supply; Forest Grove's water supply from the Forest Grove WTP; and the City of Hillsboro's water supply from the Cherry Grove WTP. Excluding these sources from the analysis ensures the JWC can provide sufficient water supply if the Member Agencies' other sources become unavailable. Furthermore, the infrastructure to develop the Willamette River water supply is not in place, TVWD's groundwater rights are only used as an emergency or backup water supply, so are not considered a water source to meet MDDs, and Beaverton's native groundwater rights are not considered additional sources to ASR given that the native groundwater rights are appropriated from the same wells used for Beaverton's ASR operations. Thus, the JWC has 248.8 cfs (160.8 mgd) of water rights and ASR limited license authorizations that can be used and developed to meet MDDs in the peak season, as shown in Exhibit 5-5.

The projected MDD of 237.94 cfs in 2040 is less than the 248.8 cfs of water rights and ASR limited licenses described above. Additional water conservation measures could also augment water supplies, which will be discussed in the Alternatives Analysis later in Section 5.

### Exhibit 5-5. Water Sources to Meet Maximum Day Demands in the Peak Season

Water Sources	Rate (cfs)	Rate (mgd)
JWC surface water rights	152.7	98.7
JWC ASR	62.3	40.3
TVWD/Beaverton ASR	22.3	14.4
Hillsboro ASR	11.5	7.5
Total	248.8	160.8

### Willamette River as a Future Water Source for the City of Hillsboro, City of Beaverton, and TVWD

Hillsboro, Beaverton and TVWD are working toward obtaining water from the Willamette River as a future water source to help meet MDDs in the peak season, to provide TVWD with a replacement source for its PWB water supply, and to provide redundant water supplies. Hillsboro, Beaverton, and TVWD determined that a redundant source is crucial given that several of the Tualatin River natural flow water rights are regularly not available, leaving primarily stored water for use. The JWC is experiencing much longer and more frequent periods when only stored water is available due to very low streamflows. In 2019, the JWC supplemented natural flow water rights with stored water into mid-December. Thus, the reliability of the JWC's Tualatin River natural flow water rights is being negatively affected by climate change and more frequent and prolonged droughts, making the need for redundant water supply critical. In addition, the Willamette River will provide a redundant source of water supply during seismic upgrades to the JWC water system. More information about plans for Hillsboro, Beaverton, and TVWD to use the Willamette River as a water source are described in their individual WMCPs.

### Schedule to Develop JWC Permits

The JWC anticipates that Permit S-54737 will be put to full beneficial use by approximately 2071, the development deadline for Permit S-54737. As described above, based on the assumption that other JWC member agency water sources are not available during the non-peak season, the JWC is seeking access to 44 cfs of the undeveloped portion of *extended permit* S-54737. The JWC anticipates that Permit S-55219 will be put to full beneficial use by July 26, 2039 in accordance with the permit's development deadline.



## 5.6. 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 JWC plans to initiate diversion of water under Permit S-54737.

### 5.6.1. Conservation Measures

OAR 690-086-0170(5)(c) requires an analysis of the extent to which the projected water needs can be satisfied through implementation of conservation measures identified under OAR 690-086-0150.

Given that Permit S-54737 authorizes use during the non-peak season, an analysis of water conservation from November through April is most pertinent. Relevant measures are primarily indoor water conservation. Each JWC Member Agency has its own water conservation program that includes numerous indoor and outdoor water conservation measures and strives to increase water use efficiency. The water conservation programs of each JWC Member Agency are described in detail in Section 3. If the JWC's Member Agencies collectively managed to achieve additional water conservation savings of 5% annually, they would reduce the projected 2040 non-peak season ADD by approximately 2 cfs. Thus, the JWC would still need access to approximately 42 cfs under Permit S-54737 by 2040. In addition, that level of water conservation savings would likely be challenging to achieve given that the JWC Member Agencies have various indoor water conservation measures already in place and have very low per capita water use, and the three largest JWC Member Agencies had water losses of 10 percent or less as of 2019.

Therefore, water savings from conservation measures cannot eliminate the JWC's need for additional water supply to meet its future demands in the non-peak season within its entire service area. With that said, the JWC will continue to strive to be a water conservation and management leader among water providers in the State of Oregon.

### 5.6.2. Interconnections

OAR 690-086-170(5)(b) requires an analysis of the extent to which the projected water needs can be satisfied through interconnection with other municipal supply systems and cooperative regional management.

The JWC's water supply agreements between multiple water supply systems exemplifies regional cooperation. JWC Member Agencies are interconnected and have cooperative water management agreements that allow a given Member Agency to make use of another Member Agency's unused water supply.

In 2011 and 2012, the City of Hillsboro and TVWD conducted evaluations of water supply options to meet their future water demands, and the City of Beaverton participated in both.



The City of Hillsboro’s evaluation considered the following supply options: the Portland Water Bureau, the Willamette River, the Tualatin Basin Water Supply Project (which involved raising the dam at Hagg Lake), JWC ASR, treated effluent, and a groundwater source. TVWD’s evaluation considered four water supply options: the Portland Water Bureau, the Willamette River, the Tualatin Basin Water Supply Project, and obtaining groundwater supply from a well field in the Scappoose area.

The evaluations considered such factors as: cost, source reliability, source redundancy, ownership, operational complexity, implementation risk, source water quality, treated water quality, environmental impacts, and responsiveness to demand growth of each of these sources. Other considerations included public acceptance, community impacts, economics, and impacts to rates.

Based on their evaluations, the City of Hillsboro and TVWD concluded that the Willamette River was the best water supply source option because it offers benefits such as year-round reliability, source redundancy, ownership and control of supply, excellent finished water quality, cost-effectiveness, and reduced environmental impacts compared to other options. According to OWRD’s water availability analysis, water is available in the reaches of the Willamette River below the McKenzie River confluence at 80 percent exceedance every month of the year. The ability of the City of Hillsboro, City of Beaverton, and TVWD to partner to create the WWSP made the Willamette River water supply option more feasible and preferable, as well.

Subsequently, the City of Hillsboro and TVWD began a partnership to develop the Willamette River option under the WWSP. The City of Beaverton participated in the WWSP preliminary design process from 2013 to 2015. Under the preliminary design, the City evaluated its demands and source options and concluded that buying into the WWSP provided the most reliable and cost-effective significant source of additional water supply. More detailed descriptions about the water supply evaluations can be found in TVWD’s 2014 WMCP, the City of Hillsboro’s 2017 WMCP, and the City of Beaverton’s 2018 WMCP.

The WWSP is a cooperative water management effort between the City of Hillsboro, TVWD, and the City of Beaverton to use water from the Willamette River to meet projected water demands, provide water supply redundancy, and in the case of TVWD, replace an existing water supply source (PWB). However, for this evaluation, the JWC is focusing on its ability to meet the needs of its member agencies in the event their individual water supplies are not available, and in that circumstance, the JWC would need to rely on Permit S-54737 to meet water demands.

### **5.6.3. Cost Effectiveness**

OAR 690-086-170(c) requires an assessment of whether the projected water needs can be satisfied through other conservation measures that would provide water at a cost that is equal or less than the cost of other identified sources.

Existing infrastructure is capable of diverting and distributing the water to which the JWC is requesting access to under Permit S-54737, such that conservation measures would not provide

water at a cost equal to or lower than the cost of using water under the permit. In addition, water conservation measures alone, regardless of the cost, cannot meet the projected adjusted ADDs in the non-peak season under the above-described assumptions in this WMCP. Nevertheless, the JWC and its member agencies will continue to implement and promote their water conservation programs.

## 5.7. 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. Within the next 20 years, the JWC is planning to need access of up to 44.0 cfs (28.4 mgd) under Permit S-54737. Assuming that the water right is used at 28.4 mgd, 24 hours per day for 31 days during a non-peak season month (likely December or March), the maximum monthly volume for the water right would be approximately 880.4 MG.

## 5.8. 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 JWC currently is not required to take any mitigation actions under state or federal law. However, the final order approving an extension of time for Permit S-54737 (formerly Permit S-50879) included “fish persistence” conditions, which are described above in Section 2. The JWC is aware of the conditions.

In addition, the JWC has proposed a mitigation project to ODFW that will allow the agency to grant a fish screen exemption for the Bureau of Reclamation fish screens at the SHPP. (Permits S-55219 and S-54737 include fish screening conditions and if OWRD issues a permit for Application S-88506, it will also have a fish screening condition.)

## 5.9. 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 JWC does not need to acquire new water rights within the next 20 years to meet its projected demands. The JWC does have a pending permit application (Application S-88506) for up to 44 cfs from the Tualatin River, which is intended to increase the reliability of the JWC's water supply during a portion of the non-peak season (December 1 through April 30), but does not provide additional water supply, because use of water under the requested permit in combination with use of the 75 cfs authorized by Permit S-54737, will be limited to a total of 75 cfs. Since Application S-88506 is not requesting additional supply, the provisions of this section are not applicable.

# **Appendix A**

## Letters to Local Governments and Comments





**Water Solutions, Inc.**

August 7, 2020

Colin Cooper  
City of Hillsboro Planning Department  
Civic Center, 4<sup>th</sup> Floor  
150 E Main Street  
Hillsboro, OR 97123  
[Colin.Cooper@hillsboro-oregon.gov](mailto:Colin.Cooper@hillsboro-oregon.gov)

Subject: Water Management and Conservation Plan for the Joint Water Commission

Dear Mr. Cooper:

The Joint Water Commission (JWC) 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. Attached you will find a copy of the JWC'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 Comprehensive Land Use Plan, a letter response to that effect would be appreciated. You may send your comments to me by email at [sdeszoeke@gsiws.com](mailto:sdeszoeke@gsiws.com).

If you have any questions, please feel free to contact me at 541-224-4588. Thank you for your interest.

Sincerely,  
GSI Water Solutions Inc.

A handwritten signature in dark ink, reading "Suzanne de Szoeki", written in a cursive style.

Suzanne de Szoeki, Water Resources Consultant

Enclosure



**Water Solutions, Inc.**

August 7, 2020

Anna Slatinsky  
City of Beaverton Planning Division  
Beaverton City Hall  
4755 SW Griffith Dr.  
P.O. Box 4755  
Beaverton, OR 97076  
[aslatinsky@BeavertonOregon.gov](mailto:aslatinsky@BeavertonOregon.gov)

Subject: Water Management and Conservation Plan for the Joint Water Commission

Dear Ms. Slatinsky:

The Joint Water Commission (JWC) 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. Attached you will find a copy of the JWC's draft WMCP for your review.

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If you have any questions, please feel free to contact me at 541-224-4588. Thank you for your interest.

Sincerely,  
GSI Water Solutions Inc.

A handwritten signature in dark ink that reads "Suzanne de Szoeki".

Suzanne de Szoeki, Water Resources Consultant

Enclosure



**Water Solutions, Inc.**

August 7, 2020

Bryan Pohl, Director  
City of Forest Grove Community Development: Planning  
City Hall  
1924 Council Street  
P.O. Box 326  
Forest Grove, OR 97116-0326  
bpohl@forestgrove-or.gov

Subject: Water Management and Conservation Plan for the Joint Water Commission

Dear Mr. Pohl:

The Joint Water Commission (JWC) 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.

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If you have any questions, please feel free to contact me at 541-224-4588. Thank you for your interest.

Sincerely,  
GSI Water Solutions Inc.

A handwritten signature in dark ink, reading "Suzanne de Szoeki", written in a cursive style.

Suzanne de Szoeki, Water Resources Consultant

Enclosure





**Water Solutions, Inc.**

August 7, 2020

Andy Back  
Washington County Public Services Building  
Land Use & Transportation Division  
Planning and Development Services, Long Range Planning  
155 N 1<sup>st</sup> Avenue, Suite 350  
Hillsboro, Oregon 97124-3072  
[lutdir@co.washington.or.us](mailto:lutdir@co.washington.or.us)

Subject: Water Management and Conservation Plan for the Joint Water Commission

Dear Mr. Back:

The Joint Water Commission (JWC) 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. Attached you will find a copy of the JWC's draft WMCP for your review.

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If you have any questions, please feel free to contact me at 541-224-4588. Thank you for your interest.

Sincerely,  
GSI Water Solutions Inc.

A handwritten signature in dark ink that reads "Suzanne de Szoeki".

Suzanne de Szoeki, Water Resources Consultant

Enclosure



**Water Solutions, Inc.**

August 7, 2020

Chris Neamtzu  
City of Wilsonville Planning Division  
29799 SW Town Center  
Loop E  
Wilsonville, OR 97070  
[neamtzu@ci.wilsonville.or.us](mailto:neamtzu@ci.wilsonville.or.us)

Dear Mr. Neamtzu:

The Joint Water Commission (JWC) 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. Attached you will find a copy of the JWC'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 Comprehensive Land Use Plan, a letter response to that effect would be appreciated. You may send your comments to me by email at [sdeszoeke@gsiws.com](mailto:sdeszoeke@gsiws.com).

If you have any questions, please feel free to contact me at 541-224-4588. Thank you for your interest.

Sincerely,  
GSI Water Solutions Inc.

A handwritten signature in dark ink that reads "Suzanne de Szoeke". The signature is fluid and cursive, with the first name "Suzanne" and last name "de Szoeke" clearly distinguishable.

Suzanne de Szoeke  
Water Resources Consultant

Enclosure



**Water Solutions, Inc.**

August 7, 2020

Andy Varner, City Manager  
City of North Plains  
31360 NW Commercial Street  
North Plains, OR 97133  
[andy.varner@northplains.org](mailto:andy.varner@northplains.org)

Subject: Water Management and Conservation Plan for the Joint Water Commission

Dear Mr. Varner:

The Joint Water Commission (JWC) 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. Attached you will find a copy of the JWC's draft WMCP for your review.

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If you have any questions, please feel free to contact me at 541-224-4588. Thank you for your interest.

Sincerely,  
GSI Water Solutions Inc.

A handwritten signature in dark ink, reading "Suzanne de Szoeke", written in a cursive style.

Suzanne de Szoeke  
Water Resources Consultant

Enclosure



August 7, 2020

Multnomah County Planning Department  
1600 SE 190<sup>th</sup> Avenue  
Portland, OR 97233  
[Land.use.planning@multco.us](mailto:Land.use.planning@multco.us)

Subject: Water Management and Conservation Plan for the Joint Water Commission

Dear Multnomah County Planning Department:

The Joint Water Commission (JWC) 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. Attached you will find a copy of the JWC'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 Comprehensive Land Use Plan, a letter response to that effect would be appreciated. You may send your comments to me by email at [sdeszoeke@gsiws.com](mailto:sdeszoeke@gsiws.com).

If you have any questions, please feel free to contact me at 541-224-4588. Thank you for your interest.

Sincerely,  
GSI Water Solutions Inc.

A handwritten signature in dark ink, reading "Suzanne de Szoeki", written in a cursive style.

Suzanne de Szoeki  
Water Resources Consultant

Enclosure



**Water Solutions, Inc.**

August 7, 2020

Elissa Gertler, Director  
Metro, Planning and Development  
Metro Regional Center  
600 NE Grand Ave  
Portland, OR 97232-2736  
[elissa.gertler@oregonmetro.gov](mailto:elissa.gertler@oregonmetro.gov)

Subject: Water Management and Conservation Plan for the Joint Water Commission

Dear Ms. Gertler:

The Joint Water Commission (JWC) 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. Attached you will find a copy of the JWC'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 Comprehensive Land Use Plan, a letter response to that effect would be appreciated. You may send your comments to me by email at [sdeszoeke@gsiws.com](mailto:sdeszoeke@gsiws.com).

If you have any questions, please feel free to contact me at 541-224-4588. Thank you for your interest.

Sincerely,  
GSI Water Solutions Inc.

A handwritten signature in dark ink that reads "Suzanne de Szoeke".

Suzanne de Szoeke  
Water Resources Consultant

Enclosure



August 7, 2020

Andrea Durbin, Director  
City of Portland  
Bureau of Planning and Sustainability  
1900 SW 4th Avenue, Suite 7100  
Portland, OR 97201-5380  
[andrea.durbin@portlandoregon.gov](mailto:andrea.durbin@portlandoregon.gov)

Subject: Water Management and Conservation Plan for the Joint Water Commission

Dear Ms. Durbin:

The Joint Water Commission (JWC) 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. Attached you will find a copy of the JWC'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 Comprehensive Land Use Plan, a letter response to that effect would be appreciated. You may send your comments to me by email at [sdeszoeke@gsiws.com](mailto:sdeszoeke@gsiws.com).

If you have any questions, please feel free to contact me at 541-224-4588. Thank you for your interest.

Sincerely,  
GSI Water Solutions Inc.

A handwritten signature in dark ink, reading "Suzanne de Szoeki", written in a cursive style.

Suzanne de Szoeki, Water Resources Consultant

Enclosure



August 7, 2020

City of Gaston  
116 Front St  
PO Box 129  
Gaston, Oregon 97119  
[wenonahb@cityofgaston.com](mailto:wenonahb@cityofgaston.com)

Subject: Water Management and Conservation Plan for the Joint Water Commission

Dear City of Gaston:

The Joint Water Commission (JWC) 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. Attached you will find a copy of the JWC'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 Comprehensive Land Use Plan, a letter response to that effect would be appreciated. You may send your comments to me by email at [sdeszoeke@gsiws.com](mailto:sdeszoeke@gsiws.com).

If you have any questions, please feel free to contact me at 541-224-4588. Thank you for your interest.

Sincerely,  
GSI Water Solutions Inc.

A handwritten signature in dark ink, reading "Suzanne de Szoeki".

Suzanne de Szoeki  
Water Resources Consultant

Enclosure



August 7, 2020

Ryan A. Wells, AICP  
Community Development Department  
City of Cornelius  
1355 N. Barlow Street,  
Cornelius, OR 97113  
[rwells@ci.cornelius.or.us](mailto:rwells@ci.cornelius.or.us)

Subject: Water Management and Conservation Plan for the Joint Water Commission

Dear Mr. Wells:

The Joint Water Commission (JWC) 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. Attached you will find a copy of the JWC'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 Comprehensive Land Use Plan, a letter response to that effect would be appreciated. You may send your comments to me by email at [sdeszoeke@gsiws.com](mailto:sdeszoeke@gsiws.com).

If you have any questions, please feel free to contact me at 541-224-4588. Thank you for your interest.

Sincerely,  
GSI Water Solutions Inc.

A handwritten signature in dark ink, reading "Suzanne de Szoeki", written in a cursive style.

Suzanne de Szoeki, Water Resources Consultant

Enclosure





August 7, 2020

City of Tigard  
Community Development Department  
13125 SW Hall Blvd  
Tigard, OR 97223  
tigardplanneronduty@tigard-or.gov

Subject: Water Management and Conservation Plan for the Joint Water Commission

Dear Community Development Department:

The Joint Water Commission (JWC) 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. Attached you will find a copy of the JWC'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 Comprehensive Land Use Plan, a letter response to that effect would be appreciated. You may send your comments to me by email at [sdeszoeke@gsiws.com](mailto:sdeszoeke@gsiws.com).

If you have any questions, please feel free to contact me at 541-224-4588. Thank you for your interest.

Sincerely,  
GSI Water Solutions Inc.

A handwritten signature in dark ink, reading "Suzanne de Szoeko", is written in a cursive style.

Suzanne de Szoeko, Water Resources Consultant

Enclosure



August 7, 2020

Scot Siegel  
City of Lake Oswego  
PO Box 369  
Lake Oswego, OR 97034  
[planning@lakeoswego.city](mailto:planning@lakeoswego.city)

Subject: Water Management and Conservation Plan for the Joint Water Commission

Dear Mr. Siegel:

The Joint Water Commission (JWC) 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. Attached you will find a copy of the JWC'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 Comprehensive Land Use Plan, a letter response to that effect would be appreciated. You may send your comments to me by email at [sdeszoeke@gsiws.com](mailto:sdeszoeke@gsiws.com).

If you have any questions, please feel free to contact me at 541-224-4588. Thank you for your interest.

Sincerely,  
GSI Water Solutions Inc.

A handwritten signature in dark ink, reading "Suzanne de Szoeke".

Suzanne de Szoeke  
Water Resources Consultant

Enclosure



August 7, 2020

LA Water Cooperative  
23055 NE Albertson Road  
Gaston, Oregon  
[lawater.cooperative@gmail.com](mailto:lawater.cooperative@gmail.com)

Subject: Water Management and Conservation Plan for the Joint Water Commission

Dear LA Water Cooperative:

The Joint Water Commission (JWC) 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 Joint Water Commission is providing you with a copy of the Draft WMCP via email. If you have any questions, please feel free to contact me at 541-224-4588 or [sdeszoeke@gsiws.com](mailto:sdeszoeke@gsiws.com).

Sincerely,  
GSI Water Solutions Inc.

A handwritten signature in dark ink, reading "Suzanne de Szoeki", written in a cursive style.

Suzanne de Szoeki  
Water Resources Consultant

Enclosure



August 7, 2020

Tom Hickman  
Tualatin Valley Water District  
1850 SW 170th Avenue  
Beaverton, OR 97003  
[tom.hickman@tvwd.org](mailto:tom.hickman@tvwd.org)

Subject: Water Management and Conservation Plan for the Joint Water Commission

Dear Mr. Hickman:

The Joint Water Commission (JWC) 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 Joint Water Commission is providing you with a copy of the Draft WMCP via email. If you have any questions, please feel free to contact me at 541-224-4588 or [sdeszoeke@gsiws.com](mailto:sdeszoeke@gsiws.com).

Sincerely,  
GSI Water Solutions Inc.

A handwritten signature in dark ink, reading "Suzanne de Szoeke", written in a cursive style.

Suzanne de Szoeke  
Water Resources Consultant

Enclosure



August 7, 2020

David Kraska  
Willamette River Water Coalition  
1850 SW 170th Avenue  
Beaverton, OR 97003  
[david.kraska@tvwd.org](mailto:david.kraska@tvwd.org)

Subject: Water Management and Conservation Plan for the Joint Water Commission

Dear Mr. Kraska:

The Joint Water Commission (JWC) 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 Joint Water Commission is providing you with a copy of the Draft WMCP via email. If you have any questions, please feel free to contact me at 541-224-4588 or [sdeszoeke@gsiws.com](mailto:sdeszoeke@gsiws.com).

