Water Management and Conservation Plan

Prepared for

CITY OF LEBANON

It's easier from here.

Oregon

February 2016

Prepared by

GSI Water Solutions, Inc.

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

This page left blank intentionally.

Contents

Section **Page**

Exhibits

Section **Page**

This page left blank intentionally.

Executive Summary

The City of Lebanon (City), located in the heart of the Willamette Valley at the foothills of the Cascade Mountains, has been working diligently to sustainably manage the water supply for its growing community. To this end, the City has developed its first Water Management and Conservation Plan (WMCP, or Plan), which aims to guide development of water management and conservation programs and to promote sustainable water supply planning. This WMCP is required as a result of the Oregon Water Resources Department (OWRD) issuing a final order extending the development deadline for the City's surface water permit S-44389 (use of water from the South Santiam River) on August 18, 2011. The final order includes conditions stating that access to additional water under Permit S-44389 is contingent on a final order approving a WMCP and that the required WMCP must be submitted to the OWRD within 3 years of approval of the extension. In late June 2014, the City requested a new deadline of November 28, 2014 to submit its WMCP, which OWRD approved. In early October 2014, the City then requested to extend the WMCP submission deadline to November 27, 2015 to enable the City to collect additional data that it believed would more accurately reflect its water consumption following the discovery of meter reading discrepancies. OWRD approved the City's request.

This WMCP contains five sections that describe the City's water supply, water management and conservation programs, water curtailment plan, and water supply projections and plans.

Municipal Water Supplier Description

The South Santiam River is the City's sole source of municipal drinking water supply. The City holds three water rights for municipal use of water from the South Santiam River: Former Certificate 90287, which is currently evidenced by transfer T-12091, for the use of up to 10.0 cfs; Former Certificate 49385, which is currently evidenced by transfer T-12091, for the use of up to 9.0 cfs; and Permit S-44389, which has a pending permit amendment (Permit Amendment T-12090) to add a point of diversion downstream, for the use of up to 18.0 cfs.

The City obtains water from the South Santiam River through an intake on the Albany-Santiam Canal, which is approximately 3.5 miles downstream of the canal headworks on the South Santiam River. The Albany-Santiam Diversion Dam, Headworks, and Canal are owned and operated by the City of Albany. The Cities of Lebanon and Albany have an intergovernmental agreement that requires the City of Lebanon to pay the City of Albany an annual sum for water delivery and associated canal operation and maintenance. The City current delivers water to customers within its city limits and in a small neighborhood outside city limits.

The City's total estimated water delivery area population is 15,873, which consists of an estimated in-city population of 15,740 plus an estimated population of 133 in the small neighborhood outside of city limits. From 2008 through 2014, the City's annual demand averaged 749.3 million gallons (MG) and the highest maximum day demand was 3.94 mgd in 2013. Demand refers to the quantity of finished water delivered to the water distribution system from the water treatment plant. Annual demand decreased from 2008 through 2011 (likely due to the substantial annual water rate increases that began in 2008 combined with the economic downturn) and then increased to reach the highest demand during the six-year period of 835.3 MG in 2014 (likely reflecting the rebounding economy).

The City has three water customer categories: residential, commercial/industrial, and municipal. In 2014, residential water use represented 85.5 percent of total consumption, while commercial/industrial water use represented 13.8 percent, and municipal water use represented 0.6 percent. Consumption refers to the portion of water use that is metered. Annual consumption decreased incrementally from 2008 through 2013, likely due to the previously described annual water rate increases and the economic downturn, and then increased in 2014.

The City then calculated the difference between the finished water demand and metered water consumption plus unmetered authorized water usage (e.g. water used for firefighting and training, flushing of water system components by City staff, and private construction projects and public works projects) to determine its unaccounted-for water. Unaccounted-for water represents the sum of system leakage, overflows, evaporation, inaccuracies of measurement at the production or customer meters, and unmetered unauthorized uses. The City's unaccounted-for water was 38.0 percent in 2014 and averaged 32.3 percent from 2008 through 2014.

In 2014 and 2015, the City investigated several possible causes of its unaccounted-for water, which included meter reading errors by the City's private contractor, problems with the City's billing software, inaccurate production meter readings at the water treatment plant (WTP), and issues with the City's copper water service lines. City staff took over the meter reading responsibility in July 2014 in response to the discovery of discrepancies in meter reading records taken by a private contractor, but monthly water audits since September 2014 did not produce the anticipated significant decrease in unaccounted-for water. The City also concluded that billing software problems do not significantly contribute to unaccounted-for water after conducting a thorough analysis of its billing software. The City ruled out master meter inaccuracies as a contributing factor to unaccounted-for water after calibration of the master meters in September 2014 indicated that the meters provide accurate readings.

The City ultimately determined that a large portion of the City's unaccounted-for water was resulting from leaks in copper water service lines. Following the discovery of two substantial leaks in the copper water lines, the City decided to conduct a leak detection study. The leak detection study found 97 leaks responsible for an estimated water loss of 65.1 MG to 96.6 MG annually. Without this estimated volume of water loss, the City's unaccounted-for water in 2014 could have been as low as 18.7 percent. The City immediately began addressing the leaks after receiving the findings of the leak detection study. The City has found that the study underestimated water losses from some of the leaks and also suspects that it did not identify all of the leaks in the system. Consequently, the City will be conducting more in-depth leak detection efforts, particularly in copper water lines.

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

Water Conservation

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

- The City is currently in the process of replacing all residential, commercial, and industrial meters with touch read meters. Thus far, the City has replaced approximately 35 percent of the meters needing replacement.
- The City completed a leak detection study in May 2015 and immediately began addressing identified leaks.
- The City has switched from using copper water service line to a PEX Poly water service line. This will reduce the amount of water service line leaks.
- The City began to substantially increase water rates in 2008, which has both raised capital for a new WTP and motivated customers to reduce water consumption.
- The City uses approximately 53.8 MG of treated effluent per year for non-potable uses at the Wastewater Treatment Plant (WWTP) instead of potable, finished water from the WTP.
- The City's Web site has links to Web sites with comprehensive information about indoor and outdoor water conservation.

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

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

Conservation Program	Five-year Benchmarks
Annual Water Audit	• In the next five years, the City will continue to conduct annual water audits. • The City will continue to investigate possible causes of its unaccounted-for water. • In the next five years, the City will evaluate whether to use some type of industry-recognized water audit method.
System-wide Metering	• The City will continue to require meters on all new connections.
Meter Testing and Maintenance	• In the next five years, the City will complete the replacement of all residential, commercial, and industrial meters with touch read meters. The City will continue to regularly test and calibrate the raw water meter and finished water meter at the WTP.
Water Rate Structure and Billing Practices that Encourage Conservation	• The City will continue to bill customers based, in part, on the quantity of water metered at the service connection. • The City will continue to bill customers monthly and based on the quantity of water metered at the service connection. In the next 5 years, the City will begin to regularly add water conservation messages to a section of its bills dedicated to announcements.
Leak Detection	• The City will continue its large diameter water main replacement program. • The City will continue to routinely observe and inspect its waterlines and to promptly repair any detected leaks. • The City will immediately begin paying particular attention to residential copper service lines during its routine observations and inspections. • In 2017, the City will conduct more in-depth leak detection efforts, particularly in the copper service lines.
Public Education	• In the next five years, the City will update and expand its Web site content about water conservation, covering such topics as indoor water conservation, outdoor water conservation, leak detection, and xeriscaping. • In the next five years, the City will begin offering water conservation brochures on the aforementioned Web site topics in its billing office, as well. • In the next five years, the City will provide water conservation information at a minimum of one public event each year, where the City will provide brochures and free water-efficient fixtures, such as showerheads and faucet aerators. The City's goal is to distribute up to 500 water conservation brochures at the event.

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

Conservation Program	Five-year Benchmarks
Technical and Financial Assistance	• In the next five years, the City will make free lawn watering gauges available to customers at its billing office to encourage water conservation that will help reduce demand in the peak summer season. These lawn watering gauges will be advertised on the City Web site and in customer bills.
Supplier Financed Retrofit or Replacement of Inefficient Fixtures	• In the next five years, the City will make free low-flow showerheads and low-flow faucet aerators available to customers at its billing office to encourage year-round indoor water conservation. These fixtures will be advertised on the City Web site and in customer bills.
Water Reuse, Recycling, and Non-potable Opportunities	• The City will continue to use treated effluent for non-potable uses at the WWTP. • In the next five years, the City will meet with five commercial/industrial customers to discuss water reuse, recycling, and non-potable water use opportunities. In the next five years, the City will meet with the City's Parks Department and Maintenance Operations Department to discuss water reuse, recycling, and non-potable water opportunities, as well. The City will then conduct cost-benefit analyses on potentially feasible opportunities identified during these discussions.

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

Water Curtailment

Water curtailment plans outline proactive measures that water suppliers may take during short-term water supply shortages. The City has adopted a four-stage water curtailment plan that it will implement in the event of a water supply shortage that requires water curtailment. The four stages of curtailment are intended to be implemented in progressive steps based on the severity of the water shortage, but a later stage could be implemented directly. The curtailment plan includes both voluntary and mandatory rationing. The initiating conditions (i.e. triggers) for the City's curtailment stages focus on reservoir water levels, damage that the water system may incur, issues with components of the water system, water supply contamination, and weather conditions.

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

- **Stage 1: Water Supply Shortage Warning**

  The City may request that its customers take the following voluntary actions:
  - Decrease indoor and outdoor water use by 10 percent.
  - Postpone new plantings.
  - Limit outdoor watering times to before 9 am or after 9 pm.

- **Stage 2: Moderate Water Supply Shortage**

  The City will institute one or more of the following voluntary or mandatory actions to curtail water use:

  - Voluntarily cease washing vehicles, except at a commercial washing facility.
  - Voluntarily cease washing outdoor surfaces.
  - Restrict watering lawns, ornamental/landscaping plants, and vegetable gardens to 3 days per week and only before 9 am or after 9 pm.

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

  The City will require that customers implement of one or more the following mandatory actions to curtail water use:

  - Cease washing outdoor surfaces (e.g. sidewalks, parking lots, driveways, and buildings).
  - No watering of lawns, but customers may hand-irrigate ornamental/landscaping plants and vegetable gardens before 9 am or after 9 pm
  - Cease non-essential water use in commercial/industrial establishments.

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

  The City will require that customers implement one or more of the following mandatory actions to curtail water use:

  - Restrict indoor water use to only water uses essential for public health and safety.
  - Prohibit outdoor watering.
  - Prohibit water use in commercial/industrial establishments except for critical functions, such as fire protection

The City will communicate stages of curtailment and the associated voluntary and/or mandatory conservation measures through its Web site and a formal press release to the local newspaper, local radio stations, the Chamber of Commerce, and/or several other organizations included in typical press releases. The City also has a "Flash Alert" emergency communication system designed to alert citizens of Stage 4 emergencies by phone.

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

Water Supply

WMCPs must provide 10-year and 20-year population and water demand projections. The City's population and demand projections for 2025 and 2035 are based on the methods used to develop projections in the City's 2007 Water System Master Plan (WSMP). The projected populations are 19,158 in 2025 and 22,731 in 2035.

To estimate the City's future water demands, a per capita maximum day demand (MDD) was calculated. The per capita MDD was applied to the projected populations for 2025 and 2035. For planning purposes, the City also developed demand projections with a weather allowance (to address the potential for variations in the MDD), industrial allowance (to allow for a new industrial or major commercial water use), 5 percent conservation, and a combination of these

scenarios. **Exhibit ES-2** presents the City's projected population and demand projections with and without these allowances. By 2035, the City's projected MDDs with the weather allowance and the industrial allowance are 9.7 cfs (6.3 mgd) and 12.2 cfs (7.9 mgd), respectively. The City's projected MDDs with 5 percent conservation plus the weather allowance and with 5 percent conservation plus the industrial allowance are 9.3 cfs and 11.8 cfs, respectively.

Exhibit ES-2. Projected Populations and Demands.

