

Final Draft

Water Management and Conservation Plan

October 2014

Prepared for

City of Carlton

Prepared by



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1. Municipal Water Supplier Plan Elements

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

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

Introduction

The City of Carlton is located in Yamhill County in the northwest portion of the Willamette Valley, approximately 6 miles north of the City of McMinnville and 12 miles west of the City of Newberg. The City was incorporated in 1899.

The purpose of this Water Management and Conservation Plan (WMCP or Plan) is to guide development, financing and implementation of water management and conservation programs that ensure sustainable water use, as well as to consider the City's future water needs. The goal in preparing this WMCP is to establish a working document, consistent with the City's adopted water system master plan, which will have a positive effect on how the City water system develops in future years.

Plan Requirement

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

Plan Organization

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

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

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

- City of Carlton Staff
- City of Carlton 2014 Draft Water System Master Plan (WSMP)
- Population Forecasts for Yamhill County, its Cities and Unincorporated Area 2011-2035 (2012 report prepared by Portland State University's Population Research Center)
- Oregon Water Resources Department (OWRD)

Affected Local Governments

OAR 690-086-0125(5)

The following local governmental agencies may be affected by this WMCP:

- City of Carlton
- Yamhill County

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

In addition, the City provided the Yamhill Regional Water Authority with notice of the draft plan as a courtesy.

Plan Update Schedule

OAR 690-086-0125(6)

The City anticipates submitting an update of this WMCP within 10 years of the final order approving this WMCP. 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)

This is the City's first WMCP. The City is not requesting additional time to implement metering or a previous benchmark.

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 primary source of water is Panther Creek, which flows eastward out of the Oregon Coast Range towards the City. The City uses natural flow from Panther Creek and stored water from Panther Creek Reservoir. The City also holds a water right permit for the potential development of a source from Fall Creek, which also flows out of the Coast Range. In addition, the City recently obtained authorization to access Willamette River water for municipal use through its membership in the Yamhill Regional Water Authority; however, it will likely be several years before the needed infrastructure is in place to use this source.

Interconnections with Other Systems

OAR 690-086-0140(7)

The City has three interconnections. One interconnection is with Valley View Water District to provide water service to approximately 42 customer connections. Another interconnection is with East Carlton Water Company to provide water to approximately 15 customer connections. The City also has a six-inch interconnection with McMinnville Water and Light's (MWL) main where it crosses the City's main transmission. This connection can provide the City water in an emergency situation.

Intergovernmental Agreements

OAR 690-086-0140(1)

The City has intergovernmental agreements (IGAs) with Valley View Water Company (signed amended agreement dated February 2007), East Carlton Water Company (unsigned agreement dated 1997), and the City is currently developing an agreement with MWL.

In December 2012, the City entered into an IGA with the cities of McMinnville (via McMinnville Water and Light Commission (MWL)), Dayton, and Lafayette to establish the Yamhill Regional Water Authority and to jointly seek, acquire, hold, and maintain a water permit for appropriation of water from the Willamette River. The IGA states that upon issuance of the Final Order for Application S-87762, the permitted 44.18 cubic feet per second (cfs) of Willamette River water will be allocated as follows: 2.98 cfs for Carlton, 3.10 cfs for Dayton,

5.00 cfs for Lafayette, and 33.10 cfs for MWL. Permit S-54792 was issued on January 17, 2013. The IGA also covers items related to governance, operations and management, and financing.

Service Area Description and Population

OAR 690-086-0140(2)

Exhibit 2-1 shows the City’s current water delivery area, which includes areas within and outside the existing City limits. (The City limits and the City’s Urban Growth Boundary are the same). Outside City limits, the City serves wholesale customer Valley View Water District (42 connections), wholesale customer East Carlton Water Company (15 connections), customers along Modafari Road (six connections), Carlton Farms, customers off of the mainline between the reservoir and the City’s water treatment plant (WTP) (33 connections), customers between the finished water storage reservoirs and the City limits, and a few customers on the outskirts (north, southwest, and southeast) of town. As of 2012, the City provided water to 891 accounts.

Exhibit 2-2 shows the City’s estimated population from 2009 through 2012, according to the Population Research Center (PRC) at Portland State University, as shown directly in its reports (2009) and indirectly in the 2012 report “Population Forecasts for Yamhill County, its Cities and Unincorporated Area 2011-2035” (2010 through 2012).

Exhibit 2-2. Population estimates based on a Portland State University’s Population Research Center report and the report “Population Forecasts for Yamhill County, its Cities and Unincorporated Area 2011-2035.”