Sincerely,  
GSI Water Solutions Inc.

A handwritten signature in dark ink, reading "Suzanne de Szoeke". The signature is fluid and cursive, with the first name "Suzanne" and last name "de Szoeke" clearly distinguishable.

Suzanne de Szoeke  
Water Resources Consultant

Enclosure

1600 SE 190<sup>th</sup> Avenue, Portland OR 97233-5910 • PH. (503) 988-3043 • Fax (503) 988-3389

**September 3, 2020**

Suzanne de Szoeki  
Water Resources Consultant  
[sdeszoeki@gsiws.com](mailto:sdeszoeki@gsiws.com)  
GSI Water Solutions, Inc.  
1600 SW Western Blvd., Suite 240  
Corvallis, OR 97333

**RE: Comment on Draft Water Management and Conservation Plan for the Joint Water Commission**

Suzanne,

Thank you for the opportunity to review the draft Water Management and Conservation Plan developed by the Joint Water Commission to fulfill requirements of OAR Chapter 690, Division 86 of the Oregon Water Resources Department.

Our land use planning office manages unincorporated lands in Multnomah County. Although the majority of the Plan's project area is located outside of our jurisdiction, a few areas along the county's northwest boarder are identified within the Plan and which are served by the Tualatin Valley Water District.

It appears from my review that the Joint Water Commission concludes on page 202 that "*The JWC does not need to acquire new water rights within the next 20 years to meet its projected demands.*" Therefore, I do not find any areas of the draft Water Management and Conservation Plan that appear inconsistent with relevant policies of the Multnomah County Comprehensive Land Use Plan which is available online: <https://multco.us/file/55870/download>

Please let me know if you have any questions or need anything further from Multnomah County.

Sincerely,



Adam Barber,  
Deputy Planning Director

*Letter sent by email*



## **Appendix B**

### Intergovernmental Agreements





**APPENDIX B**  
Summary of Intergovernmental Agreements

Title	Date	Parties	Scope
Repayment contract between the United States of America and the City of Hillsboro, Contract No. 14-06-100-7180	11/11/1971	Hillsboro, BOR	Hillsboro enters into contract with BOR for construction and repayment of costs of the Tualatin Federal Reclamation Project. Provides Hillsboro with 4,500 ac-ft per year of municipal and industrial water supply from the project.
Repayment contract between the United States of America and the Tigard Water Distrct, Contract No. 14-06-100-7182	11/18/1971	Tigard Water District, BOR	Provides Tigard Water District with 2,500 ac-ft per year of M&I water from the Tualatin Federal Reclamation Project.
Repayment Contract between the United States of America and the City of Forest Grove, Contract No. 14-06-100-7197	12/17/1971	Forest Grove, BOR	Provides Forest Grove with 4,500 ac-ft per year of M&I water from the Tualatin Federal Reclamation Project.
Repayment contract between the United States of America and the City of Beaverton, Contract No. 14-06-100-7969	11/6/1973	Beaverton, BOR	Provides Beaverton with 1,500 ac-ft per year of M&I water from the Tualatin Federal Reclamation Project.
Supplemental contract between the United States of America and the City of Hillsboro, Contract No. 14-06-100-8069	3/8/1974	Hillsboro, BOR	Adds construction of the Spring Hill Pumping Plant to the Tualatin Federal Reclamation Project.
Joint Water Commission Water Service Agreement	2/1/1976	Hillsboro, Forest Grove	Establish a joint operation for the pumping, treatment and transmission of Municipal and Industrial Water, Creating a Joint Water Commission.
Joint Water Commission Water Service Agreement	4/17/1979	Hillsboro, Forest Grove, Beaverton	"Establish joint operations for the supply, pumping, treatment and transmission of municipal and industrial waters." Adds Beaverton as member of Joint Water Commission
Assignment of repayment contract No. 14-06-100-7182	8/21/1980	Tigard Water District, Hillsboro, BOR	Transfers Contract No. 14-06-100-7182 from Tigard Water District to Hillsboro.
Spring Hill Pump Plant Bypass Construction Agreement	2/28/1984	Hillsboro, Forest Grove, Beaverton Joint Utilities Commission, TVID, BOR	Springhill Pump Station Construction, JWC providing an advance of funds (\$91,000) to construst the bypass to reduce sediment accumulation.
Repayment contract between the United States of America and the City of Hillsboro, Contract No. 2-07-10-W0867	12/26/1991	Hillsboro, BOR	Provides Hillsboro with 500 ac-ft per year of M&I water from the Tualatin Federal Reclamation Project.
Interim Water Conservation Plan Resolution No. 3230	7/16/1993	Hillsboro, Forest Grove, Beaverton, TVWD	"Committing to an Interim Water Conservation Plan." Conserving to comply with Barney Reservoir Expansion Project
By-Laws of the Columbia-Willamette Water Conservation Coalition	between 1993 and 1997	Municipal water providers of the Portland Metropolitan area	Establish the Conservation Coalition, establish goals, objectives, outline powers, duties and committees.
Joint Water Commission Water Service Agreement Amendment	6/30/1994	Hillsboro, Forest Grove, Beaverton, TVWD	Adds TVWD as member of Joint Water Commission
Joint Ownership Agreement- Barney Project (Rev 6-08-94) (AKA the "Original Barney Agreement")	7/19/1994	Hillsboro, Forest Grove, Beaverton, TVWD, United Sewerage Agency	"Establish joint ownership [and management] of a proposed expanded water reservoir commonly known as 'J.W. Barney Reservoir'." Includes Warranty Deed for land ownership in Yamhill (June 19, 1968) and Washington Counties (April 29, 1968).
Hillsboro-Beaverton-TVWD Joint Water Transmission Agreement	9/21/1994	Hillsboro, Forest Grove, Beaverton, TVWD	Amends Joint Water Service Agreement of April 17, 1979, by adding TVWD as part owner of the joint transmission line system.
Northside Water Transmission Agreement	4/11/1997	Hillsboro, Forest Grove, Beaverton, TVWD	Construction of Phase I of Northside Transmission Line
Proposed Bylaw Revision	7/17/1997	Columbia-Willamette Water Conservation Coalition	Adds new section of Finance Manager, establishes standing coalition committees
Northside Water Transmission Agreement- Phase II	1/14/2000	TVWD, Hillsboro, JWC	Construction of Phase II of Northside Transmission Line
Transmission Line Intergovernmental Agreement	1/14/2000	JWC, Hillsboro, TVWD, Cornelius	To coordinate the design and construction of replacement 72-inch water line that runs from the slow sand filter plant to Forest Grove and Cornelius and from which Cornelius has obtained doemstic water service pursuant to a contract between Hillsboro and Cornelius.

**APPENDIX B**  
Summary of Intergovernmental Agreements

Title	Date	Parties	Scope
Joint Funding Agreement IWRM Water Supply Feasibility Study	5/14/2001	United Sewerage Agency, TVWD, Hillsboro, Beaverton, Forest Grove, Tigard, Sherwood, Tualatin, North Plains, Cornelius, Banks	Enters parties into an agreement under which they shall jointly fund a feasibility study of two alternatives and a 'no action' alternative to increasing the water supply for users within the Tualatin Basin. The two alternatives are Scoggins Dam Raise and Willamette River Exchange Pipeline. (IWRM = Integrated Water Resource Management)
Tualatin Basin Water Supply Agreement Memorandum of Understanding	5/18/2001	JWC, Tigard	Memorandum of Understanding outlining cooperation in planning for the developent or expansion of water sources in the Tualatin River Basin and water supply facilities.
Ordinance No. 1-03	2/19/2003	TVWD	TVWD authorizing an Intergovernmental Agreement Continuing the JWC - Hillsboro, Forest Grove, Beaverton and Tualatin Valley Water District.
Authorizing Ordinances	3/1/2003	Hillsboro, Forest Grove, Beaverton, TVWD	Each city authorizing an intergovernmental agreement titled "Joint Ownership Agreement Barney Project" which continues the Barney Reservoir Joint Ownership Commission.
Ordinance No. 5239	3/4/2003	Hillsboro	City of Hillsboro authorizing an Intergovernmental Agreement Titled "Joint Water Commission - Hillsboro, Forest Grove, Beaverton and Tualatin Valley Water District Water Service Agreement".
Agenda Bill #03072	3/31/2003	Beaverton	City of Beaverton authorizing the Mayor to Sign the JWC - Hillsboro, Forest Grove, Beaverton and Tualatin Valley Water District Water Service Agreement
Ordinance No. 2003-06	4/14/2003	Forest Grove	City of Forest Grove authorizing an Intergovernmental Agreement Continuing the JWC - Hillsboro, Forest Grove, Beaverton and Tualatin Valley Water District.
Joint Ownership Agreement- Barney Project	10/27/2003	Hillsboro, Forest Grove, Beaverton, TVWD, CWS	Terminates and Replaces the "Original Barney Agreement" (Rev 6-08-94).
Joint Water Commission Water Service Agreement (JWC IGA)	10/27/2003	JWC	Terminates and Replaces the Water Service Agreement, the Amended Water Service Agreement, the Transmission Agreement, the Amended Transmission Agreement, the Northside Water Transmission Agreement and the Northside Water Transmission Agreement Phase II.
Ordinance No. 5348	2/3/2004	Hillsboro	Authorizing a first amendement to the water service agreement and joinder agreement relating to the Joint Water Commission.
First Amendment to Joint Water Commission Water Service Agreement and Joinder Agreement	3/1/2004	JWC, Tigard	Adds Tigard as a JWC member, and places membership stipulation that Tigard must make Capital Contributions in the Hagg Lake expansion.
Ordinance No. 1-04	4/1/2004	TVWD	Authorizing a first amendement to the water service agreement and joinder agreement relating to the Joint Water Commission.
City of Cornelius Water Supply Agreement	1/1/2005	Hillsboro, Cornelius	City of Hillsboro wholesale water supply agreement with City of Cornelius, expires in December 31, 2014.
City of Gaston Water Supply Agreement	1/24/2005	Hillsboro, Gaston	City of Hillsboro wholesale water supply agreement with City of Gaston, expires in December 31, 2014.
City of North Plains Water Supply Agreement	1/14/2005	JWC, North Plains	Joint Water Commission wholesale water supply agreement with City of North Plains, expires in December 31, 2014.
Project Management Plan Agreement	07/2018	JWC, US Fish & Wildlife, and Clean Water Institute	Project Management Plan Agreement
Cyanotoxin Analysis Services IGA	07/2019	JWC and Oregon Department of Environmental Quality	Cyanotoxin Analysis Services IGA
Mutual Aid and Assistance Agreement Addendum	08/2019	JWC and Oregon Water/Wastewater Agency Response Network	Mutual Aid and Assistance Agreement Addendum
	2/3/2015	City of Beaverton, TVWD	JWC South Transmission Line temporary water supply
	4/12/2019	JWC, City of Forest Grove, TVWD	Lease of stored raw water

APPENDIX B  
Summary of Intergovernmental Agreements

Title	Date	Parties	Scope
	4/12/2019	Joint Water Commission - City of Hillsboro, City of Beaverton, TVWD	Lease of North Transmission Line facilities capacity
	10/16/1996	Tualatin Valley Water District, City of Beaverton, Canby Utility Board, Clackamas River Water, City of Gladstone, Damascus Water District, City of Fairview, City of Gresham, City of Hillsboro Utilities Commission, City of Forest Grove, City of Lake Oswego, Metro, City of Milwaukie, Mt Scott Water District, Oak Lodge Water District, City of Portland, Raleigh Hills Water District, Rockwood Water, City of Sandy, City of Sherwood, South Fork Water Board, City of Oregon City, City of West Linn, City of Tigard Water Department, City of Troutdale, City of Tualatin, West Slope Water District, City of Wilsonville, City of Wood Village	Regional Water Providers Consortium
	10/27/2003	Tualatin Valley Water District, Joint Water Commission - City of Hillsboro, City of Beaverton, City of Forest Grove	Water service agreement
	10/27/2003	City of Hillsboro, City of Forest Grove, City of Beaverton, Clean Water Services	Barney Reservoir Joint Ownership Commission
	7/1/2013	Tualatin Valley Water District, Joint Water Commission - City of Hillsboro, City of Beaverton	Allocation and management of aquifer storage and recovery water and costs if the Cooper Mountain Area sites (or any future ones) are used in the JWC ASR system
	8/20/2013	Tualatin Valley Water District, Joint Water Commission, City of Hillsboro	Aquifer storage and recovery project design, construction, operation and property ownership



## **Appendix C**

### **Non-Municipal Water Rights of JWC Member Agencies**



Source	Priority Date	Application	Permit	Certificate	Claim, Transfer, Instream Lease	Entity Name on Water Right	Type of Beneficial Use	Authorized Rate (cfs)	Authorized Volume (ac-ft)	Maximum Rate of Withdrawal to Date		Average Daily Diversion (mgd)		Average Monthly Diversion (MG)		Authorized Date of Completion	Expiration of Instream Lease
										Instantaneous (cfs)	Annual (MG)	2015	5-year	2015	5-Year		
McKay Creek	8/16/1957	S-31801	S-25056	26358		Edward H Sahlfeld	Irrigation of 9.4 Acres	0.12		0.12	ND	ND	ND	ND	ND		
McKay Creek	4/29/1960	S-33916	S-26747	34822	IL-1325	La Vern William Buelet	Irrigation of 13.6 Acres	0.17		0.17	ND	ND	ND	ND	ND		10/1/2017
A Spring (tributary to McKay Creek)	7/11/1950	S-24975	S-19699	23481		Claire A and Marjorie E Richardson	Irrigation of 2.0 Acres	0.025		0.025	ND	ND	ND	ND	ND		
A Well	3/3/2003	<del>G-15937</del>	<del>G-15550</del> CANCELLED			Carol Curl	Irrigation	0.02		NA	NA	NA	NA	NA	NA		
A Well	1/28/1997	G-14450	G-13463			Benchmark Land Co.; Jones Farm Single Family LLC	Irrigation of 85.7 Acres	1.07		ND	ND	ND	ND	ND	ND	10/1/2020	
Glencoe Swale	10/31/1994	R-74833	R-11641	84669		Intel Corp.	Wildlife		0.9		0.29	ND	ND	ND	ND		
Beaverton Creek	4/26/1965	R-40798	R-4568	35688		Gladys Smith	Fish Culture		2.8		0.91	ND	ND	ND	ND		
Beaverton Creek and a Reservoir Constructed Under Application No R- 40798	4/26/1965	S-40799	S-30398	35689		Gladys Smith	Irrigation of 0.7 Acres and Fish Culture	0.06 (being 0.05 from Creek and Reservoir for Fish Culture and 0.01 from Creek for Irrigation)		0.06	ND	ND	ND	ND	ND		
Bronson Creek	4/20/1939	S-17913	S-13599	15402		E.J. Meihoff	Irrigation of 4.6 Acres	0.06		0.06	ND	ND	ND	ND	ND		
Bronson Creek	2/1/1945	S-20665	S-16166	16748		Erwin Springer	Irrigation of 2.5 Acres	0.031		0.031	ND	ND	ND	ND	ND		
Bronson Creek	11/30/1949	S-24303	S-19058	22749		Erwin Springer	Irrigation of 3.5 Acres	0.04		0.04	ND	ND	ND	ND	ND		
Rock Creek	4/7/1952 5/22/1952	S-27055	S-21221	23068	IL-1438	Derrell E Brown	Irrigation of 36.8 Acres	0.46		0.46	ND	ND	ND	ND	ND		9/30/2019
Bronson Creek	4/18/1940	S-18670	S-14301	14497		F.J. Meihoff	Irrigation of 5 acres	0.0625		0.0625	ND	ND	ND	ND	ND		
Beaverton Creek	1/22/1953	S-28021	S-22050	23621		Earl L Horning	Irrigation of 9.2 Acres	0.12		0.12	ND	ND	ND	ND	ND		
Dairy Creek	8/2/1966	S-42578	S-31814	35409		Laura Currin By Ruth Spaniol, Guardian	Irrigation of 264.3 Acres	1.04		1.04	ND	ND	ND	ND	ND		
Unnamed Stream, Tributary of Rock Creek	4/20/1967	R-43509	R-4876	40486		William Wallace	Storage		0.41		0.13	ND	ND	ND	ND		
Unnamed Stream, Tributary of Rock Creek	8/23/1967	R-43998	R-5072	40834		A.V. and Ida B Peterson	Storage		2.5		0.82	ND	ND	ND	ND		
Unnamed Spring Branch of Rock Creek	9/28/1932	S-14749	S-10743	12088	IL-1325	Edith S and Robert Couch	Irrigation of 16.5 Acres	0.22		0.22	ND	ND	ND	ND	ND		10/1/2017
Little Rock Creek	8/23/1966	S-42690	S-31900	38900		Joe Stroeder	Irrigation of 4 Acres	0.05		0.05	ND	ND	ND	ND	ND		
Sain Creek (and Scoggins Reservoir); Tualatin River	NA <sup>1</sup>			94896	PC-907	City of Hillsboro	Hydroelectric production of 67 theoretical horsepower	5 <sup>1</sup>		ND	ND	ND	ND	ND	ND		

ND = No Data Available; NA = Not Applicable  
Units: cfs = cubic feet per second; MG = million gallons; ac-ft = acre-feet  
<sup>1</sup>This hydropower water right does not have a priority date. Use of this water right is only allowed when the underlying water rights (Certificates 67891, 81026, and 81027) are used. This water right is limited by the rate, duty, season, and any other limitations of Certificates 67891, 81026, and 81027.



Source	Priority Date	Application	Permit/ Instream Lease	Certificate	Claim, Transfer, Instream Lease	Entity Name on Water Right	Type of Beneficial Use	Authorized Rate (cfs)	Authorized Volume (ac-ft)	Maximum Rate of Withdrawal to Date		Average Daily Diversion (mgd)		Average Monthly Diversion (MG)		Authorized Date of Completion	Expiration of Instream Lease
										Instantaneous (cfs)	Annual (MG)	2015	5-year	2015	5-Year		
Unnamed Stream, a Tributary of Rock Creek, in Wetland Enhancement Reservoir appropriated under Permit S-50702	5/15/1989	R-69904	R-11133	65057		Keith and Ann Jansen	Wildlife		0.61		0.2	ND	ND	ND	ND		
Unnamed Stream and Wetland Enhancement Reservoir constructed under Permit R-11133, a Tributary of Rock Creek	5/15/1989	S-69905	S-50702	65058		Keith and Ann Jansen	Wildlife	0.012		0.012		ND	ND	ND	ND		
Rock Creek, a tributary of Tualatin River	6/10/1958	S-32385	S-25574	28514		Syver O. Ruud	Irrigation	0.02		0.02		ND	ND	ND	ND		
Wells 2 through 10 in the Tualatin River Basin	6/17/1991	<del>G-12577</del>	<del>G-13059</del> CANCELLED			Oregon Roses Inc	Supplemental Agricultural Use and Irrigation of 30.2 acres	0.226		NA		NA	NA	NA	NA		
An Unnamed Drainage Channel and Teufel Reservoir constructed under Permit R-5805, Tributaries of Tualatin River	6/17/1991	<del>S-71702</del>	<del>S-51627</del> CANCELLED			Oregon Roses Inc	Agriculture and Irrigation on 30.2 Acres	0.223	6.4 AF	NA		NA	NA	NA	NA		
Wastewater from Hillsboro West Wastewater Treatment Plant and Effluent Holding Pond, Constructed Under Permit R-8396	2/23/1982	S-63318	S-46641	83206		United Sewerage Agency of Washington County	Irrigation of 150 Acres	1.88 (of Wastewater from the Hillsboro West WTP)	120.0 (Water from the Effluent Holding Pond)	1.88 (of Wastewater from the Hillsboro West WTP)		ND	ND	ND	ND		
Runoff, Tributary to Jackson Slough	6/16/2011	R-87729	R-14953			City of Hillsboro	Storage for Wetland Enhancement		72.1 AF		ND	ND	ND	ND	ND	5/14/2017	
No. 1 Well	3/7/1961	G-1945	G-1788	33209		Glenn A. Walters	Irrigation of 8.2 Acres	0.07		0.07		ND	ND	ND	ND		
Walters Well	9/18/1973	G-6299	G-5922	47772		Amfac Nurseries Inc.	Irrigation of 6.3 Acres	0.08		0.08		ND	ND	ND	ND		
Wells in the Tualatin River Basin	12/13/1990	G-12343	G-12247	87500		Oregon Garden Products	Nursery Operations on 19.4 Acres	0.71 cfs, being 0.28 cfs from Well NE1, 0.005 cfs from Well NE2, 0.10 cfs from NE4, 0.045 cfs from Well NE7, 0.03 cfs from Well NW3, 0.22 cfs from Well NW4, and 0.03 cfs from Well NW5		0.71 cfs, being 0.28 cfs from Well NE1, 0.005 cfs from Well NE2, 0.10 cfs from NE4, 0.045 cfs from Well NE7, 0.03 cfs from Well NW3, 0.22 cfs from Well NW4, and 0.03 cfs from Well NW5		ND	ND	ND	ND		

ND = No Data Available; NA = Not Applicable

Units: cfs = cubic feet per second; MG = million gallons; ac-ft = acre-feet

<sup>1</sup>This hydropower water right does not have a priority date. Use of this water right is only allowed when the underlying water rights (Certificates 67891, 81026, and 81027) are used. This water right is limited by the rate, duty, season, and any other limitations of Certificates 67891, 81026, and 81027.