Year	Projected Population	MDD (cfs)	MDD + 0.62 cfs Weather Allowance (cfs)	MDD + 3.1 cfs Industrial Allowance (cfs)	MDD + 5 percent Conservation (cfs)	MDD + 5 percent Conservation + 0.62 cfs Weather Allowance (cfs)	MDD + 5 percent Conservation + 3.1 cfs Industrial Allowance (cfs)
2025	19,158	7.7	8.3	10.8	7.3	7.9	10.4
2035	22,731	9.1	9.7	12.2	8.7	9.3	11.8

The City will meet these projected demands using its existing water rights.

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

This page left blank intentionally.

SECTION 1

Municipal Water Supplier Plan

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

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

Introduction

The City of Lebanon, founded in 1878, is a bustling town located in the heart of the Willamette Valley at the foothills of the Cascade Mountains. Its mission is "to provide exceptional services and opportunities that enhance the quality of life for present and future members of the community." The City recognizes that a sustainably managed, high-quality water supply is essential to achieving that mission.

The purpose of this Water Management and Conservation Plan (WMCP, or Plan) is to guide development of water management and conservation programs that ensure sustainable water use and to consider the City's future water needs. The goal in preparing this WMCP is to establish a working document that will have a positive effect on the City's water planning in future years.

Plan Requirement

This is the City's first WMCP. On August 18, 2011, the Oregon Water Resources Department (OWRD) issued a final order extending the development deadline for the City's surface water permit S-44389 (use of water from the South Santiam River). The final order includes conditions stating that access to additional water under Permit S-44389 is contingent on a final order approving a WMCP and that the required WMCP must be submitted to the OWRD within 3 years of approval of the extension. In late June 2014, the City requested a new deadline of November 28, 2014 to submit its WMCP, which OWRD approved on June 27, 2014. In early October 2014, the City requested to extend the deadline for submission of its WMCP to November 27, 2015 after a review of consumption data revealed discrepancies in the meter readings, which the City believed resulted in inaccurate unaccounted-for water calculations. The City wanted time to collect additional data that it believed would more accurately reflect its water consumption. OWRD approved the new deadline of November 27, 2015 on October 22, 2014.

This WMCP meets all of the requirements of the Oregon Administrative Rules (OAR) adopted by the Water Resources Commission in November 2002 (OAR Chapter 690, Division 86) regarding WMCPs.

Plan Organization

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

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

Section 2 is a self-evaluation of the City's water supply, water use, water rights, and water system. The later sections use information from Section 2 to consider how the City can improve its water management and conservation efforts.

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

- City of Lebanon Water Master Plan [CH2MHill, 2007]
- City of Lebanon Public Works staff
- Portland State University Population Research Center
- Oregon Water Resources Department (OWRD)

Affected Governments
OAR 690-086-0125(5)

The following local governments may be affected by this WMCP:

- City of Lebanon
- Linn County

In addition, the City provided the City of Albany with a copy of the draft plan as a courtesy.

Thirty days before submitting this WMCP to OWRD, the City made the draft WMCP available for review by each affected local government listed above along with a request for comments relating to consistency with the local government's comprehensive land use plan. The letters requesting comment and any comments received are in **Appendix A**.

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

The City anticipates submitting an update of this WMCP within 10 years of the final order approving this WMCP. As required by OAR Chapter 690, Division 86, a progress report will be submitted within 5 years of the final order.

Time Extension
OAR 690-086-0125(7)

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

SECTION 2

Water Supplier Description

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

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

Water Sources
OAR 690-086-0140(1)

The City's sole source of municipal drinking water supply is the South Santiam River. The City obtains water from the South Santiam River through an intake on the Albany-Santiam Canal, which is approximately 3.5 miles downstream of the canal headworks on the South Santiam River. The Albany-Santiam Diversion Dam, Headworks, and Canal are owned and operated by the City of Albany. The Cities of Lebanon and Albany have an intergovernmental agreement that requires the City of Lebanon to pay the City of Albany an annual sum for water delivery and associated canal operation and maintenance. The City of Albany diverts water from the South Santiam River into the Albany-Santiam Canal using the Albany-Santiam Diversion Dam, a 450 feet long concrete gravity weir section dam located at approximately River Mile 20.8. The dam has gates that are regulated to maintain the desired pool elevation up to 28 inches above the fixed concrete cap and includes two state-of-the art fishways (i.e. left and right bank fish ladders). The Albany-Santiam Canal is an open channel diversion from the South Santiam River located about 300 feet upstream of the dam. Diverted flows pass through a trash/debris rack and then through a fish screen. Instrumentation includes automated controls, gauges, and sensors that continuously transmit Albany-Santiam Canal level data to the City of Albany's WTP.

The City also has a well not connected to the municipal water supply system that it uses to irrigate 5.5 acres.

Interconnections with Other Systems
OAR 690-086-0140(7)

The City has no interconnections with other municipal water supply systems.

Intergovernmental Agreements
OAR 690-086-0140(1)

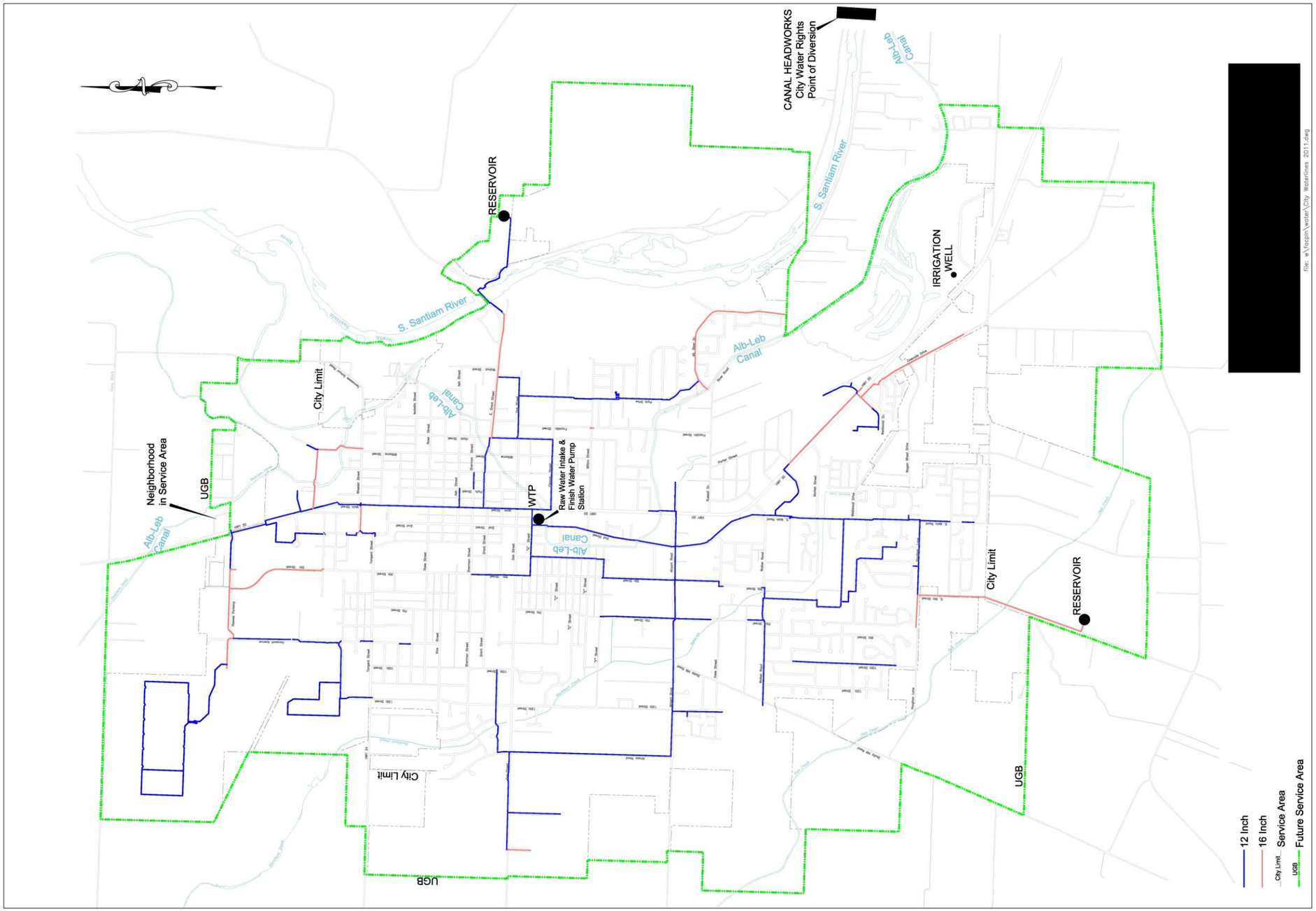
The City of Lebanon has an intergovernmental agreement with the City of Albany related to the operation and maintenance of the Albany-Santiam Canal. The agreement is automatically renewed every five years.

Service Area Description and Population

OAR 690-086-0140(2)

The City's current water delivery area is the area within its city limits plus a small neighborhood outside city limits, as shown in **Exhibit 2-1**. The City's estimated population inside city limits was 15,740 in 2014, which is based on Portland State University's Population Research Center population estimates for the City. The City estimates that the population of the small neighborhood outside of city limits is 133 based on the number of service connections (51) and an estimated 2.60 persons per single-family dwelling (Water System Master Plan, 2007). Therefore, the City's total estimated water delivery area population is 15,873.

Exhibit 2-1. Water Delivery Area Map and System Schematic.



This page left blank intentionally.

Records of Water Use
OAR 690-086-0140(4) and (9)

Terminology

Demand refers to the quantity of water delivered to the water distribution system from the water treatment plant (WTP). Demand includes metered consumption, unmetered uses, and water lost to leakage, reservoir overflow, and evaporation. For the purposes of this WMCP, the terms demand and production are synonymous. Consumption refers to the portion of water use that is metered. Generally, demand and consumption in municipal systems are expressed in units of million gallons per day (mgd). They may also be expressed in cubic feet per second (cfs) or gallons per minute (gpm). One mgd is equivalent to 1.55 cfs or 694 gpm. For annual or monthly values, a quantity of water is typically reported in million gallons (MG). Water use per person (per capita use) is expressed in gallons per person (per capita) per day (gpcd).

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

- Average day demand (ADD) equals the total annual system demand divided by 365 days.
- Maximum day demand (MDD) equals the highest system demand that occurs on any single day during a calendar year. It is also called the one-day MDD.
- Maximum monthly demand (MMD) in MG equals the highest total monthly demand of the 12 months of a calendar year. MMD in mgd equals the average day demand of the one month with the highest total demand of the 12 months of a calendar year.
- Peaking factors are the ratios of one demand value to another. The most common and important peaking factor is the ratio of the MDD to the ADD.

Historical Water Demands

Annual and Daily Demands

Exhibit 2-2 summarizes the City's finished water demands from 2008 through 2014. The water demand data are based on data from the finished water meter at the WTP.

Exhibit 2-2. Historical Annual Finished Water Demand, Average Day Demand, Maximum Day Demand, and Maximum Month Demand, 2008-2014.

Year	Annual Demand (MG)	ADD (mgd)	MDD (mgd)	Peaking Factor (MDD: ADD)	MMD (mgd)	MMD (MG)
2008	759.7	2.08	3.82	1.8	3.21	99.6
2009	713.5	1.95	3.66	1.9	2.86	88.8
2010	702.0	1.92	3.40	1.8	2.94	91.0
2011	678.2	1.86	3.16	1.7	2.73	84.6
2012	738.0	2.02	3.36	1.7	2.95	91.3
2013	818.1	2.24	3.94	1.8	3.19	98.9
2014	835.3	2.29	3.81	1.7	3.19	98.8
Average	749.3	2.05	3.59	1.8	3.01	93.3
Highest	835.3	2.29	3.94	1.9	3.21	99.6

As shown in **Exhibit 2-2** and **Exhibit 2-3**, the City's annual demand decreased from 2008 through 2011 then increased to reach the highest demand during the six-year period of 835.3 MG in 2014. The decrease in demand through 2011 is likely related to the beginning of substantial annual water rate increases and the economic downturn during that time period. The subsequent increase in demand likely reflects the rebounding economy.

Exhibit 2-3. Annual Demand (MG), 2008-2014.

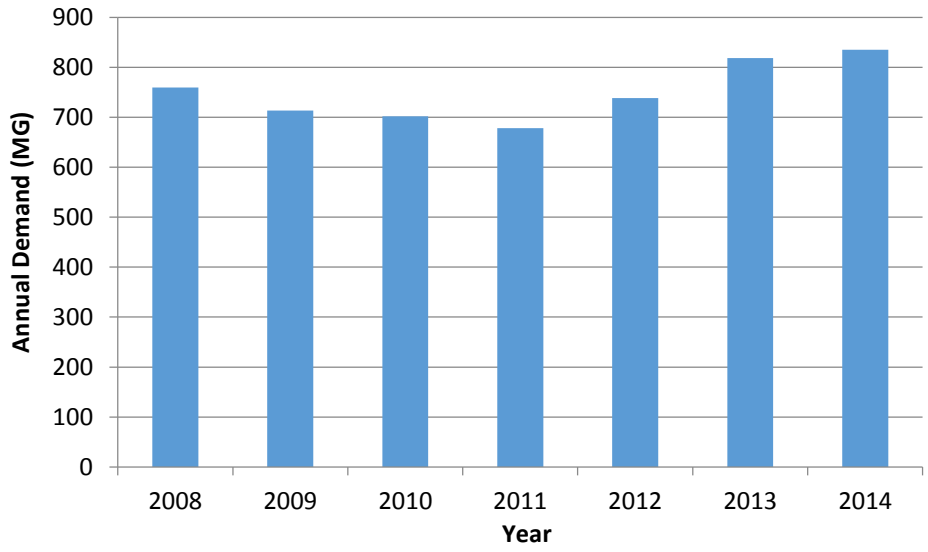
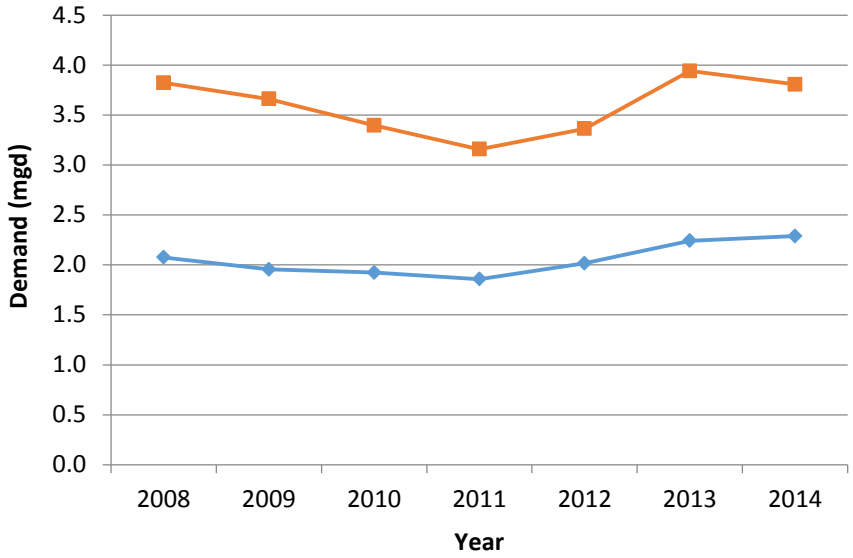


Exhibit 2-2 and 2-4 revealed that ADD and MDD had trends similar to annual demand. From 2008 through 2014, ADD ranged from 1.86 mgd to 2.29 mgd and the greatest MDD was 3.94 mgd in 2013.

Exhibit 2-4. Average Day Demand (ADD) and Maximum Day Demand (MDD), 2008-2014.



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

Weather patterns and economic conditions strongly influence MDD. Particularly hot and/or dry weather can result in more outdoor irrigation, thereby increasing MDD. Weather patterns that can cause fluctuations in MDD from year to year include: maximum temperatures, the number of consecutive days with high temperatures, the timing of high temperatures in the summer, total rainfall levels during the summer, and consecutive days without rainfall. The economy can affect MDD by influencing customers spending on irrigation, the building of new homes with landscapes needing intense irrigation for plant establishment, and the opening or closing of facilities that use water in their operations.

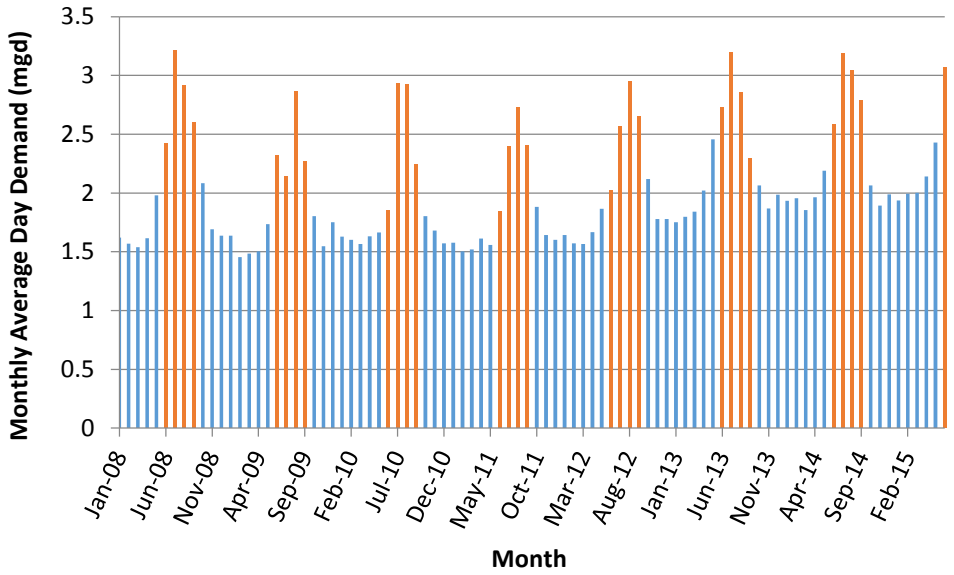
Peaking Factors

Peaking factors are the ratios of one demand value to another. The most common peaking factor is the ratio of the MDD to the ADD. This ratio often is used for estimating peak demands when only ADDs are known or measured, as well as for hydraulic modeling of the system and demand forecasting. The City's MDD to ADD peaking factor ranged from 1.7 to 1.9 and averaged 1.8 from 2008 through 2014. The City's average peaking factor is similar to other water providers in the mid-Willamette Valley, such as the City of Corvallis (averaged 2.1 from 2005 to 2009) and the City of Salem (averaged 1.7 from Fiscal Year 2007-2008 to Fiscal Year 2011-2012).

Monthly Demand

From 2008 through 2014, the City's average maximum month demand volume was 93.3 MG, as shown in **Exhibit 2-2**. During this period, the MMD occurred once in June and three times each in July and August. **Exhibit 2-5** illustrates monthly ADD from 2008 through 2014, with the peak season months of June through September shown in orange. The highest monthly ADD was 3.21 mgd in July 2008.

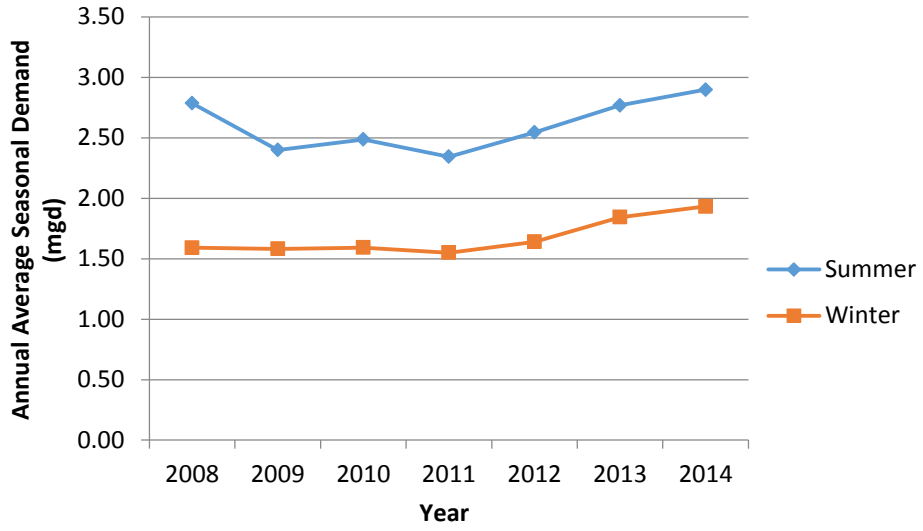
Exhibit 2-5. Monthly Average Day Demand (mgd), 2008-2014. Orange indicates peak season months (June through September) while blue indicates non-peak season months.



Seasonal Demand

Exhibit 2-6 shows that Summer (June through September) ADD ranged from 2.34 mgd to 2.90 mgd and Winter (December through March) ADD ranged from 1.55 mgd to 1.93 mgd from 2008 through 2014. During this period, the average of the City's ADD in the summer was 1.6 times greater than the average of the City's ADD in the winter, primarily reflecting the increase in water demand for irrigation.

Exhibit 2-6. Historical Seasonal Demand (mgd), 2008-2014.
Summer = June to September. Winter = December to March.



Customer Characteristics and Use Patterns
OAR 690-086-0140(6)

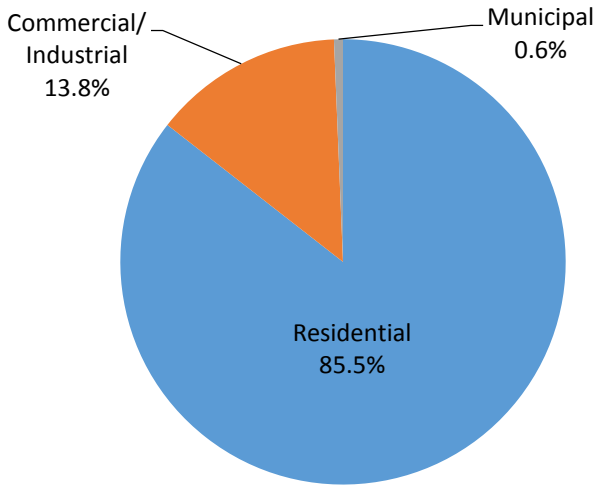
Customer Description

The City divides its customers into three customer categories: residential, commercial/industrial, and municipal. Residential includes single family residences and multi-family residences, such as apartments and senior living facilities. As shown in **Exhibit 2-7**, the total number of customer accounts increased by nearly 250 accounts from 2008 through 2014. **Exhibit 2-8** shows that residential customers represented 85.5 percent of the accounts.

Exhibit 2-7. Number of Accounts by Customer Category, 2008-2014.

Year	Residential	Commercial/ Industrial	Municipal	Total
2008	4569	707	39	5315
2009	4586	722	40	5348
2010	4592	730	39	5361
2011	4626	746	41	5413
2012	4722	749	38	5509
2013	4719	770	36	5525
2014	4757	768	36	5561

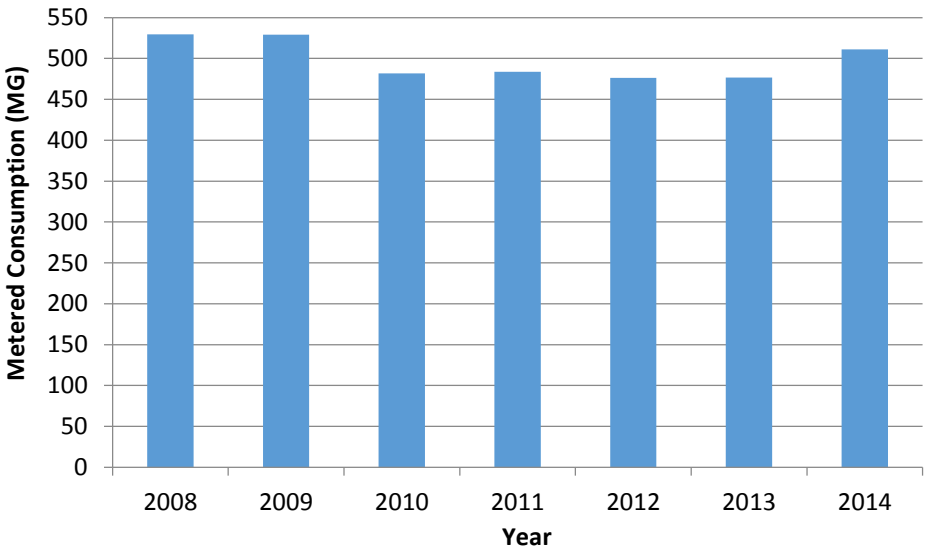
Exhibit 2-8. Percentage of Accounts by Customer Category, 2014.