Source	Priority Date	Application	Permit	Certificate	Claim, Transfer, Instream Lease	Entity Name on Water Right	Type of Beneficial Use	Authorized Rate (cfs)	Authorized Volume (ac-ft)	Maximum Rate of Withdrawal to Date		Average Daily Diversion (mgd)		Average Monthly Diversion (MG)		Authorized Date of Completion	Expiration of Instream Lease
										Instantaneous (cfs)	Annual (MG)	2015	5-year	2015	5-Year		
Waste Water from Hillsboro West Wastewater Treatment Plant, and Effluent Holding Pond	2/23/1982	R-63317	R-8396	83205		United Sewerage Agency of Washington County	Storage of Wastewater to be appropriated under Permit 466414 Irrigation		120		39.1	ND	ND	ND	ND		
Tualatin River, Tributary of Willamette River	4/20/1967	R-43511	R-5022	43325		Delane Fry	Storage for Supplemental Irrigation		97.9		31.9	ND	ND	ND	ND		
A Well	8/24/1970	G-5294	G-5127	43693		Glenn A Walters	Supplemental Irrigation of 8.2 Acres	0.1		0.1		ND	ND	ND	ND		
Rock Creek	1/4/1951	S-25550	S-20063	22925	II-1325	C E Hawkinson	Irrigation of 19.2 Acres	0.24		0.24		ND	ND	ND	ND		10/1/2017
An Unnamed Stream, Tributary of Rock Creek	11/25/1994	R-75046	R-11692	87499		City of Hillsboro, Water Department	Wetlands Creation and Enhancement		1.71		0.56	ND	ND	ND	ND		
Treated Effluent from Rock Creek Advanced Wastewater Treatment Facility, Discharged to Tualatin River	10/18/2006	S-86704	S-54476			Clean Water Services	Instream	10.4		ND		ND	ND	ND	ND	10/1/2025	
Lower Pond, Constructed Under Permit R-14774	1/20/2009	S-87381	S-54667	89671		City of Hillsboro, Parks And Recreation Department	Aesthetics		6.3		2.1	ND	ND	ND	ND		
Lower Pond, tributary to Tualatin River	1/20/2009	R-87379	R-14773	88492		City of Hillsboro, Parks And Recreation Department	Multi-Purpose Storage		0.3		0.1	ND	ND	ND	ND		
Runoff, Tributary to Tualatin River	1/20/2009	R-87380	R-14774	89670		City of Hillsboro, Parks And Recreation Department	Multiple-Purpose Storage		6.0		2.0	ND	ND	ND	ND		
Dairy Creek	10/9/1939	S-18415	S-14050	49086	II-1325	Eva Bailey Lynch	Irrigation of 34.5 Acres	0.43		0.43		ND	ND	ND	ND		10/1/2017
Sain Creek, a tributary to Scoggins Creek and the waters of the Tualatin River, a tributary to the Willamette River	NA <sup>1</sup>			87842	PC-896	City of Hillsboro	Hydroelectric Production of 137 theoretical horsepower	3.8 <sup>1</sup>		3.8		ND	ND	ND	ND		

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<sup>1</sup>This hydropower water right does not have a priority date. Use of this water right is only allowed when the underlying water rights (Certificates 67891, 81026, and 81027) are used. This water right is limited by the rate, duty, season, and any other limitations of Certificates 67891, 81026, and 81027.



## **Appendix D**

DEQ's 303(d) listings applicable to municipal  
and non-municipal water rights held by the  
JWC and JWC Member Agencies



Water quality issues by source for JWC sources.

Basin Name	Watershed	Water Body (Source)	River Miles	Parameter	Season	Status	Assessment Year
Willamette	Tualatin	Gales Creek	4.5 to 27.7	Chromium	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Gales Creek	0 to 27.7	Copper	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Gales Creek	0 to 23	Dissolved Oxygen	October 15 - May 15	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Gales Creek	0 to 11	E. Coli	FallWinterSpring	Cat 4A: Water quality limited, TMDL approved	2004
Willamette	Tualatin	Gales Creek	0 to 11	E. Coli	Summer	Cat 4A: Water quality limited, TMDL approved	2002
Willamette	Tualatin	Gales Creek	11 to 20.6	E. Coli	FallWinterSpring	Cat 4A: Water quality limited, TMDL approved	2004
Willamette	Tualatin	Gales Creek	0 to 27.7	Iron	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Gales Creek	0 to 27.7	Lead	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Gales Creek	0 to 11	Phosphorus	June 1 - September 30	Cat 4A: Water quality limited, TMDL approved	1998
Willamette	Tualatin	Gales Creek	0 to 11	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved	2002
Northern Oregon Coastal	Wilson-Trask-Nestucca	North Fork Trask River	0 to 4.4	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved	2002
Willamette	Tualatin	Scoggins Creek	0 to 5.1	Ammonia	June 1 - September 30	Cat 4A: Water quality limited, TMDL approved	1998
Willamette	Tualatin	Scoggins Creek	0 to 14	Biological Criteria	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2010
Willamette	Tualatin	Scoggins Creek	0 to 5.1	Dissolved Oxygen	October 15 - May 15	Cat 4A: Water quality limited, TMDL approved	2012
Willamette	Tualatin	Scoggins Creek	5.1 to 18	Dissolved Oxygen	January 1 - May 15	Cat 4A: Water quality limited, TMDL approved	2012
Willamette	Tualatin	Scoggins Creek	0 to 18	Iron	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Scoggins Creek	0 to 5.1	Phosphorus	June 1 - September 30	Cat 4A: Water quality limited, TMDL approved	1998
Northern Oregon Coastal	Wilson-Trask-Nestucca	Trask River	4.1 to 10.2	Dissolved Oxygen	September 15 - May 31	Cat 5: Water quality limited, 303(d) list, TMDL needed	2002
Northern Oregon Coastal	Wilson-Trask-Nestucca	Trask River	0 to 10.2	Fecal Coliform	Year Round	Cat 4A: Water quality limited, TMDL approved	2004
Northern Oregon Coastal	Wilson-Trask-Nestucca	Trask River	0 to 18.6	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved	2002
Willamette	Tualatin	Tualatin River	0 to 44.7	Ammonia	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Tualatin River	0 to 10.5	Aquatic Weeds Or Algae	Undefined	Cat 4A: Water quality limited, TMDL approved	2010
Willamette	Tualatin	Tualatin River	0 to 80.7	Biological Criteria	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2010
Willamette	Tualatin	Tualatin River	0 to 44.7	Chlorophyll a	FallWinterSpring	Cat 4A: Water quality limited, TMDL approved	2004
Willamette	Tualatin	Tualatin River	0 to 44.7	Chlorophyll a	Summer	Cat 4A: Water quality limited, TMDL approved	2004
Willamette	Tualatin	Tualatin River	44.7 to 69.9	Chlorophyll a	Summer	Cat 4A: Water quality limited, TMDL approved	1998
Willamette	Tualatin	Tualatin River	0 to 80.7	Copper	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Tualatin River	0 to 65.8	Dissolved Oxygen	Year Round (Non-spawning)	Cat 4A: Water quality limited, TMDL approved	2012
Willamette	Tualatin	Tualatin River	0 to 44.7	E. Coli	FallWinterSpring	Cat 4A: Water quality limited, TMDL approved	2012
Willamette	Tualatin	Tualatin River	0 to 44.7	E. Coli	Summer	Cat 4A: Water quality limited, TMDL approved	2012
Willamette	Tualatin	Tualatin River	0 to 80.7	Iron	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Tualatin River	0 to 44.7	Lead	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Tualatin River	55.9 to 80.7	Lead	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Tualatin River	0 to 80.7	Mercury	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Tualatin River	0 to 44.7	Phosphorus	June 1 - September 30	Cat 4A: Water quality limited, TMDL approved	1998
Willamette	Tualatin	Tualatin River	44.7 to 69.9	Phosphorus	June 1 - September 30	Cat 4A: Water quality limited, TMDL approved	1998
Willamette	Tualatin	Tualatin River	0 to 44.7	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved	2002
Willamette	Tualatin	Tualatin River	0 to 44.7	Zinc	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012

Water quality issues by source for Non-JWC sources.

Basin Name	Watershed	Water Body (Source)	River Miles	Parameter	Season	Status	AssessmentYear
Willamette	Tualatin	Beaverton Creek	0 to 9.8	Dissolved Oxygen	January 1 - May 15	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Beaverton Creek	0 to 2.1	Dissolved Oxygen	May 1 - October 31	Cat 4A: Water quality limited, TMDL approved	2002
Willamette	Tualatin	Beaverton Creek	0 to 2.1	Fecal Coliform	Summer	Cat 4A: Water quality limited, TMDL approved	2002
Willamette	Tualatin	Beaverton Creek	0 to 2.1	Fecal Coliform	Year Round	Cat 4A: Water quality limited, TMDL approved	2002
Willamette	Tualatin	Beaverton Creek	0 to 2.1	Phosphorus	June 1 - September 30	Cat 4A: Water quality limited, TMDL approved	1998
Willamette	Tualatin	Beaverton Creek	0 to 9.8	Arsenic	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Beaverton Creek	0 to 9.8	Biological Criteria	Year Round	Cat 4: Water quality limited, TMDL not needed	2002
Willamette	Tualatin	Beaverton Creek	0 to 9.8	Dissolved Oxygen	Year Round (Non-spawning)	Cat 4A: Water quality limited, TMDL approved	2012
Willamette	Tualatin	Beaverton Creek	0 to 9.8	E. Coli	FallWinterSpring	Cat 4A: Water quality limited, TMDL approved	2004
Willamette	Tualatin	Beaverton Creek	0 to 9.8	E. Coli	Summer	Cat 4A: Water quality limited, TMDL approved	2004
Willamette	Tualatin	Beaverton Creek	0 to 9.8	Iron	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Beaverton Creek	0 to 9.8	Lead	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Beaverton Creek	0 to 9.8	Phosphorus	June 1 - September 30	Cat 4A: Water quality limited, TMDL approved	1998
Willamette	Tualatin	Beaverton Creek	0 to 9.8	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved	2002
Willamette	Tualatin	Bronson Creek	0 to 6.5	Biological Criteria	Year Round	Cat 4: Water quality limited, TMDL not needed	2002
Willamette	Tualatin	Bronson Creek	0 to 6.5	Chlorophyll a	Summer	Cat 4A: Water quality limited, TMDL approved	2002
Willamette	Tualatin	Bronson Creek	0 to 5	Dissolved Oxygen	January 1 - May 15	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Bronson Creek	0 to 6.5	Dissolved Oxygen	Year Round (Non-spawning)	Cat 4A: Water quality limited, TMDL approved	2012
Willamette	Tualatin	Bronson Creek	5 to 6.5	Dissolved Oxygen	January 1 - May 15	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Bronson Creek	0 to 6.5	E. Coli	FallWinterSpring	Cat 4A: Water quality limited, TMDL approved	2002
Willamette	Tualatin	Bronson Creek	0 to 6.5	E. Coli	Summer	Cat 4A: Water quality limited, TMDL approved	2002
Willamette	Tualatin	Bronson Creek	0 to 6.5	Lead	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Bronson Creek	0 to 6.5	Phosphorus	June 1 - September 30	Cat 4A: Water quality limited, TMDL approved	1998
Willamette	Tualatin	Bronson Creek	0 to 6.5	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved	2002
Willamette	Tualatin	Dairy Creek	0 to 10.1	Ammonia	June 1 - September 30	Cat 4A: Water quality limited, TMDL approved	1998
Willamette	Tualatin	Dairy Creek	0 to 10.1	E. Coli	FallWinterSpring	Cat 4A: Water quality limited, TMDL approved	2002
Willamette	Tualatin	Dairy Creek	0 to 10.1	E. Coli	Summer	Cat 4A: Water quality limited, TMDL approved	2002
Willamette	Tualatin	Dairy Creek	0 to 10.1	Iron	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Dairy Creek	0 to 10.1	Lead	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	Dairy Creek	0 to 10.1	Phosphorus	June 1 - September 30	Cat 4A: Water quality limited, TMDL approved	1998
Willamette	Tualatin	Dairy Creek	0 to 10.1	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved	2002
Willamette	Tualatin	East Fork Dairy Creek	0 to 21.5	Biological Criteria	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2010
Willamette	Tualatin	East Fork Dairy Creek	2.9 to 20	Dissolved Oxygen	October 15 - May 15	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
Willamette	Tualatin	East Fork Dairy Creek	0 to 13.5	pH	Summer	Cat 4A: Water quality limited, TMDL approved	2002
Willamette	Tualatin	East Fork Dairy Creek	0 to 13.5	Phosphorus	June 1 - September 30	Cat 4A: Water quality limited, TMDL approved	1998
Willamette	Tualatin	East Fork Dairy Creek	0 to 13.5	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved	2002
Willamette	Tualatin	McKay Creek	0 to 15.8	Ammonia	June 1 - September 30	Cat 4A: Water quality limited, TMDL approved	1998
Willamette	Tualatin	McKay Creek	0 to 22.7	Arsenic	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012

<b>Willamette</b>	Tualatin	McKay Creek	0 to 15.7	Dissolved Oxygen	January 1 - May 15	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
<b>Willamette</b>	Tualatin	McKay Creek	0 to 15.7	Dissolved Oxygen	Year Round (Non-spawning)	Cat 4A: Water quality limited, TMDL approved	2012
<b>Willamette</b>	Tualatin	McKay Creek	0 to 15.8	E. Coli	FallWinterSpring	Cat 4A: Water quality limited, TMDL approved	2002
<b>Willamette</b>	Tualatin	McKay Creek	0 to 15.8	E. Coli	Summer	Cat 4A: Water quality limited, TMDL approved	2002
<b>Willamette</b>	Tualatin	McKay Creek	0 to 22.7	Iron	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
<b>Willamette</b>	Tualatin	McKay Creek	0 to 15.8	Phosphorus	June 1 - September 30	Cat 4A: Water quality limited, TMDL approved	1998
<b>Willamette</b>	Tualatin	McKay Creek	15.8 to 22.7	Phosphorus	June 1 - September 30	Cat 4A: Water quality limited, TMDL approved	1998
<b>Willamette</b>	Tualatin	McKay Creek	0 to 15.8	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved	2002
<b>Willamette</b>	Tualatin	Rock Creek	0 to 5.7	Biological Criteria	Year Round	Cat 4: Water quality limited, TMDL not needed	2002
<b>Willamette</b>	Tualatin	Rock Creek	0 to 18.2	Ammonia	June 1 - September 30	Cat 4A: Water quality limited, TMDL approved	1998
<b>Willamette</b>	Tualatin	Rock Creek	0 to 18.2	Arsenic	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
<b>Willamette</b>	Tualatin	Rock Creek	0 to 18.2	Biological Criteria	Year Round	Cat 4: Water quality limited, TMDL not needed	2002
<b>Willamette</b>	Tualatin	Rock Creek	0 to 18.2	Chlorophyll a	Summer	Cat 4A: Water quality limited, TMDL approved	2002
<b>Willamette</b>	Tualatin	Rock Creek	0 to 12.6	Dissolved Oxygen	January 1 - May 15	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
<b>Willamette</b>	Tualatin	Rock Creek	0 to 18.3	Dissolved Oxygen	Year Round (Non-spawning)	Cat 4A: Water quality limited, TMDL approved	2012
<b>Willamette</b>	Tualatin	Rock Creek	0 to 18.2	E. Coli	FallWinterSpring	Cat 4A: Water quality limited, TMDL approved	2002
<b>Willamette</b>	Tualatin	Rock Creek	0 to 18.2	E. Coli	Summer	Cat 4A: Water quality limited, TMDL approved	2002
<b>Willamette</b>	Tualatin	Rock Creek	0 to 18.2	Iron	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
<b>Willamette</b>	Tualatin	Rock Creek	0 to 18.2	Lead	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
<b>Willamette</b>	Tualatin	Rock Creek	0 to 18.2	Phosphorus	June 1 - September 30	Cat 4A: Water quality limited, TMDL approved	1998
<b>Willamette</b>	Tualatin	Rock Creek	0 to 18.2	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved	2002
<b>Willamette</b>	Tualatin	West Fork Dairy Creek	0 to 23.7	Dissolved Oxygen	June 1 - September 30	Cat 4A: Water quality limited, TMDL approved	2002
<b>Willamette</b>	Tualatin	West Fork Dairy Creek	0 to 23.7	E. Coli	Summer	Cat 4A: Water quality limited, TMDL approved	2002
<b>Willamette</b>	Tualatin	West Fork Dairy Creek	0 to 23.7	Phosphorus	June 1 - September 30	Cat 4A: Water quality limited, TMDL approved	1998
<b>Willamette</b>	Tualatin	West Fork Dairy Creek	0 to 23.7	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved	2002
<b>Willamette</b>	Middle Willamette	Willamette River	24.8 to 54.8	Aldrin	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2002
<b>Willamette</b>	Middle Willamette	Willamette River	24.8 to 54.8	Biological Criteria	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2004
<b>Willamette</b>	Middle Willamette	Willamette River	24.8 to 54.8	DDE 4,4	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2002
<b>Willamette</b>	Middle Willamette	Willamette River	24.8 to 54.8	DDT 4,4	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2002
<b>Willamette</b>	Middle Willamette	Willamette River	24.8 to 54.8	Dieldrin	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2002
<b>Willamette</b>	Middle Willamette	Willamette River	24.8 to 54.8	Dioxin (2,3,7,8-TCDD)	Year Round	Cat 4A: Water quality limited, TMDL approved	1998
<b>Willamette</b>	Middle Willamette	Willamette River	24.8 to 54.8	Iron	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
<b>Willamette</b>	Middle Willamette	Willamette River	24.8 to 54.8	Polychlorinated Biphenyls (PCBs)	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2002
<b>Willamette</b>	Middle Willamette; Lower Willamette	Willamette River	0 to 54.8	Chlorophyll a	Summer	Cat 5: Water quality limited, 303(d) list, TMDL needed	2010
<b>Willamette</b>	Middle Willamette; Lower Willamette	Willamette River	0 to 50.6	Temperature	Year Round (Non-spawning)	Cat 4A: Water quality limited, TMDL approved	2010
<b>Willamette</b>	Upper Willamette; Middle Willamette	Willamette River	24.8 to 186.6	Lead	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012
<b>Willamette</b>	Upper Willamette; Middle Willamette; Lower Willamette	Willamette River	0 to 186.4	E. Coli	FallWinterSpring	Cat 4A: Water quality limited, TMDL approved	2010
<b>Willamette</b>	Upper Willamette; Middle Willamette; Lower Willamette	Willamette River	0 to 186.6	Mercury	Year Round	Cat 5: Water quality limited, 303(d) list, TMDL needed	2012





# **Appendix E**

## **City of Hillsboro Water Rates**



# City of Hillsboro Utilities Commission

Water Rate Schedule Resolution #235-W effective January 1, 2020



## CUSTOMER CLASS - C-1A Single Family Residential-SINGLE FAMILY DWELLING UNIT

Meter Size	Monthly Base		Volume Charge			
	Inside	Outside	Billing Frequency	Block One 0-8 ccf	Block Two 9-18 ccf	Block Three 19+ ccf
5/8"x3/4"	\$ 16.58	\$ 24.87	Inside City	\$2.43	\$3.79	\$5.14
3/4"	16.58	24.87	Outside City	\$3.65	\$5.70	\$7.72
1"	27.63	41.45	C-1 Single Family Residential Service - Water service to a single family dwelling unit, duplex or triplex using water primarily for personal or domestic accommodation, including a group home. Other multi-unit developments with separate meters billed by the City to each individual residence is single family residential for each individual residence. Legally established home occupation businesses may utilize single family residential service if the primary use of the structure is maintained as residential.			
1-1/2"	55.21	82.82				
2"	88.37	132.56				
*1 ccf = 100 cubic feet or 748 gallons of water						

Example calculation of monthly bill for 8 ccf: \$16.58 (base charge) + (8 ccf x \$2.43) = \$36.02 total water bill.