Annual Consumption

Exhibit 2-9 shows that total annual consumption decreased incrementally from 529 MG in 2008 and 2009 to 477 MG in 2013 then increased to 511 MG in 2014. The reduction in water use after 2009 is likely the result of the substantial annual water rate increases that began 2008, as well as the economic downturn.

Exhibit 2-9. Annual Water Use, 2008-2014.



As shown in **Exhibit 2-10,** the residential customer category consistently consumed the most water during the period 2008 through 2014. Residential consumption has generally decreased after 2009, while commercial/industrial and municipal water uses have fluctuated. Commercial/industrial consumption was nearly as great as residential consumption in 2014.

Exhibit 2-10. Annual Water Use by Customer Category, 2008-2014.

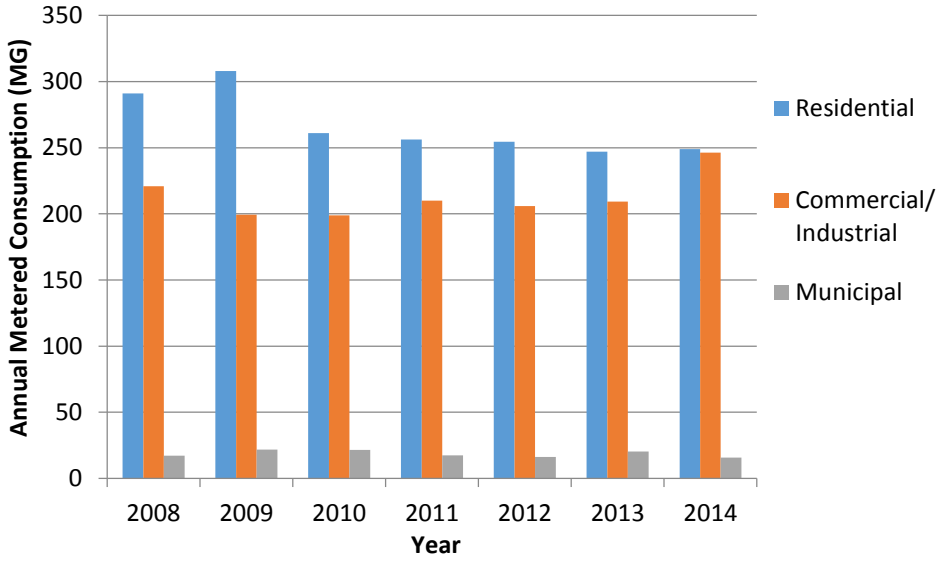
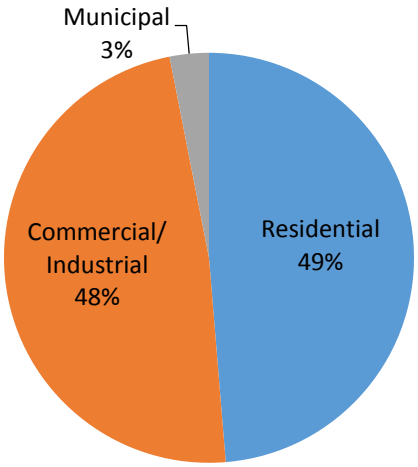


Exhibit 2-11 illustrates that residential customers consumed slightly more than half of the water while commercial/industrial customers consumed nearly all of the remaining water.

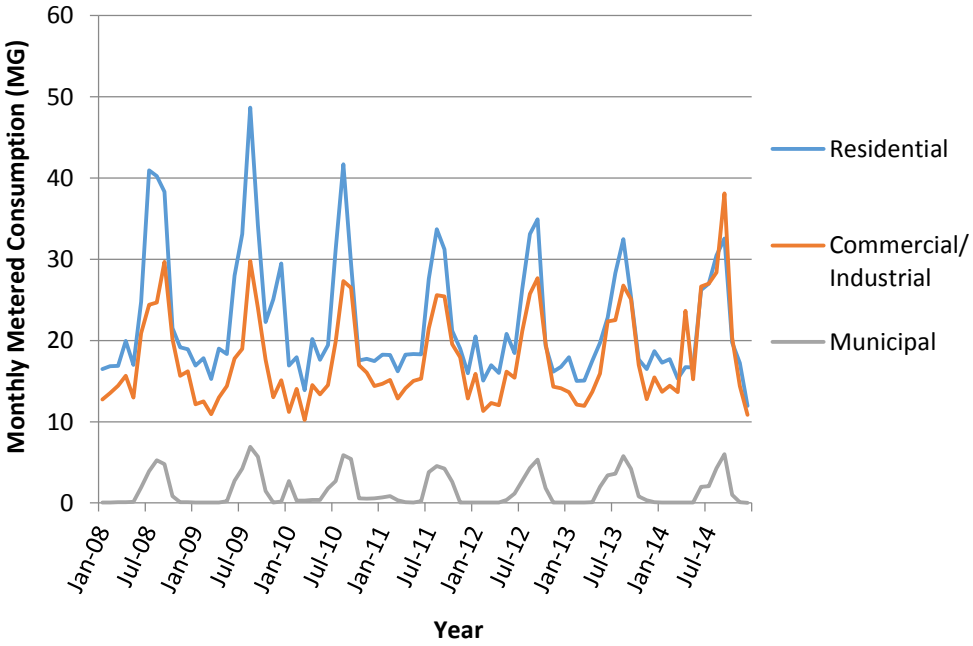
Exhibit 2-11. Percent Annual Water Use by Customer Category, 2014.



Monthly Consumption

As shown in **Exhibit 2-12**, water use by all customer categories from 2008 through 2014 increased sharply in the summer months, a typical pattern among municipalities that is attributed to outdoor watering. This pattern indicates that water conservation efforts targeting outdoor water uses in the summer months would produce notable water savings. **Exhibit 2-12** also shows the increase in commercial/industrial consumption in 2014, which exceeded residential consumption during the summer months.

Exhibit 2-12. Monthly Metered Consumption by Customer Category, 2008-2014.

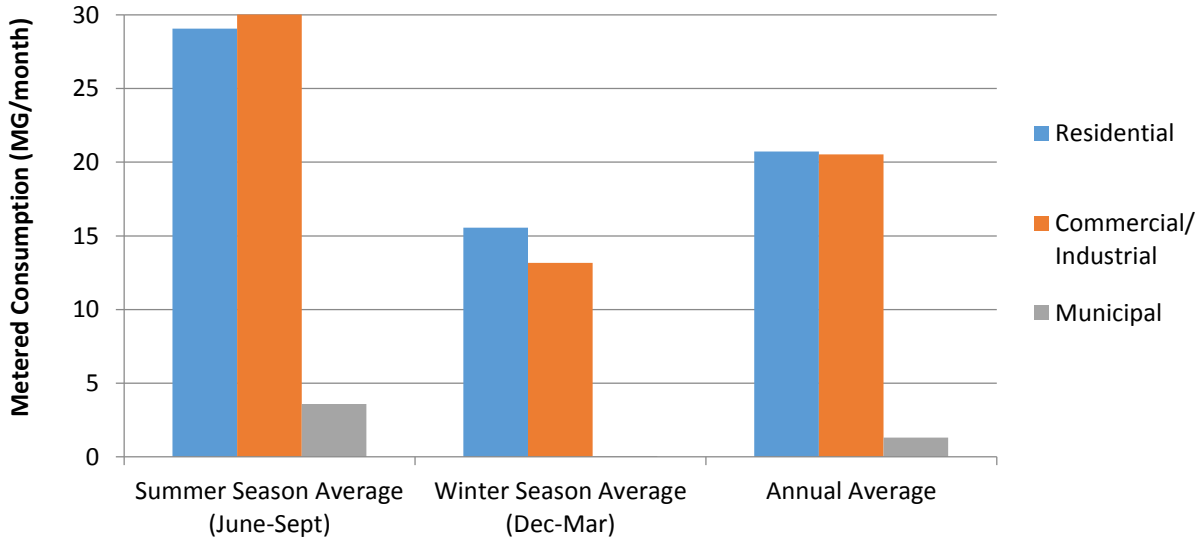


Seasonal Consumption

Exhibit 2-13 shows the City's average monthly consumption by season and customer category in 2014. The total average monthly consumption for the summer months was 62.7 MG per month and for the winter months was 28.8 MG per month, resulting in a summer season to winter season ratio of approximately 2.2 (62.7/28.8 = 2.2). The summer to winter ratio of 2.2 is within the typical range for utilities in the Willamette Valley.

The summer season to winter season ratios for residential and commercial/industrial customers were 1.9 and 2.3, respectively. The ratio for municipal customers was very high, reflecting the large amount of water used to irrigate city parks. However, municipal consumption only represents a small percentage of total consumption, such that water conservation efforts targeting municipal irrigation would produce some water savings, but not nearly as much as efforts targeting the other customer categories.

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



Residential Per Capita Consumption

The City's residential per capita demand, expressed in gallons per capita per day (gpcd), was estimated based on the annual per capita demand in 2014, the proportion of residential consumption, and the percentage of residential accounts. The City's annual per capita demand in 2014 was estimated to be 144 gpcd, based on an annual demand of 835.3 MG and a population of 15,873. Billing data showed that residential use represented approximately 49 percent of the total metered consumption in 2014. Based on the number of residential accounts in 2014 (4,757 accounts) and the estimated occupancy of 2.38 people per residence (estimated people per household per mixed density residential zoning; Water System Master Plan, 2007), the residential population was approximately 71 percent of the total population in 2014. The following shows how residential per capita in 2014 was estimated:

Residential average daily per capita demand = (0.49 *144 gpcd)/0.71 = 99 gpcd.

In 2014, the City's residential per capita consumption was 99 gpcd. For comparison, the City of Corvallis had single-family per capita demand of 107 gpcd (City of Corvallis WMCP, 2012).

Largest Water Users

As shown in **Exhibit 2-14**, the City's 10 largest water users in 2014 used 94.1 MG, which represented 11.5 percent of the 818.1 MG of total consumption that year. Of these water users, five are Commercial/Industrial customers, four are residential customers, and one is a Municipal account that serves River Park, the City's largest and most popular park.

Exhibit 2-14. Largest Water Users, 2013.

Customer Category	Annual Consumption (MG)	Percent of Annual Consumption (%)
Commercial/Industrial	52.1	6.4
Commercial/Industrial	10.2	1.3
Commercial/Industrial	6.8	0.8
Residential	4.5	0.5
Municipal	4.2	0.5
Residential	3.9	0.5
Residential	3.6	0.4
Commercial/Industrial	3.1	0.4
Commercial/Industrial	3.0	0.4
Residential	2.7	0.3
Total	94.1	11.5

Water Losses and Non-Revenue Water

OAR 690-086-0140(9)

The City's unaccounted-for water was 38.0 percent in 2014 and averaged 32.3 percent from 2008 through 2014, as shown in **Exhibit 2-15**. The City calculated its unaccounted-for water as the difference between the finished water demand and metered water consumption plus unmetered authorized water usage. Unmetered authorized uses (which are estimated by City staff) include water used by the fire department for firefighting and training, flushing of water system components by City staff, and water used for private construction projects and public works projects.

Exhibit 2-15. Unaccounted-for Water, 2008-2014.