## CUSTOMER CLASS - C-1B Single Family Residential-DUPLEX

Meter Size	Monthly Base		Volume Charge			
	Inside	Outside	Billing Frequency	Block One 0-16 ccf	Block Two 17-36 ccf	Block Three 37+ ccf
5/8"x3/4"	\$ 16.58	\$ 24.87	Inside City	\$2.43	\$3.79	\$5.14
3/4"	16.58	24.87	Outside City	\$3.65	\$5.70	\$7.72
1"	27.63	41.45	* See definition of C-1. Served by one meter.			
1-1/2	55.21	82.82				
2"	88.37	132.56				

## CUSTOMER CLASS - C-1C Single Family Residential-TRIPLEX

Meter Size	Monthly Base		Volume Charge			
	Inside	Outside	Billing Frequency	Block One 0-24 ccf	Block Two 25-54 ccf	Block Three 55+ ccf
5/8"x3/4"	\$ 16.58	\$ 24.87	Inside City	\$2.43	\$3.79	\$5.14
3/4"	16.58	24.87	Outside City	\$3.65	\$5.70	\$7.72
1"	27.63	41.45	* See definition of C-1. Served by one meter.			
1-1/2	55.21	82.82				
2"	88.37	132.56				

## CUSTOMER CLASS - C-8 Multi-Family Residential

Meter Size	Monthly Base		Inside City Volume Charge	
	Inside	Outside	Winter Volume (\$/ccf)	Use over Winter Volume \$/ccf
5/8"x3/4"	\$ 29.25	\$ 43.87	\$2.93	\$3.44
1"	48.75	73.12	Outside City Volume Charge	
1-1/2"	97.49	146.24		
2"	155.99	233.98	Winter Volume (\$/ccf)	Use over Winter Volume \$/ccf
3"	312.00	467.99	\$4.39	\$5.17
4"	487.48	731.24	C-8 Multi-Family Residential Service-Water service to multifamily dwelling unit on one parcel of land using water primarily for personal or domestic accommodation with four or more separate living units or spaces, i.e. mobile home parks, trailer courts, apartment complexes, condominiums, and group homes in which all living units are billed by the City of their water service as a single utility bill. This classification also includes homeowner association clubhouses. This category does not include hotels or motels.	
6"	974.97	1,462.45		
8"	2,729.91	4,094.86		
10"	4,094.86	6,142.30		

**CUSTOMER CLASS - C-2 Commercial**

Meter Size	Monthly Base		Inside City Volume Charge	
	Inside	Outside	Winter Volume (\$/ccf)	Use over Winter Volume \$/ccf
5/8"x3/4"	\$ 35.95	\$ 53.92	\$3.16	\$4.45
1"	59.92	89.86	Outside City Volume Charge	
1 1/2"	119.82	179.70	Winter Volume (\$/ccf)	Use over Winter Volume \$/ccf
2"	191.72	287.53	\$4.74	\$6.68
3"	383.45	575.07	C-2 Commercial Service-Water service to a business or businesses engaged in the manufacture and/or sale of a commodity or commodities, or the rendering of a service. This category includes stores, offices, manufacturing and industry office, restaurants, daycare facilities, dairies, warehouses, private schools, private colleges, hospitals, hotels, motels, and other entities. This category also includes Bulk Water.	
4"	599.13	898.54		
6"	1,198.25	1,797.07		
8"	3,355.12	5,031.79		
10"	5,032.68	7,547.69		

**CUSTOMER CLASS - C-9A Small Industrial**

Meter Size	Monthly Base		Inside City Volume Charge	
	Inside	Outside	Usage Under 4 MG \$/ccf	\$2.96
5/8"x3/4"	\$ 55.00	\$ 82.50	Outside City Volume Charge	
1"	91.66	137.49	All usage \$/ccf	\$4.44
1-1/2"	183.31	274.98	C-9 Industrial Service - Water service to a business enterprise engaged in the manufacture of products, materials, equipment, machinery or supplies where water is primarily used in the manufacturing process and not used for personal or domestic accommodation. Wineries where water is primarily used in the manufacturing of wine and not for irrigation. Water usage is relatively constant between winter and summer months.	
2"	293.31	439.96		
3"	586.62	879.94		
4"	916.60	1,374.89		
6"	1,833.18	2,749.76		
8"	5,132.92	7,699.34		
10"	7,699.38	11,549.00		

**CUSTOMER CLASS - C-9B Large Industrial**

Meter Size	Monthly Base		Inside City Volume Charge	
	Inside	Outside	Usage Over 4 MG \$/ccf	\$2.65
6" & 4 MGD	\$ 6,966.00	-	C-9B Large Industrial rate is the same as C-9A plus a volume usage exceeding four million gallons per day (MGD).	
8" & 4 MGD	19,505.00	-		
10" & 4 MGD	29,257.00	-		

**CUSTOMER CLASS - C-11 Irrigation**

Meter Size	Monthly Base		Inside City Volume Charge	
	Inside	Outside	All usage \$/ccf	\$5.93
5/8"x3/4"	\$ 43.87	\$ 65.81	Outside City Volume Charge	
1"	73.12	109.68	All usage \$/ccf	\$8.89
1-1/2"	146.24	219.36	C-11 Irrigation Service - Water service to a public park or irrigation user with seasonal use for recreational, landscaping and horticultural purposes or other similar uses, but not primarily for personal or domestic accommodation. Vineyards and other operations primarily growing vegetation. Irrigation includes outdoor residential and commercial sprinkler services when on separate meters. Irrigation customers may shut off and restart service each growing season, subject to the applicable service fee.	
2"	233.99	350.98		
3"	467.96	701.95		
4"	731.20	1,096.80		
6"	1,462.40	2,193.60		
8"	4,094.72	6,142.08		
10"	6,142.08	9,213.12		

**CUSTOMER CLASS - C-6 Public Entities**

Meter Size	Monthly Base		Inside City Volume Charge	
	Inside	Outside	Winter Volume (\$/ccf)	Use over Winter Volume \$/ccf
5/8"x3/4"	\$ 34.96	\$ 52.43	\$3.47	\$4.87
1"	58.25	87.38	Outside City Volume Charge	
1-1/2"	116.50	174.75	Winter Volume (\$/ccf)	Use over Winter Volume \$/ccf
2"	186.41	279.61	\$5.20	\$7.31
3"	372.81	559.23	C-6 Public Entities Service - Water service to publicly owned or leased land or building, under city, district, county, state, or federal ownership including public schools, public colleges, and post offices.	
4"	582.52	873.79		
6"	1,165.05	1,747.57		
8"	3,262.13	4,893.20		
10"	4,893.20	7,339.80		

**CUSTOMER CLASS - C-10 Nonprofit**

Meter Size	Monthly Base		Inside City Volume Charge	
	Inside	Outside	Winter Volume (\$/ccf)	Use over Winter Volume \$/ccf
5/8"x3/4"	\$ 31.45	\$ 47.17	\$2.76	\$3.89
1"	52.41	78.62	Outside City Volume Charge	
1-1/4"	102.84	154.25	Winter Volume (\$/ccf)	Use over Winter Volume \$/ccf
1-1/2"	104.83	157.24	\$4.14	\$5.83
2"	167.73	251.59	C-10 Nonprofit Service - Water service to a nonprofit entity that is organized as a public benefit corporation or religious corporation as those terms are defined under ORS 65.001.	
3"	335.44	503.17		
4"	524.13	786.21		
6"	1,048.28	1,572.42		
8"	2,935.18	4,402.76		
10"	4,402.76	6,604.14		

**C-4 Private Fire Protection and C-5 Public Fire Protection**

Meter Size	Monthly Base	C-4 Private Fire Protection and C-5 Public Fire Protection - Water service for fire suppression with minimal average usage.
1"	\$ 6.03	
2"	12.06	
3"	18.09	
4"	24.12	
6"	36.18	
8"	48.24	
10"	60.30	
12"	72.36	

**City of Hillsboro Water Rates**

Service Type	Rate	Volume
C-7 City of Hillsboro Wholesale - Cornelius	\$1.66	per ccf
C-7 City of Hillsboro Wholesale - Gaston	\$1.60	per ccf
C-7 City of Hillsboro Wholesale - LA Water Co-op	\$1.60	per ccf
Bulk Water	\$4.22	per 1,000 gallons volume rate



# **Appendix F**

## **City of Forest Grove Water Rates**





Published on *Forest Grove Oregon* (<https://www.forestgrove-or.gov>)

## Utility Service Rates

### WATER SERVICE RATES

**Established by Resolution No. 2019-26, Effective July 1, 2019**

#### Single-Family Residential Water Service Rates

<b>Water Meter Size</b>	<b>Monthly Fixed Rate</b>	<b>Tier 1 0 to 7 kgal</b>	<b>Tier 2 7 to 15 kgal</b>	<b>Tier 3 15 kgal &amp; over</b>
3/4" and less	\$25.67	\$1.94	\$4.11	\$5.96
1"	\$35.93	\$1.94	\$4.11	\$5.96
1.5"	\$52.98	\$1.94	\$4.11	\$5.96
2"	\$73.47	\$1.94	\$4.11	\$5.96

#### Multi-Family Residential Water Service Rates

<b>Water Meter Size</b>	<b>Monthly Fixed Rate</b>	<b>Plus Usage Rate per kgal</b>
3/4" and less	\$25.67	\$2.79
1"	\$35.93	\$2.79
1.5"	\$52.98	\$2.79
2"	\$73.47	\$2.79
3"	\$94.32	\$2.79
4"	\$139.10	\$2.79
6"	\$263.37	\$2.79
8"	\$412.55	\$2.79

#### Commercial & Industrial Water Service Rates

<b>Water Meter Size</b>	<b>Commercial Monthly Fixed Rate</b>	<b>Plus Usage Rate per kgal</b>	<b>Industrial Monthly Fixed Rate</b>	<b>Plus Usage Rate per kgal</b>
3/4" and less	\$25.67	\$2.96	\$25.67	\$2.57
1"	\$35.93	\$2.96	\$35.93	\$2.57
1.5"	\$52.98	\$2.96	\$52.98	\$2.57
2"	\$73.47	\$2.96	\$73.47	\$2.57
3"	\$116.76	\$2.96	\$134.45	\$2.57
4"	\$190.39	\$2.96	\$201.78	\$2.57
6"	\$337.63	\$2.96	\$388.79	\$2.57
8"	\$530.95	\$2.96	\$613.17	\$2.57



# **Appendix G**

## **City of Beaverton Water Rates**



# WATER RATES

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## Monthly Fixed Water Rates

### **New rates starting July 1, 2019.**

The consumption or water use charge is \$3.57 per unit. As a guide, one unit of water equals approximately 748 gallons or 100 cubic feet. The monthly fixed charge or meter charge is based on the size of the meter. A 5/8" meter serves most residences. Fixed rates for meters are as follows:

- 5/8" meter: \$16.00 / month
- 1" meter: \$25.21 / month
- 1 1/2" meter: \$40.51 / month
- 2" meter: \$58.97 / month
- 3" meter: \$101.93 / month
- 4" meter: \$163.35 / month
- 6" meter: \$316.87 / month
- 8" meter: \$388.57 / month
- 10" meter: \$613.73 / month

### Water Rate Resolution No. 4593.

Monthly water fees are used to maintain and update the water distribution system, including repair and installation of water mains, maintenance of individual water services and meters, as well as construction and upkeep of reservoir and well sites.

## Additional Information

- [Sewer Rates](#)
- [Surface Water Management Rates](#)



# **Appendix H**

## **TVWD Water Rates**





### Monthly Base Charges for All Customer Categories

Meter Size (inches)	November 2019	November 2020
	Base Charge	Base Charge
5/8	\$16.40	\$16.99
3/4	\$18.06	\$18.71
1	\$22.26	\$23.06
1 ½	\$29.91	\$30.99
2	\$44.12	\$45.71
3	\$122.85	\$127.27
4	\$164.60	\$170.53
6	\$265.28	\$274.83
8	\$383.19	\$396.98
10	\$630.23	\$652.92

Block volume charges apply to all customer categories based on bi-monthly usage:

- For residential customers, Block 1 charges are \$5.42 per hundred cubic feet (CCF) up to 28 CCF and Block 2 charges are \$7.73 per each CCF above 28 CCF;
- For multi-family, commercial non-production, production processes, and irrigation customers, Block 1 charges are \$5.42 per CCF up to 140 percent of the customer's yearly average water usage (calculated by multiplying the customer's 12 month moving average by 1.4). Block 2 charges of \$7.73 per CCF apply to water use that exceeds the Block 1 threshold.
- All consumption on firelines is charged at the Block 1 rate of \$5.42 per CCF.



# **Appendix I**

## **City of Hillsboro In-Town System Curtailment Plan**



# Hillsboro In-Town Curtailment Plan

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

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

## Introduction

The City of Hillsboro (Hillsboro) (OR 4101513) currently obtains the majority of its water supply from the Joint Water Commission (JWC); therefore, Hillsboro's curtailment planning is intrinsically linked to JWC curtailment. Hillsboro's water source is treated surface water, the winter water source is the upper Tualatin River and in summer when the river level drops too low for municipal use, so Hillsboro relies upon water stored in Barney Reservoir and Hagg Lake to meet customer needs. The water is delivered to Hillsboro and beyond via two large transmission lines. There are approximately 250-miles of distribution lines in the city of Hillsboro that are fed by the transmission lines. These lines provide water to over 24,000 business and residential customers who live west of Cornelius Pass Road. The Tualatin Valley Water District serves Hillsboro residents living east of Cornelius Pass Road. While the JWC Curtailment Plan creates processes for coordination and negotiation of water supplies for the JWC partners, the City's Curtailment Plan establishes measures to reduce its water demands when water supplies aren't enough to meet the needs of the City and its customers. Non-peak curtailment versus peak season has different challenges – higher demand but the ability to curtail outdoor use versus lower demand but little customer use diminish.

This curtailment plan will focus on supply constraints during the peak season, non-peak season and during an emergency event. Triggers are identified – including equipment failure, water system infrastructure damage and supply-limiting events – for four different curtailment stages. Next, specific actions to reduce demands, voluntary and mandatory, are described for each curtailment stage.

Because the City operates three water systems with separate treatment plants and points of diversions, one of the supply systems may be impacted by curtailment conditions while the other system is not, each system has its own Curtailment Plan.

- Hillsboro water supply comes from two surface water sources: the Tualatin River including its tributaries Sain Creek and Scoggins Creek, and the Middle Fork of the North Fork of the Trask River. In addition to diverting water directly from these sources ("direct diversion" or "natural live flow"), in the summer months Hillsboro uses water from storage supplies in Barney Reservoir, on the Middle Fork of the North Fork of the Trask River, and Scoggins Reservoir (Hagg Lake) on Scoggins Creek, a tributary of the Tualatin River.
- The Upper System customers are served water from both the JWC Water Treatment Plant and the Slow Sand Filter Plant.

- Butternut Creek is supplied by TVWD which has three sources: JWC, Portland Water Bureau (PWB), and Aquifer Storage and Recovery. PWB has two sources, a surface water source: the Bull Run Watershed, and a ground water source: the Columbia South Shore Wellfields – this is used to supplement flows from the Bull Run.

Hillsboro may enact curtailment actions for the systems separately or in combination, depending on the nature of the event and the capacity of supplies. Wholesale customers of Hillsboro are required to adhere to Hillsboro’s curtailment actions as stipulated through their wholesale contracts.

## **History of System Curtailment Incidents**

*OAR-690-086-0160(1)*

### **Assessment of Water Shortages & Limitations**

Despite several JWC supply shortages in the past, Hillsboro has not had to implement mandatory curtailment to date. Those supply incidents are described in greater detail below, but all were addressed by operational adjustments and negotiations for alternative supplies with JWC partners. Hillsboro and its partners excel at working together to find alternatives to curtailment, while being able to meet the water supply needs of all partners. While curtailment is considered a last resort to achieve decreased demand, Hillsboro has a plan to employ restrictions if necessary. Summaries of JWC water supply incidents that nearly called for Hillsboro to implement curtailment protocols are detailed below.

#### Summary of Incidents from 1990 to 1999

During the 1990s, the JWC Water Treatment Plant (WTP) experienced incidents that impacted supply/capacity, including: loss of power due to a car hitting a power pole near the WTP, loss of power due to a windstorm, severe raw water quality impacts due to the 1996 floods which affected numerous regions in Oregon, and disruption of deliveries to partners due to a transmission line leak on the WTP site. The incidents all reduced the ability of the JWC to supply water. At that time, there was only one reservoir on Fern Hill with 20 MG available storage, less stored water for emergency backup supply than is available today.

These power supply disruptions led to new JWC response agreements with PGE, and construction of a second finished water pumping station with a supporting power transformer station. In March 2016, a backup power facility was brought online at the WTP. The generators are capable of running the WTP at 50% of current peak capacity, which would be able to fully serve the partners for a large portion of the year, based on average demands.

#### Drought Incident in 2001

The JWC experienced its first source water shortage in the summer of 2001. This experience is described in brief here and in full detail in the JWC’s 2010 WMPC. JWC is generally regulated off its natural flow water rights on the Tualatin River beginning in late May to early June until mid-

October. JWC relies primarily on stored water releases from Hagg Lake and Barney Reservoir during this period.

For the first time since construction of Scoggins Dam was completed in 1977, Hagg Lake did not fill in 2001, reaching only 54 percent of its storage capacity. Several JWC member agencies (the Cities of Hillsboro, Beaverton, and Forest Grove) hold contracts with the Bureau of Reclamation (BOR) for the use of stored water in Hagg Lake that also specify curtailment measures. Based on BOR contract conditions, the JWC partner cities of Hillsboro, Beaverton, and Forest Grove received only about 76% of their normal water allocations from Hagg Lake in 2001. Clean Water Services (CWS) and Tualatin Valley Irrigation District received only 27% and 47%, respectively, of their normal water allocations. Discharge changes at Scoggins Dam were made twice a day, seven days a week to closely match the timing of water orders, avoid waste, and maintain natural flow in the Tualatin River.

In the same year, Barney Reservoir only reached 55% of its storage capacity. After accounting for dead pool storage and releases for fish flows to the Trask River (15% of the available storage), the Barney Reservoir Joint Ownership Commission partners (Hillsboro, Forest Grove, Beaverton, TVWD, and CWS) were allotted only 54% of normal full pool allocations.

The JWC and Barney Reservoir Joint Ownership Committee (BRJOC) partners used a combination of leasing, alternative source options and agreements, and voluntary curtailment to meet summer 2001 demands on the JWC water system. Portland Water Bureau (PWB) had full supplies in both Bull Run and the Columbia River Wellfield. They offered assistance with coordination of regional supply, and provided an alternate source for Tualatin Valley Water District and the City of Beaverton. TVWD allowed Clean Water Services (CWS) to use some of its allocated water in the Barney Reservoir to meet streamflow demands, and CWS paid TVWD the difference between the cost of JWC water and the more expensive PWB water in exchange. It also helped that the summer weather of 2001 was cooler and wetter than usual. No mandatory curtailment was necessary.

#### Summer Supply Incident in 2015

An abnormal onset of early summer weather, with a record number of days exceeding 90 degrees, caused customer demands to skyrocket. In anticipation of possible shortages for the City and TVWD, the JWC approved leases of stored water and treatment plant capacity at its July 2015 meeting. The summer continued hot and dry, and demands on the WTP were often near its maximum capacity, but all agencies were able to supply their customers without needing curtailment measures.

#### Winter Supply Incident in 2015

Western Oregon received a record amount of rain from December 7 to 11, 2015. The heavy rain flooded the Tualatin River, and in some places, the flooding was worse than the flood of 1996. This flooding raised water turbidity and changed the chemistry of the raw water entering the WTP, creating significant challenges for treating the water to safe drinking water standards. The more intense treatment required a slower WTP process; production declined to under 20 mgd.



During this time, demands on the WTP were over 20 mgd. Based on the decreased WTP production capacity, the demands of some partners exceeded their ownership percentage of the available capacity. Throughout the week, as the WTP continued to experience treatment challenges, and Fern Hill Reservoirs and the Cities' in-town storage continued to deplete, it became unclear if the City of Hillsboro would continue to meet demands without some measure of mandatory curtailment since the City of Hillsboro does not currently have any alternate supply sources. City of Beaverton voluntarily turned on one ASR well the first day of the event to reduce demands on the WTP and provide more water to the partners, especially the City of Hillsboro. As the event continued, it appeared that the City of Hillsboro might need to curtail its own customers' water usage. On the third day, TVWD shifted demand onto its PWB supply and ASR well, and the City of Beaverton agreed to turn on a second ASR well, to further lessen their JWC system demand. (The City of Beaverton and TVWD used ASR wells developed under LL #002, not the JWC's ASR LL #019.)

TVWD and the City of Beaverton were meeting their customer demands with these alternate sources, and the City of Forest Grove was still able to meet its customer demands with its share of the reduced JWC WTP capacity that was available. As raw water quality improved, the WTP increased production levels, and by the fourth day of the event, the WTP was again producing enough water to begin refilling the storage reservoirs. The City of Hillsboro did not need to curtail. The event was over by the beginning of the following week, with normal WTP production capacity restored and all partners returning to their normal demand levels at the WTP.

### Storm Event in 2018

Similar to December 2015's event an "atmospheric river" dropped an enormous amount of water into the Tualatin Watershed. Rainwater is notoriously hard to treat to drinking water standards because of its naturally low pH and alkalinity. To add to the problematic water chemistry, this was also the first large rainstorm of fall, which is referred to as a "flush" because a large amount of organic material is swept into the river. The entire "flush" happened in a 24-48 hour period. To further complicate matters, due to the low levels of Hagg Lake and Barney Reservoir after the long dry summer there was no release from either reservoir to supplement river flows. This meant that all river flow increase was directly the result of rainfall and rainfall runoff. On December 19<sup>th</sup>, a 70 cfs release from Hagg Lake (Scoggins Reservoir) was requested to mitigate overflowing commercial holding ponds downstream.

The rapid and extreme changes to the incoming water chemistry impacted treatment plant operations. JWC operators, concerned that water would soon not meet drinking water standards turned off the Water Treatment Plant (WTP) while they worked to figure out the correct treatment chemistry. Meanwhile, Fern Hill Reservoir supplemented demands for all partners except TVWD. Over the course of the 3-day emergency event, reservoir levels dropped to the lowest ever (less than 13 feet). Furthermore, the JWC requested that partners curtail demands and switch sources if possible, which led to the JWC Member Agencies taking the following curtailment actions:

- Hillsboro relied on in-system storage reservoirs to minimize demand on JWC, eliminated inspection and construction flushing, asked industrial customers to voluntarily reduce their demands, and closely monitored fire events.
- Forest Grove used their WTP and in-system storage to minimize demand on JWC.
- Beaverton stopped ASR injection and mobilized their ASR system to significantly decrease their demand on JWC.
- TVWD relied on Portland supply, and did not take JWC supply during the event.

Immediate remedial actions taken at the WTP included turning on a caustic soda feed to the rapid mix, which had solved a similar chemistry problem in a similar December 2015 storm event. However, staff saw very limited improvement from this measure this time around, and so continued to look for solutions. Incoming raw water was reduced to a single pipeline from the raw water intake. Staff had to keep pumping and treating water until filterable water was produced. Until that time, staff sent flume water directly to the drying beds and overflow, instead of treating the highly turbid water with the filters. A large diesel pump, which was purchased after the 2015 event, was utilized during this time (continuously for days) to minimize the amount of overflow.

#### Algae Bloom Event in 2019

In the spring of 2019, JWC water quality staff first observed an algae bloom at Hagg Lake near Scoggins Dam while conducting routine sampling. Immediately, staff began ramping up monitoring per the JWC Algal Response Plan and determined that the dominant species was *Aphanizomenon flos aquae*, a species of potentially toxin cyanobacteria. Based on the JWC Algal Response Plan, as well as recommendations by the Oregon Health Authority (OHA), JWC staff collected samples for toxic analysis, and determined that there were low levels of the toxin microcystin present at two of the four locations sampled in the reservoir, but no toxins were present in Scoggins Creek downstream of the reservoir outlet or in the JWC raw water. Continued sampling of algal speciation, enumeration, and associated toxins showed a brief increase in enumeration of *Aphanizomenon flos aquae*, followed by a steady decline over the course of the following weeks. All subsequent toxin samples in the reservoir were either at the detection limit or non-detects and toxins were never detected in Scoggins Creek downstream of the reservoir or in the JWC raw water. This event lasted approximately 5 weeks from the initial observation to when cell densities were observed at low enough levels to return to routine monitoring as defined by the JWC Algal Response Plan.