Year	Annual Finished Water Demand (MG)	Annual Metered Consumption (MG)	Estimated Unmetered Water Use (MG)	Unaccounted-for Water (MG)	Unaccounted-for Water (%)
2008	759.7	529.3	5.8	224.6	29.6
2009	713.5	529.0	7.3	177.1	24.8
2010	702.0	481.6	6.6	213.8	30.5
2011	678.2	483.7	6.7	187.7	27.7
2012	738.0	476.4	6.6	255.0	34.5
2013	818.1	476.7	6.6	334.8	40.9
2014	835.3	510.98	6.6	317.7	38.0
Average				244.4	32.3

In 2014 and 2015, the City invested substantial resources to investigate possible causes of its unaccounted-for water, which included meter reading errors by the City's private contractor, problems with the City's billing software, inaccurate production meter readings at the WTP, and issues with the City's copper water service lines.

The City suspected that errors in meter reading by the private contractor were contributing to unaccounted-for water after discovering discrepancies in meter reading records. In an effort to obtain more reliable and consistent meter reading data, as well as to reduce meter reading costs, City staff took over the meter reading responsibility in July 2014. However, monthly water audits since September 2014 have not revealed a significant decrease in unaccounted-for water.

The City also evaluated whether there were problems with its billing software following a 2012 upgrade after it found some months with inexplicably high water use. After further analysis, however, the City concluded, that billing software problems do not significantly contributes to unaccounted-for water.

The City calibrated its master meters in September 2014 and found that the meters have been producing accurate readings. The City has ruled out master meter inaccuracies as a contributing factor to unaccounted-for water.

The City recently became aware that leaks in several residential copper service lines may have been contributing to its unaccounted-for water. Two detected leaks were in close proximity and leaked enough water to saturate the ground surface. In response to the leaks, the City decided to use PEX Poly lines instead of copper lines when installing or replacing residential service lines, and to conduct a leak detection study in 2015. The leak detection study found 97 leaks responsible for an estimated water loss of 123.85 gpm to 183.75 gpm (0.17 mgd to 0.27 mgd) and 65.1 MG to 96.6 MG annually. Without this estimated volume of water loss, the City's unaccounted-for water in 2014 could have been between 18.7 percent and 30.2 percent, rather than 38.0 percent. Immediately after receiving results of the leak detection study, the City began repairing identified leaks. The leak detection study likely did not identify all of the leaks in the system, and as a result, the City will be conducting more in-depth leak detection efforts, particularly in copper water lines.

In addition, the City is replacing all 2-inch and smaller residential, commercial, and industrial meters with new touch read meters to ensure that these meters are reading accurately, which may reduce unaccounted-for water further.

Water Rights

OAR 690-086-0140(5)

The City holds three surface water rights for municipal use of water from the South Santiam River.: Former Certificate 90287 and Former Certificate 49385 are currently evidenced by transfer T-12091, which added a point of diversion downstream and updated the place of use, and Permit S-44389, which has a pending permit amendment (Permit Amendment T-12090) to add a point of diversion downstream. Former Certificate 90287 (T-12091) has a priority date of 1890 and is for the use of up to 10.0 cfs. Former Certificate 49385 (T-12091) has a priority date of 1900 and authorizes the use of up to 9.0 cfs. Permit S-44389 has a priority date of July 12, 1979 and is for the use of up to 18.0 cfs. On August 18, 2011, OWRD issued the Final Order approving an extension of time for Permit S-44389 to October 1, 2068. The Final Order included the conditions that any diversion of water under the extended permit is only authorized upon issuance of a final order approving a WMCP, and that the City is required to submit the WMCP within three years of the date of the Final Order, which was August 18, 2011. As previously described, the City requested additional time to submit the WMCP and OWRD granted the request, extending the deadline to November 28, 2014. **Exhibit 2-16** provides detailed information about these municipal water rights that supply potable water through the City's municipal distribution systems.

In addition, the City holds Transfer T-11193 for the use of up to 0.07 cfs of groundwater from one well for irrigation of up to 5.5 acres. The priority date of this water right is October 4, 1968. This well is not connected to the City's municipal distribution system, and the City does not provide groundwater to its municipal customers under this water right. **Exhibit 2-17** provides information about this non-municipal water right held by the City.

Exhibit 2-16. Municipal Water Rights Held by the City of Lebanon.

Source	Application	Permit	Claim or Decree	Transfer	Certificate	Priority Date	Type of Beneficial Use	Authorized Rate (cfs)	Authorized Date for Completion	Maximum Rate of Withdrawal to Date		2013 Average Withdrawal		Five-Year (2009-2013) Average Withdrawal		Comments
										Instantaneous (cfs)	Annually (MG)	Monthly (MG)	Daily (mgd)	Monthly (MG)	Daily (mgd)	
South Santiam River			Santiam and South Santiam Rivers	T-12091		1890	Municipal	10.0	10/1/1998	10	837.2	69.8	2.29	62.2	2.04	Transfer T-12091 added a point of diversion downstream.
South Santiam River			Santiam and South Santiam Rivers	T-12091		1900	Municipal	9.0	N/A	9.0						Transfer T-12091 added a point of diversion downstream.
South Santiam River	S-58905	S-44389	T-12090			7/12/1979	Municipal	18.0	10/1/2068	0	0	0	0	0	0	Pending Permit Amendment T-12090 proposes to add a point of diversion downstream.

Exhibit 2-17. Non-Municipal Water Rights Held by the City of Lebanon.

Source	Application	Permit	Claim or Decree	Transfer	Certificate	Priority Date	Type of Beneficial Use	Authorized Rate (cfs)	Authorized Date for Completion	Comments
Well	G-4625	G-4350		T-11193	~~37744~~	10/4/1968	Irrigation of 5.5 acres	0.07	10/1/2013	The City submitted a COBU on January 7, 2015

This page left blank intentionally.

Aquatic Resource Concerns

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

Water Quality

The South Santiam River at the City's point of diversion (POD) (mouth of the Albany-Santiam Canal) at approximately River Mile 21 is 303(d) listed as water quality limited for biological criteria, which requires a TMDL, and for habitat modification, which does not require a TMDL. The South Santiam River at the POD is also water quality limited for temperature, which was delisted in 2010 following approval of a TMDL. The 303(d) listing information was obtained from:
http://www.deq.state.or.us/wq/assessment/rpt2010/search.asp

Listed Streamflow-dependent Species

Exhibit 2-18 shows the five listed fish species in the South Santiam River within the reach of the City's POD at approximately River Mile 21.

Exhibit 2-18. Listed Fish Species in the South Santiam River within the Reach of the City's Point of Diversion (~River Mile 21)

Species	Evolutionarily Significant Unit (ESU) (if applicable)	Federal Listing	State Listing
Chinook Salmon, Spring run	Upper Willamette River	Threatened	Sensitive-Critical
Winter Steelhead	Upper Willamette River	Threatened	Sensitive-Vulnerable
Oregon Chub			Sensitive-Critical
Pacific Lamprey		Species of Concern	Sensitive-Vulnerable
Western Brook Lamprey			Sensitive-Vulnerable

Sources:
ODFW's Division 315 Evaluation of Fish Persistence for Municipal Extension, City of Lebanon Application #S-58905: Superseding Advice. May 31, 2011.
Federal ESA listed species (T&E), from NOAA Fisheries Office of Protected Resources:
http://www.nmfs.noaa.gov/pr/species/esa/fish.htm
Federal Sensitive species, from the Interagency Special Status/Sensitive Species Program for Oregon and Washington State:
http://www.fs.fed.us/r6/sfpnw/issssp/agency-policy/
Oregon State ESA listed species, from the Oregon Department of Fish & Wildlife:
http://www.dfw.state.or.us/wildlife/diversity/species/threatened_endangered_candidate_list.asp
Oregon State Sensitive Species, from the Oregon Department of Fish & Wildlife:
http://www.dfw.state.or.us/wildlife/diversity/species/sensitive_species.asp
Federal Species of Concern, from the U.S. Fish & Wildlife Service, Oregon Fish & Wildlife Office:
http://www.fws.gov/oregonfwo/Species/Data/PacificLamprey/default.asp

Critical Groundwater Area

The City does not have a municipal ground water right that supplies potable water and is not located in a Critical Groundwater Area.

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

The City has authorization to appropriate water from the South Santiam River under Certificate 44389, which has a priority date of 1900 and authorizes the use of up to 9 cfs, and Certificate 90287, which has priority date of 1890 and authorizes the use of up to 10 cfs. In addition, the City holds an undeveloped permit (Permit S-44389), which has a priority date of July 12, 1979, and authorizes the use of up to 18.0 cfs. The amount of water available to fulfill the City's South Santiam River water rights is a function of water right priority date (seniority) and streamflow.

To date, the City has been able meet its demands under Certificate 90287 and Certificate 44389, which are very senior water rights. To put this in context, the average August streamflow in the South Santiam River at Waterloo (USGS Gage Number 14187500) from 2009 through 2014 was 898 cfs, and the water rights senior to Certificate 90287 and Certificate 44389 are less than 250 cfs.

Permit S-44389 is a more junior water right, but based on priority date, this water right is still considered reliable given that water use on the South Santiam River has never been regulated based on priority date. (Personal Communication, District 2 Watermaster Michael Mattick, September 11, 2014).

However, Permit S-44389 is junior to two minimum perennial streamflows (MPSFs) (MF 167 and MF 168), which were established in June 1964. Beginning in the 1960s, the Oregon Water Resources Board (the predecessor to OWRD) adopted MPSFs in the Willamette Basin to protect streamflows for aquatic life and reduce pollution. The MPSFs were established by administrative rule and are not water rights. As part of the 1987 legislation establishing instream water rights, the Oregon Legislature created a process to "convert" the MPSFs to instream water rights. Some conversions have taken place, but several remain as MPSFs. The majority of the remaining MPSFs in the Willamette Basin include two components: natural flow and stored water released from the Willamette Basin Project (13 federal dams in the Willamette Basin, including Foster and Green Peter Reservoirs). There are, however, numerous issues and uncertainties associated with converting the MPSFs, and in particular, how conversion of the stored water component of the MPSFs would affect holders of existing water rights.

MF 167 and MF 168 are on the Santiam River, downstream of the City's point of diversion. MF 167 seeks to protect 320 cfs of natural flow and 1570 cfs of water released from storage between the mouth of the Santiam River and River Mile 1. MF 168 seeks to protect 330 cfs of natural flow and 1570 cfs of water released from storage upstream from the USGS Gage on the Santiam River at Jefferson (14189000).

In the current situation, with the MPSFs not yet converted, the City's Permit S-44389 can be a reliable source of supply. However, if the natural flow portions of the MPSFs are converted to instream water rights, the natural flow instream water rights would be expected to have a June 22, 1964 priority date, and therefore, would be senior in priority to Permit S-44389. More importantly, if the stored water portions of the MPSFs are converted to instream water rights, OWRD would likely consider the released stored water as a different "source" of water. In other words, the 1570 cfs of released stored water would be

unavailable for use by holders of natural flow water rights. Over the last several years, serious concerns have been raised about the consequences of converting the remaining MPSFs, especially the conversion of the stored water components. The City should closely track this issue, which is currently being addressed in the implementation of the 2008 Biological Opinion for the Willamette Basin Project and in the Willamette Basin Review by the Army Corps of Engineers.

The reliability of Permit S-44389 may also be impacted by its permit extension conditions. On August 18, 2011, OWRD issued a Final Order extending the deadline to develop the permit to October 1, 2068. As part of the municipal permit extension process, the Oregon Department of Fish and Wildlife (ODFW) recommended conditions to OWRD intended to "maintain the persistence of listed fish." The recommended conditions include flow targets on the South Santiam River as shown in **Exhibit 2-19**. If the flow targets are not met, use of water under Permit S-44389 would be reduced in proportion to the amount by which the flow target is not met (based on a seven-day rolling average of mean daily flows measured in the South Santiam River at Waterloo (USGS Gage Number 14187500)).

Exhibit 2-19. ODFW Recommended Fish Flow Targets in the South Santiam River, Measured at Waterloo, Oregon (USGS Gage 14187500).

Month	Recommended Minimum Fish Flow Needs (cfs)
October 1-October 15	1500
October 16-October 31	1100
November-January	1100
February	800
March 1-March 15	800
March 16-March 31	1500
April	1500
May 1-May 15	1500
May 16-May 31	1100
June	1100
July-August	800
September	1500

From January 1, 2009 through September 9, 2014, the annual total number of days the fish flow targets in the South Santiam River at Waterloo were missed ranged from 55 days in 2009 to 2 days in 2014, as shown in **Exhibit 2-20**. This range represents 14.0 percent to 3.2 percent of the total days in the given year, which means that use of water under Permit S-44389 would be reduced in proportion to the amount by which the fish flow target is not met on these days. Only the past five years were analyzed, because dam operations changed in the early 2000s to time releases to meet fish flow targets. During this period, the total number of days that the fish flow targets were missed decreased markedly each year, which likely indicates improved management of releases from the reservoirs upstream of the gage. In addition, the fish flow targets were missed primarily in September. The most that the fish flow targets were missed by during this five-year period was 698 cfs in 2009, which equate to a percent shortfall of 47.8 percent (as per the percent shortfall equation in ODFW's fish persistence advice). If the City had had access to the full 18.0 cfs on those dates, then the 18.0 cfs would have been reduced by 47.8 percent for an allowed withdrawal of 9.4 cfs.

Exhibit 2-20. Days and Months Fish Flow Targets Were Missed, 2009 to September 8, 2014.

Year	Total Days Target Missed	Percent of Days Target Missed (%)	Months with Missed Targets
2009	51	14.0	August, September, and October
2010	34	9.3	March and September
2011	17	4.7	September
2012	11	3.0	September
2013	8	2.2	September
2014	8	3.2	September

The fish flow targets associated with *extended permit* S-44389 are consistent with the flow targets on the South Santiam River in the 2008 Willamette Biological Opinion described above. Since the U.S. Army Corps of Engineers manages the storage projects to meet these prescribed flows, it increases the probability that the fish flow target associated with the City's permit will be met.

Finally, although the City's water rights from the South Santiam River appear to be reliable, diversion of water under those water rights is limited by the current production capacity of the City's WTP.

System Description
OAR 690-086-140(8)

The City operates a public drinking water system (Public Water System Identification Number is 4100473). The City's sole source of water for its municipal water distribution system is the South Santiam River. The City accesses this water supply through an intake on the Albany-Santiam Canal approximately 3.5 miles downstream from the canal headworks on the South Santiam River. The Lebanon WTP is located adjacent to the intake. The WTP, which was built in 1946 and most recently upgraded in 1995, has a capacity of 3.75 mgd, and uses multi-media filtration. The City is currently evaluating options for a WTP expansion. The City has the newly built 4 MG 5th Street Reservoir and the 2 MG East Grant Street Reservoir, for a total reservoir capacity of 6 MG. The City also has one pump station and 76.5 miles of pipelines in its water transmission and distribution system, as described in **Exhibits 2-21** and **2-23**. **Exhibit 2-1** shows a schematic of the City's existing water distribution system.

Exhibit 2-21. Summary of System Reservoirs.

Reservoir	Volume (MG)	Over Flow Elevation (feet)	Depth (feet)	Completion Date
New 5th Street Reservoir	4	508.6	48	2015
East Grant Street Reservoir	2	508.6	32	1962
Total	6			

Exhibit 2-22. Summary of Existing Pump Stations.

Name	Location	# Pumps	Flow (gpm)	Firm Capacity (gpm)	Firm Capacity (mgd)
Pump Station	Water Treatment Plant	4	7,500	4500	6.5
		Pump 1	*1,500*		
		Pump 2	*1,000*		
		Pump 3	*2,000*		
		Pump 4	*3,000*		

Exhibit 2-23. Summary of Pipeline Sizes.

Pipe Diameter (in)	Total Length (ft)	Total Length (mi)	Percent of Total Pipeline (%)
2	16,910	3.2	4.2
4	27,205	5.2	6.7
6	90,720	17.2	22.4
8	139,620	26.4	34.5
10	10,055	1.9	2.5
12	92,490	17.5	22.9
14	2,820	0.5	0.7
16	24,360	4.6	6.0
Total	404,180	76.5	100.0

This page left blank intentionally.

SECTION 3

Water Management and Conservation

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

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

Current Conservation Measures
OAR 690-086-0150(1) and (3)

Progress Report

This is the City's first WMCP.

Background

The City's water conservation efforts have primarily focused on: implementing a rate structure that encourages water conservation; showing past water use on water bills; providing links to water conservation information on its Web site; replacing all 2-inch and smaller residential, commercial, and industrial meters with touch-read meters; and conducting its leak detection program.

Use and Reporting Program
OAR 690-086-0150(2)

The City's water measurement and reporting program complies with the measurement standards in OAR Chapter 690, Division 85. The City's water use records can be found at http://apps.wrd.state.or.us/apps/wr/wateruse_report/.

The City has a magnetic probe meter to measure the raw water entering the WTP and a pressure transducer to measure its finished water leaving the WTP to serve the water distribution system.

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
- Leak detection and repair (if system leakage exceeds 10 percent)
- Public education

Five-Year Benchmarks for Required Conservation Measures

During the next 5 years, the City plans to initiate, continue, or expand the following conservation measures that are required of all municipalities.

1. **Annual Water Audit**

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

   The City conducts a systematic and documented water audit annually. The City calculates its unaccounted-for water, or water loss, as the difference between the finished water produced and metered water consumption plus unmetered authorized water usage. Unmetered authorized uses are estimated by City staff and include water used by the fire department for firefighting and training, flushing of water system components by City staff, and water used for private construction projects and public works projects. The City currently does not follow a specific industry-recognized audit method.

   The City's unaccounted-for water was 38.0 percent in 2014 and averaged 32.3 percent from 2008 through 2014. As described in the discussion of water loss and non-revenue water in Section 2, the City evaluated numerous possible causes of its unaccounted-for water including problems with meter reading data, errors in billing software, inaccurate production meter readings at the WTP, and leaks in copper water service lines. After investigating each of these potential causes, the City has concluded that leaks discovered in several residential copper service lines have been contributing to unaccounted-for water. The City conducted a leak detection study in 2015, and found 97 leaks, as further described in the leak detection discussion below.

   Five-Year Benchmarks: In the next five years, the City will continue to conduct annual water audits. The City will continue to investigate possible causes of its unaccounted-for water. In the next five years, the City will evaluate whether to use some type of industry-recognized water audit method.

2. **System-wide Metering**

   The City's water system is fully metered.

   Five-Year Benchmarks: The City will continue to require meters on all new connections.

3. **Meter Testing and Maintenance**

   The private contractor managing the WTP is contractually obligated to test and calibrate the raw water meter and finished water meter at the WTP annually. The City's most recent calibration of its master meters in September 2014 confirmed that the master meters were producing accurate readings. The City maintenance crews test large meters (2-inch and greater) in the City water distribution system annually. The City tests small residential meters (¾-inch and 1-inch) on an as

needed basis, such as when the City receives complaints from customers or if City staff notices atypical usage.

The City is currently in the process of replacing all 2-inch and smaller residential, commercial, and industrial meters with touch read meters. As of July 2015, the City has invested nearly $400,000 for labor and meter costs. The City has purchased approximately 90 percent of the meters needed and has replaced approximately 35 percent of the meters needing replacement thus far. Meter replacement will help the measuring consistency, make meter reading more efficient, and ensure accurate readings.

Five-Year Benchmarks: In the next five years, the City will complete the replacement of all residential, commercial, and industrial meters with touch read meters. The City will continue to regularly test and calibrate the raw water meter and finished water meter at the WTP.

4. Water Rate Structure

The City has a monthly basic service rate based on meter size and a monthly consumption rate based on the quantity of water metered at the service connection for residential and commercial/industrial customers. **Exhibit 3-1** shows the City's current service and consumption rates. The exhibit also shows the City's fees for the use of fire hydrants for private construction projects and for the use of a fire hydrant that serves as a "fill station" at the Santiam Canal Industrial Park (SCIP) system, a privately owned non-potable fire protection system. The fill station enables private companies, individuals, and contractors to fill their trucks at a consistent location. In addition, the City has a basic monthly rate based on meter size for fire hydrants used for privately owned and maintained fire protection and for standby water service.

Exhibit 3-1. Monthly Service and Consumption Rates as of July 1, 2015.

Meter Size (inches)	Base Rate ($/month)	Pressure Level 1	Pressure Level 2	Pressure Level 3	Pressure Level 4
		Volume Rate ($/unit[1])			
Residential					
¾" (low income)	$18.00	$4.20	$4.83	$5.56	$6.39
¾"	$20.00	$4.65	$5.35	$6.15	$7.06
1"	$26.99	$4.65	$5.35	$6.15	$7.06
1 ½"	$60.32	$4.65	$5.35	$6.15	$7.06
2"	$107.64	$4.65	$5.35	$6.15	$7.06
Commercial/Industrial					
¾"	$20.00	$4.65	$5.35	$6.15	$7.06
1"	$26.99	$4.65	$5.35	$6.15	$7.06
1 ½"	$60.33	$4.65	$5.35	$6.15	$7.06
2"	$107.64	$4.65	$5.35	$6.15	$7.06
3"	$197.29	$4.65	$5.35	$6.15	$7.06
4"	$340.93	$4.65	$5.35	$6.15	$7.06
6"	$606.80	$4.65	$5.35	$6.15	$7.06
Fire Hydrant	N/A	$4.65	$5.35	$6.15	$7.06
Santiam Canal Industrial Park Fill Station	N/A	$2.32	N/A	N/A	N/A

[1] 1 unit = 100 cubic feet or 748 gallons

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

5. Leak Detection and Repair

If the annual water audit indicates that system leakage exceeds 10 percent, the City is required to have a regularly scheduled and systematic leak detection program. The City's unaccounted-for water was 38.0 percent in 2014 and averaged 32.3 percent from 2008 through 2014.

The City has a regularly scheduled and systematic leak detection and repair program to minimize water loss in the City's water distribution system that includes the following activities:

Water line Repair/Replacement -- From 1997 through 2006, the City replaced 8 miles of 2-inch through 8-inch water lines. In subsequent years, the City was focused on replacing large diameter water mains. In addition, the City annually budgets approximately $350,000 to replace old 8-inch through 16-inch water mains that have reached the end of their useful life, which allows the City to replace approximately 2,000 feet of water main each year, depending on the size and complexity of the project. The lines identified for replacement are chosen based on leak repair history.

When recent annual water audits revealed that unaccounted-for water remained high, the City conducted an investigation of numerous potential causes for its unaccounted-for water and then concluded that its unaccounted-for water is likely the result of leaks in its copper water service lines. The City then conducted a leak

detection study (completed in May 2015) that found 97 leaks (primarily in copper service lines) responsible for an estimated water loss of 123.85 gpm to 183.75 gpm (0.17 mgd to 0.27 mgd) and 65.1 MG to 96.6 MG annually. Without this estimated volume of water loss, the City's unaccounted-for water in 2014 could have been between 18.7 percent and 30.2 percent, rather than 38.0 percent. The leak detection study recommended addressing the identified leaks, continuing replacement of older lines (particularly copper service lines), and upgrading water meters to reduce water loss. In response to the findings and recommendations, the City immediately began repairing identified leaks. The City finished addressing all identified leaks in January 2016, some of which had greater leak flow rates than estimated in the study. The City suspects that the leak detection study did not identify all of the leaks in the system, and as a result, the City will be conducting more in-depth leak detection efforts, particularly in copper water lines, in 2017. The City is already in the process of replacing all 2-inch and smaller residential, commercial, and industrial meters with touch read meters, as described above under Meter Testing and Maintenance.

Installation of PEX Poly lines -- In response to the City's finding that its unaccounted-for water is likely the result of leaks in its copper water service lines, the City decided to switch to using PEX Poly lines when installing or replacing residential service lines.

Routine field observations and inspections -- The City conducts routine field observations and inspections of its water lines. If a leak is discovered by City staff or reported by citizens, the City promptly addresses and repairs the leak.