Although this event did not require curtailment, in the event of the detection of toxins at the JWC raw water intake it is possible that curtailment may be necessary depending on the time of year, severity of the algal bloom, and the treatment plants capabilities to properly treat raw water to remove specific toxins. The WTP has the ability to add powdered activated carbon (PAC), which is effective at removing cyanotoxins. For example, if cyanotoxins are detected in the source water and at the JWC intake operators at the WTP may initiate the addition of PAC as a precaution. Dosing of PAC to effectively remove cyanotoxins often requires large amounts of PAC, which may require the WTP to decrease production. This may result in curtailment, depending on demand, storage, and the dose of PAC needed.

### **Curtailment Actions**

JWC requested partners to curtail demands, and switch sources if possible.

1. **City of Hillsboro** relied on in-system storage reservoirs to minimize demand on JWC, eliminated inspection and construction flushing, asked industrial customers to voluntarily reduce their demands, and closely monitored fire events.
2. **City of Forest Grove** used their WTP and in-system storage to minimize demand on JWC.
3. **Beaverton** stopped ASR injection and mobilized their ASR system to significantly decrease their demand on JWC.
4. **TVWD** relied on PWB's supply, and did not take JWC supply during the event.
5. **Fern Hill Reservoir's** supplemented demands for all partners except TVWD. Over the course of the three-day event, reservoir levels dropped to the lowest ever (less than 13 feet) during an emergency event.

## **Shortage Capability Assessment**

*OAR-690-086-0160(1)*

The City of Hillsboro's current capacity limitation is its ownership share in production capacity of the JWC WTP, which has been rated at 85 mgd for peak day capacity. Hillsboro's maximum ownership of production capacity is 41.75 mgd. Hillsboro's storage capacity in JWC's Fernhill Reservoirs is 10.8 million gallons. The WTP's production capacity is lower during the winter season due to impacts of colder temperatures on treatment process, and capacity can further decrease during the winter season due to water quality events. Production capacity can be impacted at any time due to equipment failures.

In an event where Hillsboro cannot access its capacity in JWC, the capacity limitation is the storage volume of the City's three distribution system storage tanks totaling 31 million gallons.

In the event of a supply interruption, Hillsboro is well-positioned to meet its non-peak season customer demands for the following reasons:

- Additional finished water storage
  - Construction of a second JWC Fern Hill Reservoir was completed in 2006, adding an additional 20 MG of finished water capacity to the system for a total of 40 MG. Hillsboro's allocation is 45% or 10.8 MG of that total.
  - Hillsboro also increased in-town storage with the addition of the 10 MG Crandall Reservoir in 2013, for a total of 31 MG.
  - Hillsboro consistently follows best management practices and stores three days of average day demand (ADD) in finished water storage in the JWC and local distribution system.
- Installation of back-up electricity
  - In cooperation with PGE, the WTP added a back-up power generator system onsite in 2016.
- Improvements to water quality treatment
  - Hillsboro added chlorination feeders in 2014 to its reservoirs to increase storage time of finished water.
  - The WTP added a PAC feeder in 2008 to improve treatment of organics
  - During the WTP Expansion to 85 MGD there were a number of Water Quality improvements made. These improvements include:
    - Plate Settlers added to basins D-F.
    - Coagulation/Settling Aid feed added to the Rapid Mix.
    - Caustic and Chlorine injection moved up the Raw Water pipeline to allow proper mixing prior to the Rapid Mix.
    - Rapid Mix mixing improvements.
- Seismic reinforcement
  - The JWC's Fern Hill Reservoir 1 was seismically upgraded in 2007.
  - The construction of the second JWC Fern Hill Reservoir included seismic hardening and wrapping Reservoir 1 with rebar in 2006.
  - Hillsboro seismically reinforced the 24th Street Reservoir in 2004, and Dilley Reservoir in 2017.

## Curtailment Event Triggers and Stages

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

During the peak summer demand period each year from June through September, the system is typically operating at or near its maximum capacity. An interruption to supply during this time – such as a natural disaster, mechanical failure, terrorist act, or loss of source – could present significant challenges to Hillsboro. Therefore, the following triggers and related curtailment stages in this plan are based primarily on events occurring during this time period. In addition, less critical impacts to the water supply – such as forecasted drought and minor mechanical or electrical failures – are addressed in Stages 1 and 2. Since there is also a need to plan for supply shortages in the winter, potential restrictions on indoor use are also presented. This scenario presents a unique challenge because few opportunities exist to further reduce winter-time demand to meet lowered supplies.

It is important to note that Hillsboro may be able to make alternative arrangements to meet customer demands, and that the “Initiating Conditions” described below don’t always require the need to implement curtailment stages. If Hillsboro is able to make arrangements, or utilize other parts of its system to meet the demands required of its customers, no curtailment stage will be activated. When a curtailment stage is activated, staff will review the status of available supply and current and historic demands to establish a demand reduction goal. Each curtailment event will be addressed on a case-by-case basis.

This curtailment plan for Hillsboro is designed to be initiated and implemented in progressive stages. The plan has four distinct stages, as shown in **Exhibit 1**, each of which is triggered by one or more of the listed events:

## Exhibit 1. Curtailment Plan Stages 1 through 4.

Curtailment Stages	Potential Initiating Conditions
<b>Stage 1</b> <b>Advisory</b> Temporary Water Shortage Alert (Short-Term Voluntary)	Short-term <sup>1</sup> interruption of electrical service affecting water treatment and distribution affecting ability to meet customer demands short-term; Harmful algal blooms (HAB) clogs filters and impairs performance or occurrence of a cyanotoxin producing bloom; in which Powder-Activated Carbon (PAC) may need to be added, affecting ability to meet customer demands short-term; Minor mechanical or electrical malfunction in pumping facilities or treatment plant affecting ability to meet customer demands short-term; Minor damage to raw or treated water transmission mains (e.g., leaking joint requiring repair); or Below-normal <sup>2</sup> levels of stored water in Barney Reservoir and Scoggins Dam (Hagg Lake) that may fall below the historical 25 <sup>th</sup> percentile in the peak season.
<b>Stage 2</b> <b>Voluntary</b> Long-Term Water Shortage Alert (Long-Term Voluntary)	Stored water is below-normal <sup>2</sup> levels in Barney Reservoir and Scoggins Dam (Hagg Lake) that may fall below the historical 10 <sup>th</sup> percentile in the peak season.
<b>Stage 3</b> <b>Mandatory</b> Severe Water Shortage (Long-Term Mandatory)	One of JWC's summer supplemental sources (Barney Reservoir and Scoggins Dam (Hagg Lake) are 50% of full capacity at the start of release season, resulting in a significant reduction <sup>3</sup> of Hillsboro's water supply capacity; Failures in the pumping facilities, treatment plant or transmission mains that require a lengthy repair time.
<b>Stage 4</b> <b>Emergency</b> Critical Water Shortage (Critical Mandatory Short or Long-Term Restrictions)	Extensive damage to transmission, pumping or treatment processes caused by natural disaster (i.e. earthquake); Both of JWC's summer supplemental sources (Barney Reservoir and Scoggins Dam (Hagg Lake) are below 50% of full capacity at the start of release season, resulting in a severe reduction of Hillsboro's water supply capacity; Interruption of electrical service to the WTP for an unknown or extended period of time. Localized transmission line break resulting in supply disruption. Unplanned water quality, or other treatment issue, that slows JWC WTP production below partner demands in which the timeline for recovery from the condition is uncertain and the risk of total reservoir depletions, at projected rates of production and demand, is high. Short-term increase in Hillsboro's demand beyond Hillsboro's percentage of JWC WTP production capabilities, due to an unforeseen circumstances such as extreme hot weather conditions, fire, or loss of a secondary supply. (This condition would be for acute short-term shortages, and not long-term shortages, such as one caused by drought.)

<sup>1</sup> "Short-term" interruption means an interruption with an expected end. For example, a power outage expected to last one week would be probable cause for Stage 1 curtailment. The decision to initiate curtailment would depend on the time of year, likelihood that power will be restored in the predicted timeframe, and the likelihood that Hillsboro can maintain backup power for the duration of the outage. In this case, Hillsboro could avoid curtailment by using the back-up generators at the water treatment plant, backup fuel supplies, and Hillsboro's in-town storage.

<sup>2</sup> "Below normal" levels means that water levels fall slightly outside the normal drawdown curve. However, Hillsboro could avoid curtailment if alternate supplies are made available that put source supplies back into normal ranges. For example, the reservoirs were between the 25<sup>th</sup> and 10<sup>th</sup> percentile in the 2015-2016 release season, but curtailment was not necessary. In addition, if alternate supplies are expensive, Hillsboro may choose to promote voluntary curtailment in order to reduce dependency on alternative supplies and to reduce costs.

Curtailment Stages	Potential Initiating Conditions
<sup>3</sup> “Significant Reduction” means that Hillsboro’s water supply capacity cannot be made up through alternative means, so mandatory curtailment is necessary to reduce demand levels to ensure that water supplies don’t run out. However, Hillsboro could avoid mandatory curtailment if alternate supplies are made available that put source supplies back into normal ranges. For example, Hillsboro’s summer supplemental sources were at 50% full, but Hillsboro received 54% and 76% of its stored water. Mandatory curtailment wasn’t needed due to availability of other supplies in the region.	

## Authority

Hillsboro’s Water Department Director, under the authority of the City of Hillsboro Utilities Commission, will be responsible for the actions and implementation of Stages 1 and 2, with frequent updates to the City Manager and City Council. Before implementing Stages 3 or 4, the Water Department Director, under the authority of the Utilities Commission, will notify and make a recommendation to the City Manager regarding the proposed curtailment action. Actions under Stages 3 and 4 of this plan may be initiated only after a declaration of emergency is issued by the Mayor, City Council, or appropriate successor as outlined in the City’s Emergency Response Plan. If an emergency declaration made by the Mayor or City Council does not impact water supply or demands, Stages 3 and 4 may not be implemented, under the authority of the Utilities Commission.

Plan provisions will remain in effect until the emergency declaration is lifted by the City Manager or appropriate successor, or until the Utilities Commission is able to demonstrate that the Water Department can meet water demands.

Curtailment measures may be applied to the entire system, or only to water use sectors, and/or in certain geographic areas, which are directly impacted as determined by City staff under the direction of the Water Department Director, or a designee such as an Acting Director or the Assistant City Manager. Different restriction levels may be placed upon the Upper System depending on the nature, severity, and location of the initiating conditions.

The Water Department Director and Water Department staff, under the authority of the Utilities Commission, are responsible for execution of the plan provisions once an emergency has been declared.

The Water Department Director and staff will keep the JWC, its partners, and its wholesale customers informed about water demands and curtailment plans during the course of any water emergency.

## Curtailment Plan Implementation

*OAR-690-086-0160(4)*

In implementing this curtailment plan, Department staff will work closely with the JWC and other member agencies to assure consistent approaches to dealing with water shortages by coordinating stage designations, public notices, press releases, and other outreach activities. Department staff will also coordinate with its wholesale customers on curtailment efforts.

## **Stage 1: Advisory - Temporary Water Shortage Alert**

After notifying the City Manager and the Utilities Commission, Water Department staff, under the direction of the Water Department Director, will activate an Advisory Temporary Water Shortage Alert to inform customers of the need for voluntary, temporary reductions in consumption. This will occur when the Stage 1 triggers described in **Exhibit 1** are met, and Hillsboro determines demands will not be met through alternative methods.

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

Stage 1 public information program elements may include one or more of the following actions:

1. Begin preparations for a voluntary curtailment bilingual (English and Spanish) campaign. Include components such as:
  - a. Issue a general request for voluntary reductions in water use by all water users. The request will include a summary of the current water situation, the reasons for the requested reductions, and a warning that mandatory cutbacks will be required if voluntary measures do not sufficiently reduce water usage.
  - b. Get the message out through multiple communication venues.
  - c. Contact local media outlets, in coordination with the JWC, to inform customers about temporary interruptions to normal service delivery.
  - d. Post a public service announcement on Hillsboro's webpage and Social Media (SM) outlets. Include prepared information regarding conservation tips.
2. Encourage voluntary reductions on outdoor irrigation.
3. Encourage refraining from washing vehicles except at commercial establishments that recycle or reuse water in their cleaning process. Consider offering free or discounted single-wash coupons to encourage compliance. Depending on severity of situation, car wash fundraisers may also be excluded from voluntary restriction, as decided by Water Department Director with advisement from staff.
4. Notify wholesale customers of the existence of, or potential for, water shortages and ask them to issue similar messages to their customers.
5. Provide bilingual notification, assistance, and conservation curtailment materials to wholesale customers and City departments if requested. Share materials with JWC partners on request as well, for awareness even if they are not participating in curtailment actions. Notify the Regional Water Providers Consortium (RWPC) to coordinate with other providers if needed.



### **Non-Peak Season (Winter) Curtailment**

1. Ask industrial and commercial customers to conserve and reduce or eliminate non-essential water use.
2. Encourage customers to shut off their irrigation systems for the season.
3. Encourage repair of all known customer leaks.
4. Encourage customers to take shorter showers.
5. Encourage customers to run taps and flush toilet only when necessary.
6. Encourage customers to delay washing clothes if possible.
7. Encourage customers to eliminate all non-essential water use.

### **Stage 2: Voluntary - Long-Term Water Shortage Alert**

A Stage 2 Voluntary Long-Term Water Shortage Alert will be issued for reduction preparations if it is projected by the JWC and BRJOC. Reasons might include; that peak season storage supplies may not reach projected peak season demand, Hillsboro determines demands will not be met or it is undesirable to do so through alternate means. The actions under this stage will include the previous actions listed above in Stage 1, but will also include the following actions requesting customers to voluntarily restrict their non-essential uses.

Stage 2 public information program elements will include one or more of the following actions:

1. Hillsboro's Water Department Director, under the authority of the City of Hillsboro Utilities Commission, will implement Stages 1 and 2, with frequent updates to the City Manager and City Council.
2. Begin preparations for an aggressive voluntary curtailment bilingual campaign to begin in April or May, before the peak season begins. Include components such as:
  - a. Provide notice and press releases to local media outlets to inform customers about potential water shortages for peak season demands.
  - b. Develop and provide voluntary conservation messaging through various communication venues.
  - c. Encourage customers to water sparingly, by sharing information at community events and promotions. Tailor all conservation messaging at outreach events to the drought conditions and attend additional events such as neighborhood or homeowner's associations, farmer's markets, etc.
  - d. Provide weekly notices and updates using the City website and other communication venues of water availability in Barney and Scoggins reservoirs.
  - e. Consider purchasing additional radio or television advertisements with other affected partners such as the JWC or RWPC.

3. Advise the Industrial Users Group, Top 25 Customer Group, City departments, and wholesale customers of the water supply situation.

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

If the situation worsens, or warrants stricter measures, the following restrictions could also be implemented under Stage 2:

4. Encourage outdoor irrigation to only three-days per every seven-day period (including use of specific schedules imposed by the City Manager) and only between the hours of 8 pm and 5 am. This restriction and prohibition applies to all outdoor irrigation unless:
  - a. Grass, trees, turf or landscaping is less than one-year old;
  - b. Grass, trees, or turf is part of a commercial sod farm;
  - c. Grass, trees, or turf areas are within a high use athletic field used for organized play;
  - d. Grass, trees, or turf areas are used for golf tees or greens; or
  - e. Grass, trees, or turf areas are part of a park or recreation area deemed by the City Council or Utilities Commission to be of particular significance and value to the community.
5. Notwithstanding the exceptions to the outdoor irrigation restrictions and prohibitions noted above, all outdoor watering schedules shall be limited to only that necessary to maintain plant health and shall not allow unnecessarily irrigation. This includes:
  - a. Voluntary restrictions on nonessential water uses, including:
    - i. No washing of paved surfaces;
    - ii. No fountains except those using re-circulated water;
    - iii. No washing of vehicles other than in establishments that recycle water. (Depending on severity of situation, car wash fundraisers may also be excluded from voluntary restriction, as decided by Water Department Director with advisement from staff); and
    - iv. No washing of roofs, decks, or home siding unless such uses are solely to abate a potential fire hazard.
6. Water Department staff will continue to work closely with Utility Billing to identify and notify customers of unfixed leaks. Additional financial incentives may be made available to customers that fix their leaks within a short timeframe.

7. In addition, Water Department staff will work with its industrial and commercial water users to minimize their non-essential water use.

### **Stage 3: Mandatory - Severe Water Shortage**

Conditions causing Stage 3 curtailment measures are severe enough in terms of extent and duration that significant reductions in water use must be achieved as quickly as possible in order to ensure public health, safety, and welfare. This step would take place after Hillsboro has attempted to secure additional supply through alternate means. Stage 3 builds on measures enacted through the previous stages. In a Stage 3 curtailment, all outside watering with City-served water is prohibited and any exceptions noted above for outdoor water uses are rescinded unless such uses are solely to abate public health or fire hazards (an allowance may be made by the City Manager to water sparingly in order to keep public-funded parks and outdoor areas alive). Stage 3 measures attempt to achieve reductions in residential and commercial demands of up to 20% of peak season demand. In the case of temporary water loss due to major damage to critical supply system facilities or major damage to local electrical utility systems, it may be necessary to go directly to Stage 4.

Under Stage 3 it will be expressly prohibited to use City-served/metered water to do any of the following:

1. Water or irrigate lawns, grass, landscaping, or turf unless such uses are solely to abate public health or fire hazards, as directed by the City Manager with advisement from agencies such as Washington County Public Health or Hillsboro Fire Department, or as directed by the City Manager to sustain publicly-funded outdoor areas and facilities.
2. Wash or wet down sidewalks, walkways, driveways, parking lots, open ground, or other hard-surfaced areas with water.
3. Wash vehicles, unless the City Manager or other authority, such as the Washington County Health Department, finds that the public health, safety, and welfare is contingent upon frequent vehicle cleaning such as cleaning of solid waste transfer vehicles, vehicles that transfer food and other perishables, or as otherwise required by law. An exception is that washing vehicles will be allowed at vehicle washing establishments that recycle water.
4. Flush water mains, except for water quality concerns, construction flushing, flow tests or emergency purposes.

The Water Department Director will consider exemptions on a case-by-case basis for businesses that rely on irrigation for their essential operations, such as nurseries, as well as businesses that are willing to implement requested conservation measures. Exemptions can also be appealed by the customer to the Utilities Commission. Staff, under the authority of the Utilities Commission, may also consider reducing pressure at Pressure Reducing Valve (PRV) stations for a prolonged severe water shortage event.

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

If the Stage 3 alert is triggered within a specific geographical area with the distribution system, Hillsboro may provide bottled water or deploy the JWC Emergency Water Distribution System to the limited number of customers who are affected by loss of water service.

#### **Stage 4: Emergency - Critical Water Shortage**

Stage 4 responds to events causing an immediate and sustained loss of the source of supply or major damage to critical treatment, transmission and pumping systems, even after Hillsboro has attempted to secure additional supply through alternate means. Examples may include failure of a main transmission line, failure of an intake or water treatment plant, a contamination event in Barney or Scoggins reservoirs, or the upper Tualatin River or its tributaries, natural disaster such as an earthquake, or a malevolent attack on the system that introduces a contaminant at some point in the system.

Under the Critical Water Shortage stage, all water use may be prohibited, except that which is necessary for human consumption, fire suppression, and sanitation needs. If the emergency causes or is expected to cause a shortage of water for an extended period of time, implementing the curtailment measures of Stage 3 may be more appropriate than Stage 4 for business continuity purposes and recovery operations.

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

1. Implement the appropriate response protocols of the City's Emergency Response Plan for the Hillsboro Water System.
2. Contact Washington County Emergency Management, Washington County Public Health, and the Oregon Drinking Water Program: Department of Human Services, and any other identified support agencies, to request assistance in response actions.
3. Issue media releases, and notify the local news media to solicit their assistance in notifying customers.
4. Contact county, state, and federal law enforcement officials as appropriate.
5. Contact the County Public Health Officer and local hospitals as appropriate for the nature of the event.
6. Contact JWC staff and request deployment of the Emergency Water Distribution System.
7. Hillsboro may impose fines or penalties for negligent use of water.
8. Consider contacting another Oregon Water/Wastewater Agency Response Network (ORWARN) agency requesting additional equipment and staff for emergency response operations.

Hillsboro will continue to investigate and develop specific back-up plans for curtailment emergencies. These plans may include negotiating a water purchase agreement with another water agency, designating emergency water distribution locations, securing redundancy supply through the development of the mid-Willamette River as a second source, and assessing feasibility of ASR technology.

### **Winter Curtailment Options**

During winter months, curtailment is geared towards indoor use only. This makes reductions harder for customers to implement and for staff to enforce, due to the essential needs of water use instead of irrigation use, and that use is occurring mostly unseen. Use the following tips to reduce winter water use:

1. Request reduction in water use by the percentage determined to be the goal based on the comparable month in the prior year.
2. Ensure customers have shut their irrigation off for the season and winterized their systems to prevent leaks.
3. Encourage leak investigation and repair.
4. Encourage customers to take shorter showers.
5. Encourage customers to run taps and flush toilet only when necessary.
6. Encourage customers to delay washing clothes if possible.
7. Encourage customers to eliminate all non-essential water use.
8. Order industrial and commercial customers to conserve and reduce or eliminate non-essential water use.
9. Fire Department should discontinue training exercises that use water.
10. Stop serving water in restaurants unless requested by the customer. This action generates awareness for curtailment, and reduces use of water for washing glasses.
11. Hotels and motels shall discourage daily linen replacement by providing procedures for guests to opt for less frequent laundering.

### **Penalties and Enforcement**

The penalties for violations of this chapter shall be cumulative in that they may be in addition to, not in lieu of, other penalties, remedies or surcharges established by this chapter.

Service may be terminated to any customer who knowingly and willfully violates any provision of the current curtailment ordinance.

## Drought Declaration

If the Governor declares a drought in Washington County or in the State of Oregon, but Hillsboro has/will not activate any of the four stages outlined above, Hillsboro will inform customers of the drought declaration and the status of Hillsboro's water supply. In addition, Hillsboro will ask customers to voluntarily decrease water use through measures similar to the ones provided under Stage 1.

The public information program elements may include one or more of the following actions:

1. Issue a bilingual general request for voluntary reductions in water use by all water users:
  - a. Summarize the current water situation, status of Hillsboro's water supply, and the reasons for the requested reductions.
  - b. Outline measures that customers can take to reduce water use and remind customers of Hillsboro's availability as an information resource and for water-saving devices.
  - c. Post a public service announcement on City's webpage and SM outlets. Include prepared information regarding conservation tips.
  - d. Increase conservation promotion efforts.
2. Contact wholesale customers notifying them of the drought declaration and the status of Hillsboro's water supply. Ask them to increase their promotion of conservation programs.
3. Provide notification, assistance, and conservation/curtailment materials to wholesale customers and City departments, if requested. Share materials with JWC partners on request. Notify the RWPC to coordinate with other providers if needed.

*Note: The JWC adopted an updated Curtailment Plan on January 13, 2017. The City's In-town and Upper System Curtailment Plans work in conjunction with the JWC plan.*



# **Appendix J**

## **City of Hillsboro Upper System Curtailment Plan**





# Upper System Curtailment Element

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

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

## Introduction

The Hillsboro-Cherry Grove Water System (OR 4100985) is also known as Hillsboro’s “Upper System” and will be referred to as such in this curtailment plan to differentiate from Hillsboro’s “In-town” curtailment plan. The Cherry Grove Slow Sand Filter Plant (SSFP) – located outside unincorporated Cherry Grove – is one of two sources for 1,456 people and the wholesale customers of City of Gaston and L.A. Water Cooperative. The Upper System is supplemented by Dilley Reservoir fed from the Joint Water Commission (JWC) Water Treatment Plant. This curtailment plan establishes measures to reduce water demands when water supplies aren’t enough to meet Upper System demands.

This curtailment plan focuses on supply constraints during peak season, non-peak season and emergency events. Triggers are identified such as equipment failure, water system infrastructure damage, and supply-limiting events for four different curtailment stages. Next, specific actions to reduce demands voluntarily and by mandate are described for each curtailment stage.

Because Hillsboro operates three water systems with separate treatment plants and points of diversions, one of the supply systems may be impacted by curtailment conditions while the other system is not, each system has its own Curtailment Plan. Wholesale customers are required to adhere to Hillsboro’s curtailment actions as stipulated through their wholesale contracts.

- Hillsboro water supply comes from two surface water sources: the Tualatin River including its tributaries Sain Creek and Scoggins Creek, and the Middle Fork of the North Fork of the Trask River. In addition to diverting water directly from these sources (“direct diversion” or “natural flow”), in the summer months Hillsboro uses water from storage supplies in Barney Reservoir, on the Middle Fork of the North Fork of the Trask River, and Scoggins Reservoir (Hagg Lake) on Scoggins Creek, a tributary of the Tualatin River.
- The Upper System customers are served water from both the JWC Water Treatment Plant and the Slow Sand Filter Plant.
- Butternut Creek is supplied by TVWD which has three sources: JWC, Portland Water Bureau (PWB), and Aquifer Storage and Recovery. PWB has two sources, a surface water source: the Bull Run Watershed, and a ground water source: the Columbia South Shore Wellfields – this is used to supplement flows from the Bull Run.

## **History of System Curtailment Incidents**

*OAR-690-086-0160(1)*

### **Assessment of Water Shortages & Limitations**

Despite several incidents of Upper System supply shortages in the past, the Upper System has not had to implement mandatory curtailment to date. Curtailment is considered a last resort to achieve decreased demand, but there is a plan to employ curtailment if necessary. The SSFP has flexibility in source water. Typically, water runs from the river to a settling pond to the SSFP, but the pond can be bypassed.

Summaries of Upper System water supply incidents that resulted in supply disruptions and nearly called for curtailment protocols are detailed below.

#### **Summary of Incidents from 2000 – 2009**

- December 2007: Due to a three day heavy rain event totaling 10.65", the ditch and culverts on Lee Falls Road became flooded. This also caused landslide issues on Lee Falls Road near mile marker three. Operation crews cleared the roadway and placed rock gabions at the landslide site.
- December 2008: A series of winter snow storm events hit the coast range. Trees fell across Lee Falls Road in all directions, knocking out power for three days. PGE attempted to restore power for two days but concluded it was too dangerous for workers during the storm and waited for the storm to pass. Over 20 big fir trees came down in the settling pond that had to be air lifted and recovered by a logging company.

#### **Summary of Incidents from 2010 – 2019**

- April 2015: While contractors were connecting a new waterline to an existing line in Dille, the connection blew apart due to not having restraints in place. Water and Public Works department staff welded the two pieces together. Operations staff shut off the valves at the intersection of Maple and Etters causing limited disruption to customers.
- September 2013: A green algae that was a type of *Spirogyra* was detected at the raw water intake from the pond, on the top of the filter. There was also brown algae present that was an overgrowth of diatoms. Both were harmless to customers.
- March 2014: Limited filter capacity was caused from replacing the sand in one of the filters. The wrong sand was ordered, which slowed down the filtration process.
- January 2016: The local Fire Department utilized a hydrant near the Patton valley control valve. They were unaware the connecting line was under high-pressure and created a water hammer. This resulted in supply outages to a handful of customers, due to a main break. In response Hillsboro Water trained local Fire Department staff from Gaston Fire about the high pressure zone in the area and marked all hydrants "high pressure". Hillsboro updated an outdated plan on how to shut down the Upper Systems' distribution backbone.

## Shortage Capability Assessment

*OAR-690-086-0160(1)*

The Upper System's current capacity limitation is based on the Slow Sand Filter Plant maximum production capacity of 3 mgd, Dilley Reservoir's storage capacity of 0.65 million gallons, and Elm PRV's capacity of 4 mgd. The Elm PRV allows the Upper System to be served by Hillsboro's capacity in JWC.

In the event of a supply interruption, the Upper System has one to two days' worth of stored water for customers. Dilley Reservoir holds 575,000 gallons, and the SSFP clear well holds 225,000 gallons of treated water.

- In response to vulnerability assessments and outages, Hillsboro has recently made the following improvements.
  - A back-up generator was installed at the SSFP in 2015 with seven days of fuel on site.
  - Dilley Reservoir had a seismic evaluation and determined the stored water level should be 575 feet of elevation. The water is now at that elevation.
  - A list of customers affected by supply and pressure issues is maintained by Hillsboro. Hillsboro has provided those customers 50 gallon barrels and small pumps to use during supply outages.

## Curtailment Event Triggers and Stages

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

During the peak summer demand period each year from June through September, the system is typically operating at or near its maximum capacity. An interruption to supply during this time – such as a natural disaster, mechanical failure, terrorist act, or loss of source – could present significant challenges to the Upper System. Therefore, the following triggers and related curtailment stages in this plan are based primarily on events occurring during this time period. In addition, less critical impacts to the water supply – such as forecasted drought and minor mechanical or electrical failures – are addressed in Stages 1 and 2. Since there is also a need to plan for supply shortages in the winter, potential restrictions on indoor use are also presented. This scenario presents a unique challenge because few opportunities exist to further reduce winter-time demand to meet lowered supplies.

A wide range of initiating conditions are represented in the following four curtailment stages. As the stages increase from 1 to 4, the severity and/or length of the outage increases. Less critical impacts to the water supply such as forecasted drought, and minor mechanical or electrical failures are addressed in Stages 1 and 2. Severe droughts, earthquakes, or major infrastructure failures are addressed in Stages 3 and 4.

It is important to note that Hillsboro may be able to make alternative arrangements to meet customer demands, and that the “Initiating Conditions” described below don’t always require the need to implement curtailment stages. If Hillsboro is able to make arrangements, or utilize other parts of its system to meet the demands required of its customers, no curtailment stage will be activated. When a curtailment stage is activated, staff will review the status of available supply and current and historic demands to establish a demand reduction goal. Each curtailment event will be addressed on a case-by-case basis.

This curtailment plan for the Upper System is designed to be initiated and implemented in progressive stages. The Upper System’s curtailment plan has four distinct stages, as shown in Exhibit 1, each of which is triggered by one or more of the listed events:

#### **Exhibit 1. Upper System Curtailment Plan Stages 1 through 4**

<b>Curtailment Stages</b>	<b>Potential Initiating Conditions</b>
<b>Stage 1</b> <b>Advisory</b> Temporary Water Shortage Alert (Short-Term Voluntary)	Short-term <sup>1</sup> interruption of electrical service affecting water treatment and distribution; Harmful algal blooms (HAB) clogs filters and impairs performance or occurrence of a cyanotoxin producing bloom; Minor mechanical or electrical malfunction of treatment plant; Minor damage to raw or treated water transmission mains (e.g., leaking joint requiring repair); or Forecasts of below-normal <sup>2</sup> levels of stored water in Barney Reservoir that may fall below the historical 25 <sup>th</sup> percentile in the peak season.
<b>Stage 2</b> <b>Voluntary</b> Long-Term Water Shortage Alert (Long-Term Voluntary)	Forecasts of below-normal <sup>2</sup> levels of stored water in Barney Reservoir that may fall below the historical 10 <sup>th</sup> percentile in the peak season; or Forecasts of drought conditions for the peak season.
<b>Stage 3</b> <b>Mandatory</b> Severe Water Shortage (Long-Term Mandatory)	The summer supplemental source Barney Reservoir is 50% of full capacity at the start of release season, resulting in a significant reduction <sup>3</sup> of the Upper System’s water supply capacity; or Any event causing the Cherry Grove WTP to be out of service for an extended period beyond the storage capacity (); up to 7 days with the Lee Road valve closed and the rest of the Upper System fed by JWC. Failures in the treatment plant or transmission main that require a lengthy repair time.
<b>Stage 4</b> <b>Emergency</b>	Extensive damage to transmission, or treatment processes caused by natural disaster (i.e. earthquake);

<b>Curtailment Stages</b>	<b>Potential Initiating Conditions</b>
Critical Water Shortage	Interruption of electrical service to the SSFP for an unknown or extended period of time;
(Critical Mandatory Restrictions)	Localized transmission line break resulting in supply disruption; Unplanned water quality, or other treatment issue, that slows SSFP production below demands in which the timeline for recovery from the condition is uncertain and the risk of total reservoir depletion, at projected rates of production and demand, is high; or Short-term increase in demand beyond the Upper System’s percentage of SSFP production capabilities, due to an unforeseen circumstance such as extreme hot weather conditions or fire. (This condition would be for acute short-term shortages, and not long-term shortages, such as one caused by drought.)

<sup>1</sup> “Short-term” interruption means an interruption with an expected end. For example, a power outage expected to last one week would be probable cause for Stage 1 curtailment. The decision to initiate curtailment would depend on the time of year, likelihood that power will be restored in the predicted timeframe, and the likelihood that the Upper System can maintain backup power for the duration of the outage. In this case, the Upper System could avoid curtailment by using the back-up generators at the water treatment plant, backup fuel, and increased reliance on the JWC’s water treatment plant.

<sup>2</sup> “Below normal” levels means that water levels fall slightly outside the normal drawdown curve. However, the Upper System could avoid curtailment if alternate supplies are made available or demands are lower than anticipated. For example, the reservoirs were between the 25<sup>th</sup> and 10<sup>th</sup> percentile in the 2015-2016 release season, but curtailment was not necessary. In addition, if alternate supplies are not feasible, promoting voluntary curtailment in order to reduce dependency on alternative supplies and to reduce costs may be the selected option.

<sup>3</sup> “Significant Reduction” means that the Upper System’s water supply capacity cannot be made up through alternative means, so mandatory curtailment is necessary to reduce demand levels to ensure that water supplies don’t run out. However, the Upper System could avoid mandatory curtailment if alternate supplies are made available that put source supplies back into normal ranges, or actual demands are lower than anticipated. For example, the Upper System’s summer supplemental source was at 50% full in 2001, but the Upper System received over 50% of its stored water. Mandatory curtailment wasn’t needed due to availability of other supplies in the region and voluntary curtailment measures.

## Authority

The Water Department Director, under the authority of the City of Hillsboro Utilities Commission will be responsible for the actions and implementation of Stages 1 and 2, with frequent updates to the City Manager and City Council. Before implementing Stages 3 or 4, the Water Department Director, under the authority of the Utilities Commission, will notify and make a recommendation to the City Manager regarding the proposed curtailment action. Actions under Stages 3 and 4 of this plan may be initiated only after a declaration of emergency is issued by the Mayor, City Council, City Manager or appropriate successor as outlined in the City’s Emergency Response Plan. If an emergency declaration made by the Mayor or City Council does not impact water supply or demands, Stages 3 and 4 may not be implemented, under the authority of the Hillsboro Utilities Commission.

Plan provisions will remain in effect until the emergency declaration is lifted by the City Manager or appropriate delegate, or until the Utilities Commission is able to demonstrate that the Water Department can meet water demands.

Curtailment measures may be applied to the entire system, or only to specific types of water use, and/or in certain geographic areas, which are directly impacted depending on the nature, severity, and location of the initiating conditions. This will be determined by City staff under the direction of the Water Department Director, or a designee such as an Acting Director or the Assistant City Manager.

The Water Department Director and Water Department staff, under the authority of the Utilities Commission, are responsible for execution of the plan provisions once an emergency has been declared.

The Water Department Director and staff will keep the JWC, its partners, and its wholesale customers informed about water demands and curtailment plans during the course of any water emergency.

## **Curtailment Plan Implementation**

*OAR-690-086-0160(4)*

In implementing this curtailment plan, Department staff will work closely with the JWC and other member agencies to assure consistent approaches to dealing with water shortages by coordinating stage designations, public notices, press releases, and other outreach activities. Department staff will also coordinate with its wholesale customers on curtailment efforts.

### **Stage 1: Advisory - Temporary Water Shortage Alert**

After notifying the City Manager and the Utilities Commission, Water Department staff, under the direction of the Water Department Director, will activate an Advisory Temporary Water Shortage Alert to inform customers of the need for voluntary, temporary reductions in consumption. This will occur when the Stage 1 triggers described in **Exhibit 1** are met, and Hillsboro determines demands will not be met through alternative methods.

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

Stage 1 public information program elements may include one or more of the following actions:

1. Begin preparations for a voluntary curtailment bilingual (English and Spanish) campaign. Include components such as:
  - a. Issue a general request for voluntary reductions in water use by all water users. The request will include a summary of the current water situation, the reasons for the

requested reductions, and a warning that mandatory cutbacks will be required if voluntary measures do not sufficiently reduce water usage.

- b. Get the message out through multiple communication venues.
  - c. Contact local media outlets, in coordination with the JWC, to inform customers about temporary interruptions to normal service delivery.
  - d. Post a public service announcement on Hillsboro's webpage and Social Media (SM) outlets. Include prepared information regarding conservation tips.
2. Encourage voluntary reductions on outdoor irrigation.
  3. Encourage refraining from washing vehicles except at commercial establishments that recycle or reuse water in their cleaning process. Consider offering free or discounted single-wash coupons to encourage compliance. Depending on severity of situation, car wash fundraisers may also be excluded from voluntary restriction, as decided by Water Department Director with advisement from staff.
  4. Notify wholesale customers of the existence of, or potential for, water shortages and ask them to issue similar messages to their customers.
  5. Provide bilingual notification, assistance, and conservation curtailment materials to wholesale customers and City departments if requested. Share materials with JWC partners on request as well, for awareness even if they are not participating in curtailment actions. Notify the Regional Water Providers Consortium (RWPC) to coordinate with other providers if needed.

### **Non-Peak Season (Winter) Curtailment**

1. Ask industrial and commercial customers to conserve and reduce or eliminate non-essential water use.
2. Encourage customers to shut off their irrigation systems for the season.
3. Encourage repair of all known customer leaks.
4. Encourage customers to take shorter showers.
5. Encourage customers to run taps and flush toilet only when necessary.
6. Encourage customers to delay washing clothes if possible.
7. Encourage customers to eliminate all non-essential water use.

### **Stage 2: Voluntary - Long-Term Water Shortage Alert**

A Stage 2 Voluntary Long-Term Water Shortage Alert will be issued for reduction preparations if it is projected by the JWC and BRJOC. Reasons might include; that peak season storage supplies may not reach projected peak season demand, Hillsboro determines demands will not be met or it is undesirable to do so through alternate means. The actions under this stage will include



the previous actions listed above in Stage 1, but will also include the following actions requesting customers to voluntarily restrict their non-essential uses.

Stage 2 public information program elements will include one or more of the following actions:

1. Hillsboro's Water Department Director, under the authority of the City of Hillsboro Utilities Commission, will implement Stages 1 and 2, with frequent updates to the City Manager and City Council.
2. Begin preparations for an aggressive voluntary curtailment bilingual campaign to begin in April or May, before the peak season begins. Include components such as:
  - a. Provide notice and press releases to local media outlets to inform customers about potential water shortages for peak season demands.
  - b. Develop and provide voluntary conservation messaging through various communication venues.
  - c. Encourage customers to water sparingly, by sharing information at community events and promotions. Tailor all conservation messaging at outreach events to the drought conditions and attend additional events such as neighborhood or homeowner's associations, farmer's markets, etc.
  - d. Provide weekly notices and updates using the City website and other communication venues of water availability.
  - e. Consider door-to-door distribution or mailing of conservation materials.
3. Advise the wholesale customers, Stimson Lumber, Washington County, Clean Water Services, and high communication customers. Ensure Gaston notifies the Gaston School District.

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

If the situation worsens, or warrants stricter measures, the following restrictions could also be implemented under Stage 2:

4. Encourage outdoor irrigation to only three-days per every seven-day period (including use of specific schedules imposed by the City Manager) and only between the hours of 8 pm and 5 am. This restriction and prohibition applies to all outdoor irrigation unless:
  - a. Grass, trees, turf or landscaping is less than one-year old;
  - b. Grass, trees, or turf is part of a commercial sod farm;
  - c. Grass, trees, or turf areas are within a high use athletic field used for organized play;

- d. Grass, trees, or turf areas are used for golf tees or greens; or
  - e. Grass, trees, or turf areas are part of a park or recreation area deemed by the City Council or Utilities Commission to be of particular significance and value to the community.
- 5. Notwithstanding the exceptions to the outdoor irrigation restrictions and prohibitions noted above, all outdoor watering schedules shall be limited to only that necessary to maintain plant health and shall not allow unnecessarily irrigation. This includes:
  - a. Voluntary restrictions on nonessential water uses, including:
    - i. No washing of paved surfaces;
    - ii. No fountains except those using re-circulated water;
    - iii. No washing of vehicles other than in establishments that recycle water. (Depending on severity of situation, car wash fundraisers may also be excluded from voluntary restriction, as decided by Water Department Director with advisement from staff); and
    - iv. No washing of roofs, decks, or home siding unless such uses are solely to abate a potential fire hazard.
- 6. Water Department staff will continue to work closely with Utility Billing to identify and notify customers of unfixed leaks. Additional financial incentives may be made available to customers that fix their leaks within a short timeframe.
- 7. In addition, Water Department staff will work with its industrial and commercial water users to minimize their non-essential water use.

### **Stage 3: Mandatory - Severe Water Shortage**

Conditions causing Stage 3 curtailment measures are severe enough in terms of extent and duration that significant reductions in water use must be achieved as quickly as possible in order to ensure public health, safety, and welfare. This step would take place after Hillsboro has attempted to secure additional supply through alternate means. Stage 3 builds on measures enacted through the previous stages. In a Stage 3 curtailment, all outside watering with City-served water is prohibited and any exceptions noted above for outdoor water uses are rescinded unless such uses are solely to abate public health or fire hazards (an allowance may be made by the City Manager to water sparingly in order to keep public-funded parks and outdoor areas alive). Stage 3 measures attempt to achieve reductions in residential and commercial demands of up to 20% of peak season demand. In the case of temporary water loss due to major damage to critical supply system facilities or major damage to local electrical utility systems, it may be necessary to go directly to Stage 4.

Under Stage 3 it will be expressly prohibited to use City-served/metered water to do any of the following:

1. Water or irrigate lawns, grass, landscaping, or turf unless such uses are solely to abate public health or fire hazards, as directed by the City Manager with advisement from agencies such as Washington County Public Health or Hillsboro Fire Department, or as directed by the City Manager to sustain publicly-funded outdoor areas and facilities.
2. Wash or wet down sidewalks, walkways, driveways, parking lots, open ground, or other hard-surfaced areas with water.
3. Wash vehicles, unless the City Manager or other authority, such as the Washington County Health Department, finds that the public health, safety, and welfare is contingent upon frequent vehicle cleaning such as cleaning of solid waste transfer vehicles, vehicles that transfer food and other perishables, or as otherwise required by law. An exception is that washing vehicles will be allowed at vehicle washing establishments that recycle water.
4. Flush water mains, except for water quality concerns, construction flushing, flow tests or emergency purposes.
5. Staff, under the authority of the Utilities Commission, may also consider reducing pressure at Pressure Reducing Valves (PRV) stations for prolonged severe water shortage event.

The Water Department Director will consider exemptions on a case-by-case basis for businesses that rely on irrigation for their essential operations, such as nurseries, as well as businesses that are willing to implement requested conservations measures. Exemptions can also be appealed by the customer to the Utilities Commission. Staff, under the authority of the Utilities Commission, may also consider reducing pressure at Pressure Reducing Valve (PRV) stations for a prolonged severe water shortage event.