Five-Year Benchmarks: The City will continue its large diameter water main replacement program. The City will continue to routinely observe and inspect its waterlines and to promptly repair any detected leaks. The City will immediately begin paying particular attention to residential copper service lines during its routine observations and inspections. In 2017, the City will conduct more in-depth leak detection efforts, particularly in the copper service lines.

6. Public Education

The City currently educates the public about water conservation using its Web site. The City has a link to several Web pages on a Web site called Water Use It Wisely and a link to the Oregon Water Resources Department Web site, which contains water conservation information under the heading "Water Conservation." Both Web sites allow visitors to browse information about indoor and outdoor water conservation measures that water users can take. In addition, customer water bills show usage over the previous 12 months to help customers understand how much water they are using from month-to-month.

The City will be expanding its public education program over the next 10 years to include greater community outreach. The City will update and expand its Web site content about water conservation, covering topics including: indoor water conservation, outdoor water conservation, leak detection, and xeriscaping. The City will also develop or obtain existing brochures in those topic areas. The City will begin promoting water conservation at a minimum of one community event per year

where the City will provide brochures and free water-efficient fixtures, such as showerheads and faucet aerators, to City customers.

Five-Year Benchmarks: In the next five years, the City will update and expand its Web site content about water conservation, covering such topics as indoor water conservation, outdoor water conservation, leak detection, and xeriscaping. In the next five years, the City will begin offering water conservation brochures on the aforementioned Web site topics in its billing office, as well. In the next five years, the City will provide water conservation information at a minimum of one public event each year, where the City will provide brochures and free water-efficient fixtures, such as showerheads and faucet aerators. The City's goal is to distribute up to 500 water conservation brochures at the event.

Expanded Use under Extended Permits

OAR 690-086-0150(5)

Under OAR 690-086-0150(5), any municipal water supplier that proposes to expand or initiate the diversion of water under an extended permit for which resource issues have been identified shall include a description of activities and five-year implementation schedule for a system-wide leak repair or line replacement program to reduce system leakage to no more than 15 percent. The City is not proposing to initiate or expand diversion of water under an extended permit; therefore, this rule does not apply.

Additional Conservation Measures

OAR 690-086-0150(6)

OAR 690-086-0150(6) requires municipal water suppliers that serve a population greater than 1,000 and propose to expand or initiate the diversion of water under an extended permit for which resource issues have been identified, or if the population served is greater than 7,500, to provide a description of the specific activities, along with a five-year schedule to implement several additional conservation measures. The City does not propose to expand diversion of water under its extended permits, but in 2013, the City served a population of 15,817; therefore, the City is required to address the following additional conservation measures.

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

   Under this rule requirement, the City is required to implement a system-wide leak repair program or line replacement program to reduce system leakage to 15 percent, and if feasible to 10 percent. The City's unaccounted-for water was 38.0 percent in 2014 and averaged 32.3 percent from 2008 through 2014, which the City suspects is the result of leaks in the City's copper water service lines.

   The City has a leak detection and repair program, and its goal is to achieve 15 percent or less system leakage. The City is implementing the following activities to achieve that system leakage goal:

- Repairing the 97 leaks identified in the 2015 Leak Detection Study (completed in January 2016)
- Conducting more in-depth leak detection efforts, particularly in copper lines, in 2017
- Switching to installing PEX poly lines instead of copper lines
- Conducting routine field observations and inspections of its water lines
- Promptly repairing leaks discovered by City staff or citizens

The City's current expenditures of $350,000 per year to reduce system leakage is sufficient to repair the leaks identified in the 2015 Leak Detection Study and to conduct additional leak detection studies, as well as make any related water line repairs. The City aims to reach its goal of 15 percent system leakage or less within 10 years, assuming that the City is able to maintain its budget for addressing system leakage and to continue at the current rate of leak repair.

Five-Year Benchmarks: The City will continue its large diameter water main replacement program. The City will continue to routinely observe and inspect its waterlines and to promptly repair any detected leaks. The City will immediately begin paying particular attention to residential copper service lines during its routine observations and inspections. In 2017, the City will conduct more in-depth leak detection efforts, particularly in the copper service lines. In the next five years, the City will promote leak detection and repair among its customers through its Web site, as well as providing a brochure and dye tablets at its billing office.

2. Technical and Financial Assistance Programs

The City currently does not have a technical or financial assistance program to encourage water conservation.

Five-Year Benchmarks: In the next five years, the City will make free lawn watering gauges available to customers at its billing office to encourage water conservation that will help reduce demand in the peak summer season. These lawn watering gauges will be advertised on the City Web site and in customer bills.

3. Supplier Financed Retrofit or Replacement of Inefficient Fixtures

The City currently does not help finance the retrofit or replacement of inefficient fixtures.

Five-Year Benchmarks: In the next five years, the City will make free low flow showerheads and low flow faucet aerators available to customers at its billing office to encourage year-round indoor water conservation. These fixtures will be advertised on the City Web site and in customer bills.

4. Rate Structure and Billing Practices that Encourage Conservation

The City bills customers monthly, which provides customers with relatively quick feedback on water usage. Customers' bills show usage over the previous 12 months to help customers understand how much water they are using from month-to-month. In addition, the City began to substantially increase water rates in 2008, which has both raised capital for a new WTP and motivated customers to reduce

water consumption. The City increased water rates by: 10 percent in FY 2008-2009; 4.5 percent in FY 2009-2010; 15 percent in FY 2010-2011, FY 2011-12, and FY 2012-2013; and 4 percent in FY 2014-15.

Five-Year Benchmarks: The City will continue to bill customers monthly and based on the quantity of water metered at the service connection. In the next 5 years, the City will begin to regularly add water conservation messages to a section of its bills dedicated to announcements.

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

The City uses approximately 53.8 MG of treated effluent per year for non-potable uses at the Wastewater Treatment Plant (WWTP), such as plant process water and irrigation. If the City did not recycle the effluent for these uses, it would have to use potable, finished water from the WTP.

Five-Year Benchmarks: The City will continue to use treated effluent for non-potable uses at the WWTP. In the next five years, the City will meet with five commercial/industrial customers to discuss water reuse, recycling, and non-potable water use opportunities. In the next five years, the City will meet with the City's Parks Department and Maintenance Operations Department to discuss water reuse, recycling, and non-potable water opportunities, as well. The City will then conduct cost-benefit analyses on potentially feasible opportunities identified during these discussions.

6. Other Conservation Measures

City staff is a member of the American Public Works Association and Association of Clean Water Agencies, which address water conservation issues. The City also subscribes to the Oregon Insider, a monthly environmental management and regulatory news source.

SECTION 4

Municipal Water Curtailment

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

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

Introduction

Water curtailment plans outline proactive measures that water suppliers may take to reduce demand 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: mechanical or electrical equipment failure in the system, unanticipated catastrophic events (flooding, landslides, earthquakes and contamination), events not under control of the water supplier (e.g., localized or area-wide power outages and intentional malevolent acts), or prolonged drought.

History of System Curtailment Episodes
OAR-690-086-0160(1)

In the past 10 years, the City has not needed to implement water curtailment measures. Flow in the lower South Santiam River is regulated year-round by two dams (Green Peter Dam and Foster Dam) located upstream from the City. These dams have reservoirs that enable management of streamflow in the South Santiam River, which allows for water to be diverted into the Albany-Santiam Canal at the required rate year-round. Consequently, the City is less vulnerable to long-term drought. If some natural disaster or contamination disrupts diversion of water from the South Santiam River, the City could maintain delivery of finished water for approximately 3 days before the City's 6 MG finished water storage capacity stored supplies would be exhausted (based on the City's average day demands).

The City's main capacity limitation is its WTP, which is 3.75 mgd (5.80 cfs). However, the City is able to meet present and near-term demand with its current WTP and is exploring options for an expanded treatment capacity.

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

The City developed this curtailment plan to describe the standards and procedures that will be employed in the event of a water shortage that requires the City's to implement a water curtailment stage.

Situations that could create a water supply shortage include, but are not limited to:

a) fire, earthquake, or windstorm damage to water system infrastructure
b) water system infrastructure or facility failure
c) contamination in the South Santiam River and/or the Albany-Santiam Canal
d) drought

The City has adopted a four-stage curtailment plan to be invoked in the event of a water supply shortage. These stages could be initiated and implemented in progressive steps or a later stage could be implemented directly. The plan includes both voluntary and mandatory measures, depending upon the cause, severity, and anticipated duration of the shortage.

Exhibit 4-1 presents the four curtailment stages, as well as their initiating conditions (i.e. triggers). Initiation of a curtailment stage is based on judgment and the specific circumstances of the actual event. The City's initiating conditions focus on reservoir water levels, damage that the water system may incur, issues with components of the water system, water supply contamination, and weather conditions.

Exhibit 4-1. Curtailment Stages 1 through 4.

Curtailment Stages	Potential Initiating Conditions
Stage 1: Water Supply Shortage Warning	• The maximum daily production of the water treatment plant does not meet daily demand. • There is expectation of a potential water supply deficiency.
Stage 2: Moderate Water Supply Shortage	• Maximum daily production of the water treatment plant does not meet daily demand and water storage reservoirs fall to 80 percent of capacity. • Minor damage to the water system due to a natural disaster, fire, or criminal act. • Failure of a minor part of the water system or facility. • Prolonged period of hot, dry weather.
Stage 3: Severe Water Supply Shortage	• Maximum daily production of the water treatment plant does not meet daily demand and water storage reservoirs fall to 70 percent of capacity. • Serious damage to the water system due to a natural disaster, fire, or criminal act. • Failure of a significant part of the water system or facility. • Isolated contamination of the water supply. • Severe drought.
Stage 4: Critical Water Supply Shortage	• Maximum daily production of the water treatment plant does not meet daily demand and water storage reservoirs fall to 50 percent of capacity. • Major damage to the water system due to a natural disaster, fire, or criminal act. • Failure of a critical part of the water system or facility. • Contamination of the entire water supply.

Authority, Penalties, and Enforcement

The City Engineer has the authority to declare and to end water curtailment stages, to issue warnings, to order water service disconnection, and to determine the "turn-on charge" to restore water service. In addition, the City Engineer has the authority to grant temporary variances for prospective uses of water otherwise prohibited and to revise or revoke any variances or adjustments to prohibited water uses. The City will enforce penalties, which may include issuing warnings, fines, installation of a flow restrictor to the service connection, and disconnection of water service.

Communication

The City will communicate stages of curtailment and the associated voluntary and/or mandatory conservation measures through its Web site and a formal press release to the local newspaper, local radio stations, the Chamber of Commerce, and/or several other organizations included in typical press releases. The communications will include a statement describing the current water situation, the reason for the requested voluntary and/or mandatory water curtailment measures, and as applicable, a warning that mandatory water curtailment will be required if voluntary actions do not sufficiently reduce water use. In addition, the City will call its largest commercial/industrial water users to notify them of the impending or immediate activation of curtailment stages, so that they can prepare.

The City also has a "Flash Alert" emergency communication system that would apply to Stage 4 curtailment. This system is designed to alert citizens of emergencies near their residences or businesses. When an emergency or significant event occurs, the internet-based system allows the Lebanon Police Department to deliver pre-recorded emergency telephone notifications and informational messages to either selected neighborhoods or the entire city.

Curtailment Plan Implementation

OAR-690-086-0160(4)

Stage 1: Water Supply Shortage Warning

Stage 1 is activated when the maximum daily production of the WTP does not meet daily demand or there is expectation of a potential water supply deficiency. Under Stage 1, the City may ask City customers to voluntarily decrease indoor and outdoor water use by 10 percent, as well as postpone new plantings. Suggestions to decrease water use may include but are not limited to: applying a maximum of 1 inch of water per week, confining outdoor watering to before 9 am or after 9 pm, postponing washing outdoor surfaces (e.g. sidewalks, parking lots, driveways, and buildings), and looking for and fixing any indoor leaks (e.g. toilets and faucets).