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

If the Stage 3 alert is triggered by an extended disruption at Hillsboro's Cherry Grove WTP or a specific geographical area with the distribution system, Hillsboro may provide bottled water or deploy the JWC Emergency Water Distribution System to the limited number of customers who are affected by loss of water service.

#### **Stage 4: Emergency - Critical Water Shortage**

Stage 4 responds to events causing an immediate and sustained loss of the source of supply or major damage to critical treatment, transmission and pumping systems, even after Hillsboro has attempted to secure additional supply through alternate means. Examples may include failure of a main transmission line, failure of an intake or water treatment plant, a contamination event in Barney or Scoggins reservoirs, or the upper Tualatin River or its tributaries, natural disaster such as an earthquake, or a malevolent attack on the system that introduces a contaminant at some point in the system.

Under the Critical Water Shortage stage, all water use may be prohibited, except that which is necessary for human consumption, fire suppression, and sanitation needs. If the emergency

causes or is expected to cause a shortage of water for an extended period of time, implementing the curtailment measures of Stage 3 may be more appropriate than Stage 4 for business continuity purposes and recovery operations.

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

1. Implement the appropriate response protocols of the City's Emergency Response Plan for the Hillsboro Water System.
2. Contact Washington County Emergency Management, Washington County Public Health, and the Oregon Drinking Water Program: Department of Human Services, and any other identified support agencies, to request assistance in response actions.
3. Issue media releases, and notify the local news media to solicit their assistance in notifying customers.
4. Contact county, state, and federal law enforcement officials as appropriate.
5. Contact the County Public Health Officer and local hospitals as appropriate for the nature of the event.
6. Contact JWC staff and request deployment of the Emergency Water Distribution System.
7. Hillsboro may impose fines or penalties for negligent use of water.
8. Consider contacting another Oregon Water/Wastewater Agency Response Network (ORWARN) agency requesting additional equipment and staff for emergency response operations.

Hillsboro will continue to investigate and develop specific back-up plans for a Stage 4 emergency. These plans may include negotiating a water purchase agreement with another water agency, designating emergency water distribution locations, and assessing feasibility of Aquifer Storage and Recovery (ASR) technology. The Willamette Water Supply System will be online in 2026 and will serve as a redundant supply for the In-Town System but may potentially be used as a source for emergency water for the Upper System.

## **Winter Curtailment Options**

During winter months, curtailment is geared towards indoor use only. This makes reductions harder for customers to implement and for staff to enforce, due to the essential needs of water use instead of irrigation use, and that use is occurring mostly unseen. Use the following tips to reduce winter water use:

1. Request reduction in water use by the percentage determined to be the goal based on the comparable month in the prior year.
2. Ensure customers have shut their irrigation off for the season and winterized their systems to prevent leaks.
3. Encourage leak investigation and repair.
4. Encourage customers to take shorter showers.
5. Encourage customers to run taps and flush toilet only when necessary.
6. Encourage customers to delay washing clothes if possible.
7. Encourage customers to eliminate all non-essential water use.
8. Order industrial and commercial customers to conserve and reduce or eliminate non-essential water use.
9. Fire Department should discontinue training exercises that use water.
10. Stop serving water in restaurants unless requested by the customer. This action generates awareness for curtailment, and reduces use of water for washing glasses.
11. Hotels and motels shall discourage daily linen replacement by providing procedures for guests to opt for less frequent laundering.

### **Penalties and Enforcement**

The penalties for violations of this chapter shall be cumulative in that they may be in addition to, not in lieu of, other penalties, remedies or surcharges established by this chapter.

Service may be terminated to any customer who knowingly and willfully violates any provision of the current curtailment ordinance.

### **Drought Declaration**

If the Governor declares a drought in Washington County or in the State of Oregon, but the Upper System has/will not activate any of the four stages outlined above, Hillsboro will inform customers of the drought declaration and the status of the Upper System's water supply. In addition, Hillsboro will ask customers to voluntarily decrease water use through measures similar to the ones provided under Stage 1.

The public information program elements may include one or more of the following actions:

1. Issue a bilingual general request for voluntary reductions in water use by all water users:
  - a. Summarize the current water situation, status of the Upper System's water supply, and the reasons for the requested reductions.

- b. Outline measures that customers can take to reduce water use and remind customers of the Upper System's availability as an information resource and for water-saving devices.
  - c. Post a public service announcement on City's webpage and SM outlets. Include prepared information regarding conservation tips.
  - d. Increase conservation promotion efforts.
- 2. Contact wholesale customers notifying them of the drought declaration and the status of the Upper System's water supply. Ask them to increase their promotion of conservation programs.
- 3. Provide notification, assistance, and conservation curtailment materials to wholesale customers and City departments if requested. Share materials with JWC partners on request. Notify the Regional Water Providers Consortium (RWPC) to coordinate with other providers if needed.

*Note: The JWC adopted an updated Curtailment Plan on January 13, 2017. The City's In-town and Upper System Curtailment Plans work in conjunction with the JWC plan.*



# **Appendix K**

## **City of Forest Grove Curtailment Plan**





## Forest Grove

The City of Forest Grove depends on the JWC's water source for an average of 44 percent (2008 through 2018) of its water supply, so Forest Grove's curtailment planning will consider JWC curtailment as well as measures based on the City's own water supplies. As stated in the JWC's curtailment plan, the JWC does not have direct authority to regulate its member agencies. Thus, while the JWC curtailment plan creates processes for coordination, negotiation and public education, Forest Grove's curtailment plan establishes measures to reduce on-the-ground water demand.

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

## History of System Curtailment Episodes

*OAR 690-086-0160 (1)*

During the last 10 years, the City of Forest Grove has not experienced supply deficiencies. When the City has had transmission line or power failures, it has been able to use capacity from the JWC system so that its customers have had sufficient water supply and curtailment has been unnecessary. Refer to the JWC "History of System Curtailment Episodes" at the beginning of this section for more information.

## Shortage Capability Assessment

*OAR 690-086-0160 (1)*

The City of Forest Grove's current capacity limitation is its raw water supply if it becomes significantly reduced or unavailable for an extended period.

In the event of a supply interruption the City is well-positioned to meet its non-peak season customer demands based on the previously described upgrades to the JWC water system and the following reasons:

- Additional finished water storage
  - The City consistently follows best management practices and stores three days of average day demand (ADD) in finished water storage in the JWC and local distribution system.
- Additional Water Sources
  - The City of Forest Grove has the Clear Creek water source
  - The City of Forest Grove has an emergency intertie with the City of Cornelius

# Curtailment Event Triggers and Stages

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

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

Stage 1 – Water Shortage Alert

Stage 2 – Serious Water Shortage

Stage 3 – Critical Water Shortage

Stage 4 – Emergency Water Shortage

The City of Forest Grove's curtailment plan stages will be triggered by one or more of the criteria presented in Exhibit 1.

## Exhibit 1. City of Forest Grove Curtailment Stages

Curtailment Stages	Initiating Conditions
Stage 1 Water Shortage Alert	Mechanical or electrical malfunction at city's or SHPP Intake or water treatment plant anticipated to be of short duration; Interruption of local utility electrical service anticipated to be of short duration; or Abnormal weather conditions during the storage season, or other reasons, that make it unlikely that Barney Reservoir and Scoggins Dam (Hagg Lake) will fill to their full capacities preceding the peak summer supply season;
Stage 2 Serious Water Shortage	Notice of potential water shortage from the JWC as part of its Stage 2 curtailment; Water supply at or below 90 percent of demands for three or more consecutive days; or Mechanical or electrical malfunction or other incident requiring a longer duration and more extensive repairs of pumping facilities, treatment plant or water transmission mains.
Stage 3 Critical Water Shortage	Curtailment request from the JWC as part of its Stage 3 curtailment; Water supply at or below 80 percent of projected demands for three or more consecutive days; or Mechanical or electrical malfunction or other incident requiring a longer duration and more extensive repairs of pumping facilities, treatment plant or water transmission mains.
Stage 4 Emergency Water Shortage	Water supply notification from the JWC as part of its Stage 4 curtailment; Water supply at or below 70 percent of demands for three or more consecutive days;

Curtailment Stages	Initiating Conditions
	<p>Intentional acts or fire, contamination of source or any other event resulting in an immediate, sustained deprivation of water supply; or</p> <p>Extensive damage to transmission, pumping or treatment processes caused by natural disaster.</p>

## Authority

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

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

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

## Curtailment Plan Implementation and Enforcement

*OAR 690-086-0160 (4)*

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

### Stage 1: Water Shortage Alert

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

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

1. Minimize landscape watering between 10:00 a.m. and 6:00 p.m., the period of highest water loss due to evaporation.
2. Water landscapes on alternate days (even numbered addresses water on even numbered days and odd numbered addresses water on odd numbered days.)

3. Implement other conservation measures, such as those described on the Regional Water Providers Consortium website, which can be accessed from the City's website.

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

## **Stage 2: Serious Water Shortage**

Stage 2 is similar to Stage 1, except that the voluntary measures regarding outdoor water use will be made mandatory by the City Manager, and additional non-essential water use will be prohibited. The goal under Stage 2 is to reduce demand by approximately 10 percent.

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

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

## **Stage 3: Critical Water Shortage**

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

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

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

1. Irrigate lawns, grass, landscaping or turf
2. Flush water mains, except for water quality concerns or emergency purposes.
3. Filling or otherwise putting water into any swimming pool or hot tub, unless it:
  - a. Is used for a neighborhood fire control supply;
  - b. Has a recycling water system;
  - c. Has an evaporative cover; or
  - d. Is required by a medical doctor's prescription.

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

#### **Stage 4: Emergency Water Shortage**

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

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

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

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

## **Drought Declaration**

If a declaration of a severe drought is declared by the Governor per ORS 536.720, the Oregon Water Resources Commission may order political subdivisions within any drainage basin or subbasin to implement a water conservation or curtailment plan or both, approved under ORS 536.780. The City's conservation and curtailment elements in this WMCP meet these requirements. If the City is within a severe drought area declared by the Governor, such as Washington County, the City will consider whether it needs to implement curtailment measures to meet system demands. The City will encourage its customers to conserve water regardless of whether curtailment is needed.

# **Appendix L**

## **City of Beaverton Curtailment Plan**





## **Beaverton**

The City currently obtains most of its water supply from JWC so the City's curtailment planning is intrinsically linked to JWC curtailment. JWC adopted an updated curtailment plan on January 13, 2017. The City's curtailment plan works in conjunction with JWC's plan. While JWC curtailment plan creates processes for coordination and negotiation of water supplies for JWC partners, the City's curtailment plan establishes measures to reduce its water demands when water supplies are not enough to meet the needs of the City and its customers.

This curtailment plan focuses on supply constraints during an emergency in the peak season, although the plan is flexible enough to address non-peak season constraints. To address these constraints, the City has identified triggers, such as equipment malfunctions, infrastructure damage, and supply-limiting events for five different curtailment stages. For each of these stages, specific actions to reduce demands, voluntary and mandatory, are described.

Not only does the City's curtailment plan comply with Division 86 requirements, it also expands on Beaverton's city code and comports with its 2016 Emergency Response Plan (ERP). JWC also has an ERP, updated in 2004, which describes how the member agencies will respond to a variety of incidents, addressing the entirety of JWC infrastructure and sources of supply. The City's curtailment plan and ERP were designed to work in tandem with JWC's ERP to allow for a coordinated response among members as needed.

## **Availability of Emergency Supplies**

In addition to water sourced from JWC, Beaverton can rely on native groundwater and water derived from its ASR program (recharged typically during non-peak seasons via JWC), and has interties with TVWD and the Cities of Tigard and Portland for use as supply during a water shortage.

## **History of System Curtailment Episodes**

*OAR 690-086-0160 (1)*

Despite several incidents of JWC supply shortages in the past, the City has not had to implement mandatory curtailment within the last 10 years. Those supply incidents are described in detail in the JWC "History of System Curtailment Episodes" at the beginning of this section, but all were handled by operational adjustments, negotiations for alternative supplies with JWC partners, and use of water via interconnections with other non-JWC partner entities. The City and its partners excel at working together to meet the water supply needs of all partners if alternatives besides curtailment are available. Curtailment is considered a last resort to achieve decreased demand, but the City has a plan to employ curtailment if necessary.

# Shortage Capability Assessment

*OAR 690-086-0160 (1)*

The City's current capacity limitation is the South Transmission Line (STL), as the City owns 18.75 mgd but can move only 14 mgd through the STL. The City is moving forward with a connection to the North Transmission Line (NTL) to make up for this gap in transmission capacity and owned treatment capacity.

In the event of a supply interruption the City is well-positioned to meet its non-peak season customer demands based on upgrades to the JWC water system and the following reasons:

- Additional finished water storage
  - The City consistently follows best management practices and stores three days of average day demand (ADD) in finished water storage in the JWC and local distribution system.
- Additional Water Sources

The City's groundwater and ASR wells can reliably meet non-peak season demand on a temporary basis.

  - The City has interties with TVWD, PWB, and Tigard and can call on these entities for emergency supplies as needed.
  - By 2026, the City will have access to the Willamette River through Permit S-54940.

## Curtailment Event Triggers

*OAR 690-086-0160 (2), (3)*

The following triggers and related curtailment stages in this curtailment plan are based primarily on events occurring during the peak season time period, although the triggers can be initiated at any time.

This curtailment plan is designed to be initiated and implemented in progressive stages. As shown in Exhibit 1, Beaverton's curtailment plan has five distinct stages, each of which is triggered by one or more of the listed events. The City's curtailment plan is consistent with a resolution for curtailment that adopted in 2010 with which the City is required to comply. Furthermore, City Council has authority to authorize emergency water use restrictions under City Code 4.02.180.

## Exhibit 1. City of Beaverton Water Use Curtailment Plan Stages 1 through 5

Curtailment Stages	Initiating Conditions
Stage 1 Temporary Water Shortage Alert (Short-Term Voluntary)	Interruption of local utility electrical service affecting water treatment and distribution. Minor mechanical or electrical malfunction in pumping facilities or treatment plant. Minor damage to raw or treated water transmission mains (e.g., leaking joint requiring repair).
Stage 2 Long-Term Water Shortage Alert (Preparing for Long-Term Voluntary)	JWC forecasts below-normal levels of stored water in Barney Reservoir and Scoggins Dam (Hagg Lake) that may fall below City's projected peak season demand. JWC forecasts of drought conditions for the peak season.
Stage 3 Serious Water Shortage (Long-Term Voluntary)	JWC forecasts of below-normal levels of stored water in Barney Reservoir and Scoggins Dam (Hagg Lake) (storage supply at or below 90% of City's projected peak season demand). Mechanical or electrical malfunction or other incident requiring more extensive repairs of pumping facilities, treatment plant, or water transmission mains than in Stage 1.
Stage 4 Severe Water Shortage (Long-Term Mandatory)	JWC forecasts below-normal levels of stored water in Barney Reservoir and Scoggins Dam (Hagg Lake) (storage supply at or below 80% of City's projected peak season demand). Multiple failures in the pumping facilities, treatment plant, or transmission mains.
Stage 5 Critical Water Shortage (Short-Term Critical Mandatory Restrictions)	Extensive damage to transmission, pumping, or treatment processes caused by natural disaster. JWC forecasts of below-normal levels of stored water in Barney Reservoir and Scoggins Dam (Hagg Lake) (storage supply at or below 70% of City's projected peak season demand). Intentional acts, fire, contamination of source, or any other event resulting in an immediate, sustained deprivation of water supply.

### Notes:

JWC = Joint Water Commission

ORS = Oregon Revised Statute

## Authority

Actions under Stages 2 through 5 of the City's curtailment plan may be initiated only after a declaration of emergency by the Mayor and ratified by the City Council per City Code 2.01. Provisions of the plan will remain in effect until the emergency is declared ended by the City Council.

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

The Mayor is responsible for execution of the plan provisions after an emergency has been declared and will rely on the City's emergency response team to implement appropriate measures.

## **Curtailment Plan Implementation and Enforcement**

*OAR 690-086-0160 (4)*

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

### **Stage 1: Temporary Water Shortage Alert**

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

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

Stage 1 public information program elements would include the following:

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

## **Stage 2: Long-Term Water Shortage Alert**

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

Stage 2 public information program elements would include the following:

Follow Stage 1 program elements.

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

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

## **Stage 3: Serious Water Shortage**

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

1. Restrict outdoor irrigation to 3 days per every 7-day period (including use of specific schedules imposed by the Mayor) and only between the hours of 8 p.m. and 10 a.m. This restriction and prohibition applies to all outdoor irrigation unless:
  - a. Grass, turf or landscaping is less than 1 year old.
  - b. Grass or turf is part of a commercial sod farm.
  - c. Grass or turf areas are within a high use athletic field used for organized play.

- d. Grass or turf areas are used for golf tees or greens.
- e. Grass or turf areas are part of a park or recreation area deemed by the City Council to be of particular significance and value to the community.

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

2. Restrict all water waste:

- a. No washing of paved surfaces.  
No use of fountains except those using re-circulated water.  
No water running onto streets, sidewalks, or into gutters.  
No washing of vehicles other than in establishments that recycle water.  
No washing of roofs, decks, or home siding unless such uses are solely to abate a potential fire hazard.

- 3. Identify and notify customers about unfixed leaks in their systems. Financial incentives will be available to customers that fix their leaks in a short time frame. Additional restrictions on notified customers with unfixed leaks will be considered.
- 4. Notify the City's water supply partners to activate alternative water supplies.
- 5. Work with large, local industrial and commercial water users to minimize their non-essential water use.

#### **Stage 4: Severe Water Shortage**

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

Under Stage 4, it will be expressly prohibited to:

- 1. Water, sprinkle, or irrigate lawns, grass, landscaping, or turf.
- 2. Wash, wet down, or sweep sidewalks walkways, driveways, parking lots, open ground, or other hard-surfaced areas with water.
- 3. Wash vehicles, unless the Mayor finds that the public health, safety, and welfare are contingent upon frequent vehicle cleaning, such as cleaning of solid waste transfer vehicles, vehicles that transfer food and other perishables, or as otherwise required by law. Exceptions will be required to wash vehicles at establishments that recycle water.

4. Flush water mains, except for water quality concerns or emergency purposes.

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

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

## **Stage 5: Critical Water Shortage**

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

Under Stage 5, all water use may be prohibited, except water that is necessary for human consumption, fire suppression, and sanitation needs.

The City Council also may activate the City's Emergency Operations Center (EOC) to mobilize sufficient resources to respond to the event(s) causing the need for a Stage 5 action.

If the event renders water in the system unsafe to drink (e.g., chemical spill or intentional act against the system), the EOC will be activated and the Incident Commander will assume command and control of the City's response to the event. As the cause and severity of the event dictates, the Incident Commander will:

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

The City will continue to investigate and develop specific backup plans for a Stage 5 emergency. These plans may include purchasing water from another JWC partner agency, directing residents to a pre-designated water distribution location, and supplying bottled water.



## **Drought Declaration**

If a declaration of a severe drought is declared by the Governor per ORS 536.720, the Oregon Water Resources Commission may order political subdivisions within any drainage basin or subbasin to implement a water conservation or curtailment plan or both, approved under ORS 536.780. The conservation and curtailment elements of this WMCP meet these requirements. If the City is within a severe drought area declared by the Governor, such as Washington County, the City will consider whether curtailment measures are needed to meet system demands. Regardless of whether curtailment is needed, the City will encourage customers to conserve water.

# **Appendix M**

## **Tualatin Valley Water District Curtailment Plan**



## **Tualatin Valley Water District**

The Tualatin Valley Water District (District or TVWD) developed its water supply shortage plan to guide the Board of Commissioners and District staff in the event of a water shortage. Water supply shortage plans (i.e. 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, which may result from incidents such as: prolonged drought, equipment failure in the system, catastrophic events (e.g. flooding, landslides, earthquakes, and contamination), or events not under control of the water supplier (e.g., localized or area-wide power outages and intentional malevolent acts).

The District may undertake a variety of curtailment actions, depending on the time of year and the expected duration of any water supply shortage. Throughout any such shortage, the District will continue to pursue the following objectives:

- Maintain adequate volume of high-quality water supplies for all District customers.
- Provide clear customer communications and rapid customer service. Be consistent with public expectations based on information shared to date.
- Promote water use efficiency.
- Control costs that come with curtailed water use, such as losses in revenue, or higher-cost water supplies (e.g., the purchase of peaking water from the PWB or the lease of extra water from the JWC).
- Have an equitable impact on all users—public and private, urban and suburban, business and residential. Prioritize actions to have the least permanent negative impact.

## **History of System Curtailment Episodes**

*OAR 690-086-0160(1)*

### **Assessment of Water Shortages & Limitations**

In the past 10 years, the District has not implemented a curtailment stage beyond Stage 1: Summer Advisory, which it routinely implements every year during the summer (peak-demand) season. Nonetheless, the following is a description of earlier curtailment events that were Stage 2 or higher. These events prompted the District to develop an effective conservation program and to diversify its sources of supply.

#### **Drought**

Drought has been the principal cause of water shortages and resulting curtailment for the region in recent years.

### *1992 Drought Affecting the City of Portland*

During 1992, PWB and its wholesale customers, including the District, experienced severe water supply shortages for five reasons: (1) the Bull Run watershed, which serves the Portland metropolitan region, had experienced the lowest spring rainfall and stream flows since the year 1899; (2) demand for water during May and June of that year was unusually high due to record-breaking temperatures that occurred in the region; (3) reservoir levels were low, as is typical in the late summer months; (4) the PWB back-up source, the Columbia South Shore wellfield, was unavailable because of concern that a contamination plume would move into the well field aquifer if those wells were used; and (5) voluntary requests to reduce water use were not effective. (Similar shortages also occurred in 1952, 1987, and 1991.)

In response to the severe water supply shortage, the PWB implemented mandatory water restrictions to reduce water use during the peak season. The District, as a wholesale customer of the City of Portland, was subject to the curtailment measures declared by the PWB. In response, the District prepared an ordinance in July 1992, declaring a water source emergency and imposing mandatory water conservation on its customers. The ordinance prohibited lawn watering (except in the case of newly seeded or sodded lawns and parks), washing of hard surfaces such as sidewalks and parking lots, and car washing. Following a warning, penalties for ordinance violations ranged from \$100 for the first violation to \$500 for repeat violations. The District also purchased water from the JWC to partially offset the reduced supply from the PWB and lessen the severity of water curtailment measures. In addition, the District also activated its three emergency wells and obtained additional water supply from the City of Hillsboro via an emergency connection with that city.

In the aftermath, the District formed a conservation committee and designed and installed a demonstration garden to promote the efficient use of water through innovative landscape design, construction, and maintenance principles. Furthermore, it held landscaping workshops for customers, and participated in the conservation activities of the Columbia-Willamette Water Conservation Coalition, which later merged with the Regional Water Providers Consortium. In addition, the District purchased an ownership interest in the JWC, which provides access to additional water supply from multiple sources.

### *2001 Drought Affecting the JWC*

Refer to the JWC “History of System Curtailment Episodes” at the beginning of this section for a detailed description of this event. The District was able to meet its customers’ demands by purchasing additional water from the City of Portland, thereby avoiding the need to ask customers to curtail water usage. Although the District ultimately did not need to curtail water use, this event has been mentioned because it demonstrates the ability of water providers in the region to work cooperatively to avoid curtailment.

### **Other Events Resulting in Supply Deficiencies**

In addition to drought, numerous other events or conditions in the JWC’s and PWB’s sources of supply could cause the District to experience supply deficiencies. For example, water quality

problems in the PWB's Bull Run watershed could reduce supply available to the District. Other conditions that could cause supply deficiencies for the District include requirements of the Endangered Species Act that reduce access to Bull Run water supplies, contamination of the PWB or JWC's water supply sources, long-term interruptions in power supplies, breaks in major transmission lines, or damage to reservoirs as the result of earthquakes or other causes.

### **Planning for Future Events**

In the event of a future water shortage, the District plans to meet its customers' water needs by offsetting the reduced supply with water from another source, accessing its groundwater supply, utilizing emergency interconnections, and implementing curtailment.

## **Shortage Capability Assessment**

*OAR 690-086-0160 (1)*

As noted above, the District's current capacity limitations are primarily related to major disruptions in its JWC and PWB sources of supply occurring at the same time. Beyond this scenario, the District is well-positioned to meet its non-peak season customer demands for the following reasons (some of which were previously mentioned under the JWC curtailment plan):

- Additional finished water storage
  - Construction of a second JWC Fern Hill Reservoir in 2006. This added an additional 20 MG of finished water capacity to the system for a total of 40 MG.
  - The District consistently follows best management practices and stores three days of average day demand (ADD) in finished water storage in its local distribution system
- Installation of back-up electricity
  - The WTP in cooperation with PGE added a back-up power generator onsite in 2016
- Improvements to water quality treatment
  - The WTP added a powdered activated carbon (PAC) feeder in 2008 to improve treatment of organics
- Seismic reinforcement
  - The JWC's Fern Hill Reservoir 1, was seismically upgraded in 2006.
  - The construction of the second JWC Fern Hill Reservoir included seismic hardening and wrapping with rebar in 2007.
- Additional Water Sources
  - The District's additional source through PWB can reliably meet most all non-peak demands on a temporary basis.

- The District’s groundwater and ASR wells can reliably meet a portion of demand on a temporary basis.
- The District has interties with Beaverton, Hillsboro, PWB, and Tigard and can call on these entities for emergency supplies as needed.
- By 2026, the District will have access to the Willamette River through Permit S-54940.

## **Curtailment Event Triggers and Stages**

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

The District has adopted a four-stage curtailment plan to be invoked in the event of a water supply shortage. These stages are designed to be initiated and implemented in progressive steps. The plan includes both voluntary and mandatory rationing, depending upon the cause, severity, and anticipated duration of the shortage.

Exhibit 1 presents the four curtailment stages, as well as their initiating conditions (i.e. triggers). Curtailment could be initiated by any of the corresponding initiating conditions.

### **Exhibit 1. Curtailment Stages 1 through 4**

<b>Curtailment Stages</b>	<b>Initiating Conditions</b>
Stage 1: Routine Summer Advisory	<p>PWB issues a “notice of drawdown,” announcing the release of stored water in the Bull Run System.</p> <p>PWB activates groundwater wells as part of its supplies.</p> <p>Hagg Lake fails to fill 100 percent by May 1.</p> <p>Barney Reservoir fails to fill 100 percent by May 1.</p> <p>The JWC issues a “notice of drawdown,” announcing the release of stored water.</p>
Stage 2: Moderate Water Supply Shortage	<p>PWB is operating under a warm-dry scenario [see the example diagram below under Stage 2].</p> <p>Hagg Lake is filled to less than 80 percent before May 1.</p> <p>District customer use reaches contractual and/or facility capacity for seven consecutive days.</p>

<b>Curtailment Stages</b>	<b>Initiating Conditions</b>
Stage 3: Severe Water Supply Shortage	<p>PWB has only groundwater sources available.</p> <p>PWB cannot meet supply demands of wholesale customers.</p> <p>JWC reservoirs drop below 40 percent of “normal conditions”; under such circumstances JWC enacts mandatory curtailment for its members.</p> <p>Water supplies fail to meet U.S. Environmental Protection Agency Safe Drinking Water Act standards.</p> <p>The District’s distribution system experiences a significant and sustained reduction of water pressure.</p> <p>District customer use reaches contractual and/or facility capacity for 14 consecutive days.</p>
Stage 4: Critical Water Supply Shortage	<p>PWB offloads (i.e. ceases serving) the District from its system and JWC cannot meet the District’s resulting additional demands for water.</p> <p>JWC offloads the District from its system, and PWB supplies cannot meet the District’s resulting additional demands for water.</p> <p>Water supplies from the JWC or the PWB are either physically cut off or otherwise become unavailable.</p> <p>District customer use reaches contractual and/or facility capacity for 28 consecutive days.</p>

## Authority

The District’s Chief Executive Officer has the authority to enact the four stages of curtailment.

## Enforcement

District field staff will enforce mandatory curtailment measures, if necessary.

## Curtailment Plan Implementation

*OAR 690-086-0160(4)*

### Stage 1: Routine Summer Advisory

The District predicts that it will face Stage 1 curtailment initiating conditions each summer as warm dry weather settles into the region and drawdown of the reservoirs begins. Summer water use is much greater than winter use as a result of customers irrigating their landscapes, washing cars, and using water for cooling purposes.

#### Water Reduction Goal

The goal of Stage 1 curtailment is for each water user to strive to maintain, and not exceed, average summer usage levels.

#### Triggers (any of these)



Events causing the District to activate Stage 1 curtailment include:

- PWB issues a “notice of drawdown,” announcing the release of stored water in the Bull Run System.
- PWB activates groundwater wells as part of its supplies.
- The JWC issues a “notice of drawdown,” announcing the release of stored water.
- Hagg Lake fails to fill 100 percent by May 1. (Hagg Lake holds 53,000 acre-feet (17.3 billion gallons).)
- Barney Reservoir fails to fill 100 percent by May 1. (The holds 20,000 acre-feet (6.5 billion gallons).)

During Stage 1 curtailment, the District will implement the following curtailment actions, including providing public messages, taking identified possible actions and working with partner agencies.

*Public Message: Voluntary Conservation Measures*

- Each summer, the District asks its customers to voluntarily limit water application to 1-inch of water per week for turf areas and less for areas with trees and shrubs.
- The District promotes already-existing conservation messages, such as “Use Water Wisely!” Suggested water conservation measures are posted on the District’s Web site.

*Possible District Actions*

- Partner with Regional Water Providers Consortium and west side providers to send consistent conservation messages to the media.
- Place conservation reminders and tips in Water Words, bill message, and on the District’s Web site and conservation hotline. Use various venues to distribute information. Set up public information booths where opportunities exist and look for other opportunities for public outreach, such as speaking engagements, etc.

*Partners to Contact*

- Work with local agencies to coordinate resources and uniform messages for water customers, and to prepare, review and/or update local water ordinances regarding curtailment enforcement.

## **Stage 2: Moderate Water Supply Shortage**

Stage 2 curtailment may be a temporary condition lasting several days, such as a supply shortage caused by service interruptions in the region. During this time, the District may redirect supplies to areas experiencing shortages. Alternatively, Stage 2 curtailment may be an

intermediate stage in an ongoing water supply shortage, such as when regional reservoirs have begun “summer drawdown,” with no rain in the forecast.

### Water Reduction Goal

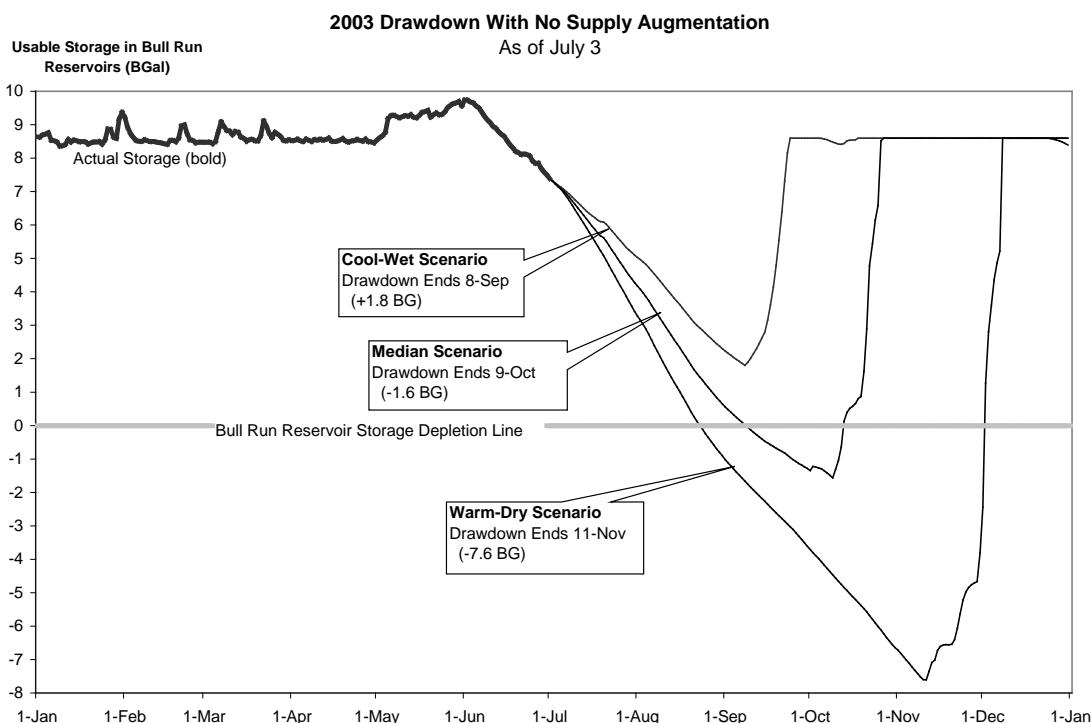
The goal of Stage 2 curtailment is to decrease overall daily water use by 10 percent. Voluntary curtailment use is intended to extend existing water supplies to last throughout the shortage.

### Triggers (any of these)

Events causing the District to activate Stage 2 curtailment include:

- PWB is operating under a warm-dry scenario [see Exhibit 2 for an example Reservoir drawdown scenario, which is updated by PWB officials each year].

### Exhibit 2. PWB Reservoir Drawdown Scenarios Example



- Hagg Lake fails to fill 80 percent before May 1, which equates to 42,400 acre-feet (or 13.8 billion gallons). The JWC will only make the full allotment available to municipal users if the lake fills to at least 80 percent.
- District customer use reaches contractual and/or facility capacity for seven consecutive days.

In the event of Stage 2 curtailment, the District would take the following curtailment actions.

### *Public Message: Voluntary Conservation Measures*

- The District will provide public messages that describe the following voluntary conservation measures:
- Reduce all water use by 10 percent (as a rule of thumb, for example, residential customers in a four-person single-family household should try to reduce their use by about 20 gallons per household per day during the winter and 27 gallons per household per day during the summer).
- Limit use of water in commercial businesses (e.g., do not serve water to restaurant customers unless specifically requested).
- Reduce watering of lawns, plants, trees, gardens, shrubbery, and flora on private or public property to the minimum necessary. Conduct outdoor watering during early morning hours to reduce evaporation (preferably between 4 and 8 a.m.; must conclude by 10 a.m.).
- Eliminate all other kinds of outdoor water use, including:
  - a. Washing down of hard surface areas, decks, buildings, gutters, and vehicles;
  - b. Use of water in fountains, reflection ponds, and decorative water bodies for aesthetic or scenic purposes, except where necessary to support aquatic life;
  - c. Filling or maintaining private swimming pools (except children's wading pools);
  - d. Use of fire hydrants for any purpose other than firefighting or flushing essential to maintain water quality.

### *Possible District Actions*

- Issue a notice to the local media that the District is in a Moderate Water Supply Shortage.
- Send postcard notification of Moderate Water Supply Shortage to District customers.
- Turn off automatic irrigation and water features in the District's Water Efficient Demonstration Garden.
- Provide reminders to non-efficient users (including customers who have been given a 30-day notice to repair one or more leaks and have failed to do so).
- Continue to encourage and educate customers to implement voluntary water conservation.
- Routinely publish in the Beaverton Valley Times, Hillsboro Argus, Tigard Times, and The Oregonian the voluntary conservation measures that the customers are requested to follow during a Moderate Water Shortage.
- Place reminder messages on in Water Words, in the bill messages and on the District Web site, as well as on billboards, signs, bus-sides, and movie theatre ads.

### *Partners to Contact*

- Contact potential institutional partners in water conservation, including local businesses that are the most affected (e.g. landscapers/green industry, commercial carwashes, nurseries, restaurants, water-intensive manufacturers, etc.).
- Ask cities and counties to postpone enforcement of regulations that require the use of water (landscape ordinances, etc.).
- Make conservation presentations to Homeowner Associations (HOAs) and Community Planning Organizations (CPOs).

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

Stage 3 curtailment occurs when customers still have time to prepare for and conserve water before a loss of service. Scenarios triggering Stage 3 curtailment include a protracted period of drought (similar to the drought of 1992) or multi-day disruption of service across sections of the District's service territory. Such scenarios may not affect both of the District's water sources equally.

#### **Water Reduction Goal**

The goal of Stage 3 curtailment is to decrease overall daily water use by 25 percent. Reduced water use will enable the District to re-direct unaffected water supplies without removing any customers from the system.

#### **Triggers (any of these)**

Events causing the District to activate Stage 3 curtailment include:

- PWB has only groundwater sources available.
- The PWB system cannot meet supply demands of wholesale customers.
- JWC reservoirs drop below 40 percent of "normal conditions" and JWC enacts mandatory curtailment for its members.
- Water supplies fail to meet U.S. Environmental Protection Agency Safe Drinking Water Act standards.
- The District's distribution system experiences a significant and sustained reduction of water pressure.
- District customer use reaches contractual and/or facility capacity for 14 consecutive days.

The District may take the following actions in the event Stage 3 curtailment is declared:

*Public Message: Mandatory Curtailment Measures*

The District will provide public messages that include the following:

- Water is in short supply.
- Reduce all water use by 25 percent (as a rule of thumb, for example, residential customers in a four-person single-family household should try to reduce their use by about 50 gallons per household per day during the winter and 70 gallons per household per day during the summer).
- The District will enforce its Water Supply Shortage Plan.
- Mandatory curtailment actions include:
  - a. Eliminate all outdoor water use, including:
    - a. Irrigation of established lawns (those at least six weeks old). Exceptions include commercial sod farms, high-use athletic fields that are used for organized play, and daycare providers. Residents may hand-irrigate ornamental plants, flowers, and vegetable gardens during early morning hours to reduce evaporation (preferably between 4:00 a.m. and 8:00 a.m.; must conclude by 10:00 a.m.);
    - b. Irrigation of golf courses. District water cannot be used to irrigate fairways or greens on golf courses. Hand watering of ornamental plants and flowers is permitted during early morning hours to reduce evaporation (preferably between 4:00 a.m. and 8:00 a.m.; must conclude by 10:00 a.m.);
    - c. Washing down of hard surface areas, decks, buildings, gutters, or vehicles. Wash-down is allowed for sanitary purposes only;
    - d. Use of water in ornamental fountains, reflection ponds, and decorative water bodies for aesthetic or scenic purposes, except where necessary to support aquatic life;
    - e. Filling or maintaining private swimming pools (except children's wading pools); and
    - f. Use of fire hydrants for any purpose other than firefighting or flushing essential to maintain water quality.
  - b. Prohibit chemical applications to lawns that require subsequent watering.
  - c. Limit expanding commercial nursery facilities, placing new irrigated agricultural land in production, or planting or landscaping except when required by the permitting jurisdiction.
  - d. Limit use of water in commercial businesses (e.g., do not serve water to restaurant customers unless specifically requested).
  - e. Repair leaks in hoses, faucets, and couplings.

### *Possible District Actions*

- Issue a statement that the District is experiencing a Severe Water Supply Shortage; notify the local media and send postcard notification to District customers.
- Turn off automatic irrigation and water features in the District's Water Efficient Demonstration Garden.
- Cease water service to customers who have been given a 30-day notice to repair one or more leaks and have failed to do so.
- Implement the enforcement provisions of District's Water Supply Shortage Plan.
- Routinely publish in the Beaverton Valley Times, Hillsboro Argus, Tigard Times, and The Oregonian the mandatory restrictions to be placed on the use of water supplied by the District.
- Through the media and public outreach efforts, including door hangers, publicize widely the penalties to be imposed for violations of mandatory restrictions and the procedures to be followed if a variance in the restrictions is requested.
- Place curtailment reminder messages on in Water Words, in the bill message and on the District Web site, as well as on billboards, bus-sides, TV, radio, and movie theatre ads.
- Provide and advertise a conservation hotline that provides relevant curtailment information, such as the reason for the curtailment and information to help customers comply with the curtailment stage policy.
- Update and mail a conservation brochure to customers.

### *Partners to Contact*

- Remind business, industrial, and government (B.I.G.) customers of any letters of cooperation that the District may have signed with them to prepare for Stage 4 curtailment situations.
- Send pre-drafted letter of intent to local jurisdictions (Portland, Tigard, Hillsboro, and Beaverton) to let them know the District plans to begin issuing fines to any of their residents who are not complying with the District's mandatory restrictions.
- Inform landscape/green industry (i.e. landscape and irrigation construction professionals, landscape maintenance service providers, landscape irrigation equipment vendors, the Oregon Landscape Contractors Association, and the Oregon Landscape Contractor's Board) of prohibitions on irrigation and chemical applications that require irrigation.
- Work with Tualatin Valley Parks and Recreation to suspend irrigation of parks where applicable.

- Work with local governments and homeowners associations to temporarily suspend regulations that require the use of water (landscape ordinances, etc.).

## **Stage 4: Critical Water Supply Shortage**

Stage 4 curtailment may be implemented in emergency conditions under which little or no water is flowing to customers (as in the case of natural disasters that result in sudden and acute water loss). It may be necessary for the District to proceed directly to Stage 4, or this stage may be the result of an extended period of time in which demand outstrips supply.

### **Water Reduction Goal**

The goal of Stage 4 curtailment is to decrease overall daily water use by 50 percent or more, and to protect safety, health, and economic livelihood.

### **Triggers (any of these)**

Events causing the District to activate Stage 4 curtailment include:

- Portland “offloads” (i.e. ceases serving) the District from its system and JWC cannot meet the District’s resulting demands for water.
- JWC “offloads” the District from its system, and the PWB cannot meet the District’s additional water demands.
- Water supplies from JWC or PWB are either physically cut off or otherwise become unavailable to the District.
- District customer use reaches contractual and/or facility capacity for 28 consecutive days.

### **Public Message: Mandatory Curtailment Measures**

The District will provide its customers with public messages about the following mandatory curtailment measures:

- Water may be used for drinking, cooking, and sanitation purposes only.
- Reduce all water use by 50 percent (as a rule of thumb, for example, residential customers in a four-person single-family household should try to reduce their use by about 100 gallons per household per day during the winter and 140 gallons per household per day during the summer).
- Eliminate use of water at construction sites.
- Enforcement of the District’s Water Supply Shortage Plan including issuance of fines.

### **Possible District Actions**

- Issue a statement that the District is experiencing a Critical Water Supply Shortage.

- Issue media releases.
- Continue to enforce Water Supply Shortage Plan with warnings, fines, and discontinued service if necessary.
- Place reminder messages in Water Words, in the bill message and on the District Web site, as well as on billboards, bus-sides, TV, radio, and movie theatre ads.
- Provide and advertise conservation hotline.
- If necessary, conduct the following emergency actions:
  - a. Activate the District's Emergency Operations Center (EOC).
  - b. Begin rationing water as needed.
  - c. Activate any curtailment agreements previously negotiated with B.I.G. customers.
  - d. Open interconnections with neighboring water suppliers.
  - e. Bring emergency wells on-line.
  - f. Declare emergency (per District Purchasing Policy) to allow suspension of the normal bidding process.
  - g. Place a moratorium on all new water service connections and new water main extensions. Provide notice to developers of the moratorium.
- Work with partners to distribute bottled water as needed.

#### **Partners to Contact**

- Ask Tualatin Valley Fire & Rescue Fire Marshal to issue statement banning burning or construction (because these activities are possible fire hazards).
- Notify CII customers of the District's intention to activate any previously agreed upon curtailment arrangements.
- Inform developers of the moratorium on all new water service connections and water main extensions.
- Notify and work with neighboring water providers.
- Activate partnerships with bottled water manufacturers, National Guard, Red Cross or other water distributors, if needed.

Contact the Washington County Office of Consolidated Emergency Management for additional resources, as needed.