Stage 2: Moderate Water Supply Shortage

Stage 2 is activated when maximum daily production of the WTP does not meet daily demand and water storage reservoirs fall to 80 percent of capacity; minor damage to the water system occurs due to a natural disaster, fire, or criminal act; failure of a minor part of the water system or facility occurs; or when the area is experiencing a prolonged period of hot, dry weather. Under Stage 2, the City will promote more significant voluntary water use reductions and some mandatory water use reductions.

The City will ask customers to take one or more of the following voluntary actions to curtail water use:

- Cease washing vehicles, except at a commercial washing facility
- Cease washing outdoor surfaces
- Cease filling swimming pools (except pools with recycling water systems and evaporative covers, pools used for fire control, and pools required by a medical doctor's prescription)
- Cease using water to maintain water features, except those supporting fish life

- Reduce non-essential water use in commercial/industrial establishments

The City may inform customers of the following mandatory action to curtail water use:

- Restrict watering lawns, ornamental/landscaping plants, and vegetable gardens to 3 days per week and only before 9 am or after 9 pm

The City will ask staff to take the same curtailment actions as requested of City customers.

Stage 3: Severe Water Supply Shortage

Stage 3 is activated when maximum daily production of the WTP does not meet daily demand and water storage reservoirs fall to 70 percent of capacity; serious damage to the water system occurs due to a natural disaster, fire, or criminal act; failure of a significant part of the water system or facilities occurs; an isolated part of the water supply is contaminated; and/or the area is experiencing a severe drought. Under Stage 3, voluntary water use reduction actions in Stage 2 will become mandatory and the City will implement additional mandatory water use reductions.

The City will require that customers implement of one or more the following mandatory actions to curtail water use:

- No watering of lawns, but customers may hand-irrigate ornamental/landscaping plants and vegetable gardens before 9 am or after 9 pm
- No planting of new lawns
- Cease washing vehicles, except at a commercial washing facilities
- Cease washing outdoor surfaces (e.g. sidewalks, parking lots, driveways, and buildings)
- Cease filling swimming pools (except pools with recycling water systems and evaporative covers, pools used for fire control, and pools required by a medical doctor's prescription)
- Cease using water to maintain water features, except those supporting fish life
- Cease using water for dust control
- Cease non-essential water use in commercial/industrial establishments
- No allowing water to run to waste in any gutter or drain

The City will ask staff to take the same curtailment actions as required of City customers. In addition, the City will limit hydrant and water main flushing to emergencies.

Stage 4: Critical Water Supply Shortage

Stage 4 is activated when maximum daily production of the WTP does not meet daily demand and water storage reservoirs fall to 50 percent of capacity; major damage to the water system occurs due to a natural disaster, fire, or criminal act; failure of a critical part of the water system or facility occurs; and the entire water supply is contaminated. Under Stage 4, the City will require that customers implement one or more of the following mandatory actions to curtail water use:

- Restrict indoor water use to only water uses essential for public health and safety.
- Cease outdoor watering.
- Cease water use in commercial/industrial establishments except for critical functions, such as fire protection

The City will ask staff to take the same curtailment actions as required of City customers.

SECTION 5

Water Supply

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

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

Delineation of Service Areas

OAR 690-086-0170(1)

The City's future water service area for the 20-year planning period of this WMCP includes the area within the City's UGB, plus a neighborhood with 51 service connections. **Exhibit 2-1** shows the City's future water service area.

Population Projections

OAR 690-086-0170(1)

The City's population projections are based on the projections from the City's 2007 Water System Master Plan (WSMP). The WSMP uses an annual average growth rate of 1.71 percent, which was made official in the 1999 Linn County/Lebanon City Coordinated Population Forecast for the City of Lebanon and used in the City's 2004 Comprehensive Plan Update to project population to year 2050. Using the 2014 estimated water delivery area population of 15,873 (15,740 from Portland State University's Population Research Center plus 133 from City estimates of the neighborhood served outside of the city limits) and the annual average growth rate of 1.71 percent, the City's projected population is 19,158 in 2025 and 22,731 in 2035, as shown in **Exhibit 5-1**.

Exhibit 5-1. Projected Population.

Year	Projected Population	Year	Projected Population
2014	15,873	2025	19,158
2015	16,147	2026	19,488
2016	16,425	2027	19,825
2017	16,709	2028	20,166
2018	16,997	2029	20,514
2019	17,290	2030	20,868
2020	17,588	2031	21,228
2021	17,891	2032	21,594
2022	18,200	2033	21,967
2023	18,514	2034	22,345
2024	18,833	2035	22,731

Demand Forecast

OAR 690-086-0170(3)

The City's demand projections are based on the per capita estimation method used in the 2007 WSMP, but values have been updated to reflect more current data. The demand projections were developed using the previously described population projections, 2014 per capita ADD of 144 gpcd (year with the highest ADD from 2008 through 2014), and the per capita MDD of 253 gpcd (2014 per capita ADD multiplied by the average peaking factor from 2008 through 2014 of 1.8). For planning purposes, the City developed demand projections with a weather allowance, industrial allowance, 5 percent conservation, and a combination of these scenarios, as well. The City added a weather allowance of 0.4 mgd to the projected MDD to address the potential for variations in the MDD, which has varied from the trendline by as much as 0.43 mgd in the past 20 years. The City added an industrial allowance of 2 mgd to the projected MDD to allow for a new industrial or major commercial water use; the City has substantial developable industrial and commercial lands. The City also added a scenario in which the City reduces its projected MDD by 5 percent through implementation of additional water conservation measures, such as those described as benchmarks in Section 3. (It should be noted that demand reductions are anticipated from leak repair, but some element of unaccounted-for water is likely due to metering and accounting, and therefore, will not necessarily result in reduced water demand). The City then added a weather allowance and industrial allowance to the 5 percent conservation scenario for comparison.

The values used to develop the City's 10-year and 20-year demand projections are presented in **Exhibit 5-2. Exhibit 5-3** shows the projected MDDs for each year during the 20-year planning period of this WMCP, including those incorporating the weather allowance, industrial allowance, 5 percent conservation, and a combination of these scenarios. By 2035, the City's projected MDDs with the weather allowance and MDDs with the industrial allowance are 9.7 cfs and 12.2 cfs, respectively. The City's projected MDDs with 5 percent conservation plus the weather allowance and with 5 percent conservation plus the industrial allowance are 9.3 cfs and 11.8 cfs, respectively.

Exhibit 5-2. Projected Demand Elements.

Element	Values
2014 service population	15,873
Rate of population growth	1.71%
Overall per capita ADD	144 gpcd
Overall per capita MDD	253 gpcd
MDD weather allowance	0.4 mgd (0.62 cfs)
MDD industrial allowance	2.0 mgd (3.1 cfs)
MDD conservation scenario	5%

Exhibit 5-3. Projected Demand.

Year	Projected Population	ADD (mgd)	MDD (mgd)	MDD + 0.4 mgd Weather Allowance (mgd)	MDD + 2 mgd Industrial Allowance (mgd)	MDD + 5 percent Conservation (mgd)	MDD (cfs)	MDD + 0.62 cfs Weather Allowance (cfs)	MDD + 3.1 cfs Industrial Allowance (cfs)	MDD + 5 percent Conservation (cfs)	MDD + 5 percent Conservation + 0.62 cfs Weather Allowance (cfs)	MDD + 5 percent Conservation + 3.1 cfs Industrial Allowance (cfs)
2014	15,873	-	-	-	-	-	-	-	-	-	-	-
2015	16,147	2.3	4.2	4.6	6.2	4.0	6.5	7.1	9.6	6.1	6.8	9.2
2016	16,425	2.4	4.3	4.7	6.3	4.0	6.6	7.2	9.7	6.3	6.9	9.4
2017	16,709	2.4	4.3	4.7	6.3	4.1	6.7	7.3	9.8	6.4	7.0	9.5
2018	16,997	2.4	4.4	4.8	6.4	4.2	6.8	7.4	9.9	6.5	7.1	9.6
2019	17,290	2.5	4.5	4.9	6.5	4.3	6.9	7.5	10.0	6.6	7.2	9.7
2020	17,588	2.5	4.6	5.0	6.6	4.3	7.0	7.7	10.1	6.7	7.3	9.8
2021	17,891	2.6	4.6	5.0	6.6	4.4	7.2	7.8	10.3	6.8	7.4	9.9
2022	18,200	2.6	4.7	5.1	6.7	4.5	7.3	7.9	10.4	6.9	7.5	10.0
2023	18,514	2.7	4.8	5.2	6.8	4.6	7.4	8.0	10.5	7.0	7.7	10.1
2024	18,833	2.7	4.9	5.3	6.9	4.6	7.5	8.2	10.6	7.2	7.8	10.3
2025	19,158	2.8	5.0	5.4	7.0	4.7	7.7	8.3	10.8	7.3	7.9	10.4
2026	19,488	2.8	5.0	5.4	7.0	4.8	7.8	8.4	10.9	7.4	8.0	10.5
2027	19,825	2.9	5.1	5.5	7.1	4.9	7.9	8.6	11.0	7.5	8.2	10.6
2028	20,166	2.9	5.2	5.6	7.2	5.0	8.1	8.7	11.2	7.7	8.3	10.8
2029	20,514	3.0	5.3	5.7	7.3	5.0	8.2	8.8	11.3	7.8	8.4	10.9
2030	20,868	3.0	5.4	5.8	7.4	5.1	8.4	9.0	11.5	7.9	8.6	11.0
2031	21,228	3.1	5.5	5.9	7.5	5.2	8.5	9.1	11.6	8.1	8.7	11.2
2032	21,594	3.1	5.6	6.0	7.6	5.3	8.7	9.3	11.8	8.2	8.8	11.3
2033	21,967	3.2	5.7	6.1	7.7	5.4	8.8	9.4	11.9	8.4	9.0	11.5
2034	22,345	3.2	5.8	6.2	7.8	5.5	9.0	9.6	12.1	8.5	9.1	11.6
2035	22,731	3.3	5.9	6.3	7.9	5.6	9.1	9.7	12.2	8.7	9.3	11.8

This page left blank intentionally.

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

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

As described in Section 2, the City currently holds three surface water rights for municipal use of water from the South Santiam River: Certificate 90287 (10 cfs), Certificate 49385 (9 cfs), and Permit S-44389 (18 cfs). Given that the City can use water under its two certificated water rights (Certificates 49385 and 90287) the City currently has access to 19 cfs to meet its projected demands. These rights are sufficient to meet the City's projected demand with an industrial allowance (12.2 cfs) in 2035, the most aggressive demand scenario. Consequently, the City is not seeking access to water under *extended permit* S-44389 in this WMCP.

As documented in the City's permit extension application and OWRD's August 18, 2011 Final Order approving the extension of time for Permit S-44389, the City anticipates that it will fully beneficially use Permit S-44389 (18 cfs) by October 1, 2068.

Alternative Sources

OAR 690-086-0170(5)

OAR 690-086-0170(5) requires an analysis of alternative sources of water if any expansion or initial diversion of water allocated under existing permits is necessary to meet future water demand. The City does not currently anticipate any expansion or initial diversion of water allocated under its existing permit during the planning period of this WMCP; therefore, this rule does not apply.

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 near future. The City does not currently anticipate any expansion or initial diversion of water allocated under its existing permit during the planning period of this WMCP; therefore, this rule does not apply.

Mitigation Actions under State and Federal Law

OAR 690-086-0170(7)

Under OAR 690-086-0170(7), for expanded or initial diversion of water under an existing permit, the water supplier is to describe mitigation actions it is taking to comply with legal requirements of the Endangered Species Act, Clean Water Act, and other applicable state or federal environmental regulations. The City does not currently anticipate any expansion or initial diversion of water allocated under its existing permit during the planning period of this WMCP; therefore, this rule does not apply. Nonetheless, the City currently is not required to take any mitigation actions under state or federal law. The final order on the City's extension application for Permit S-44389, however, did include "fish persistence" conditions.

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. As shown in the above, the City's water rights are sufficient to meet projected demands during the next 20 years. Consequently, the City currently does not plan to acquire additional water rights within that timeframe.