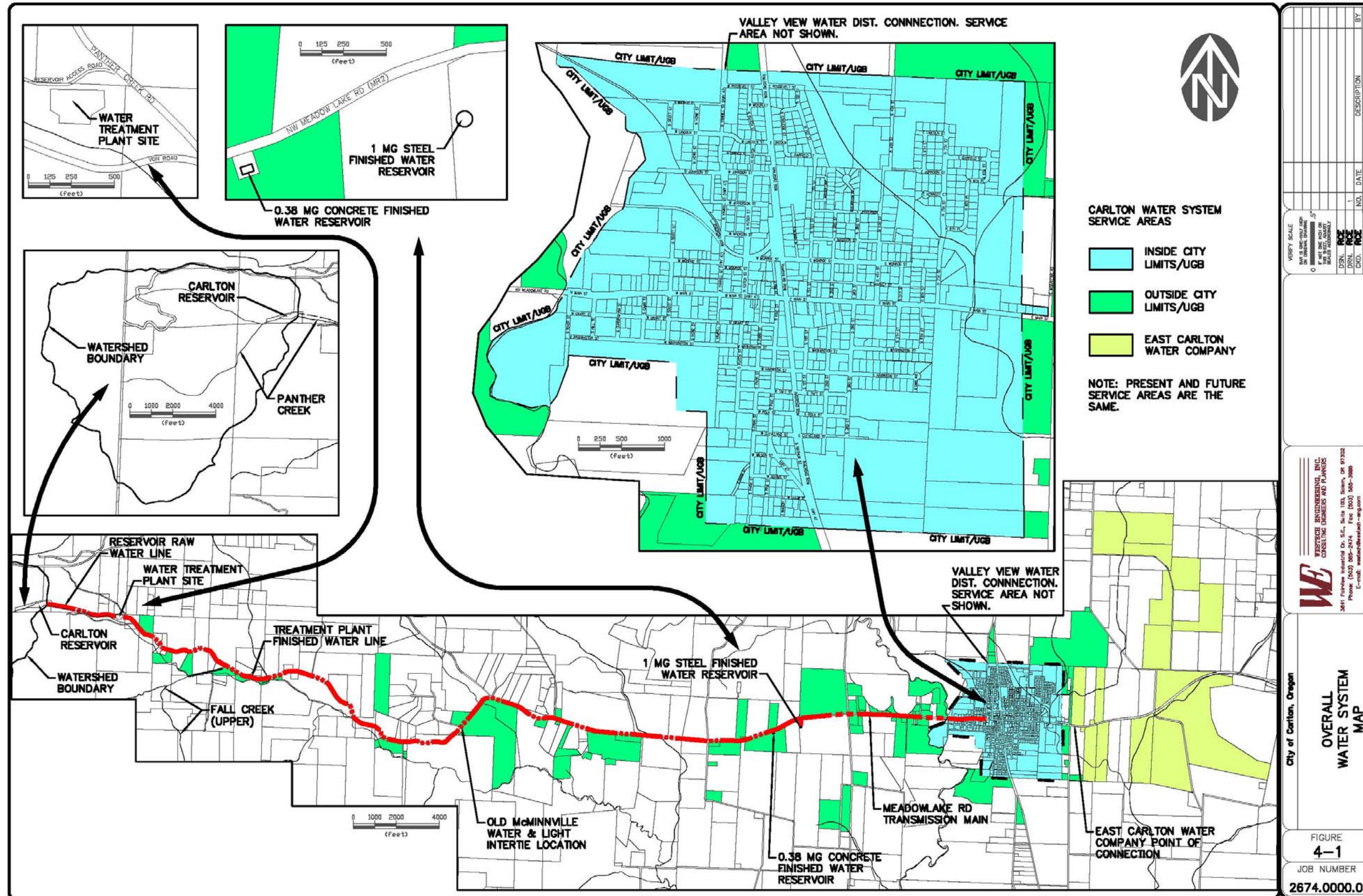
Year	Population
2009 ¹	1,790
2010 ²	2,007
2011 ²	2,036
2012 ^{2*}	2,065

¹PRC report.

²Population Forecasts for Yamhill County, its Cities and Unincorporated Area 2011-2035.

*Forecasted. A more recent PRC report estimates that the population in 2012 is 2035, but this WMCP uses 2,065 for consistency with City’s 2014 Draft WSMP.

Exhibit 2-1. City of Carlton Current Service Area Map and System Schematic.



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Records of Water Use

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

Methodology

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).

This report distinguishes between “raw water” and “finished water” demand. “Raw water” demand refers to water diverted from the source and “finished water” demand refers to treated water entering the City’s distribution system. For the purposes of this report, the following terms are used to describe specific values of demands:

- Average day demand (ADD) equals the total annual input (demand) divided by 365 days.
- Maximum day demand (MDD) equals the highest demand that occurs on any single day during a calendar year. It is also called the one-day MDD.
- 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.

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

Historical Water Demands

Annual Demands

Historical records of water production (referred to as demand) provided by the City were evaluated to determine water usage rates and demand fluctuations. Only data from 2010 through 2012 were used in this analysis as a result of changes made to record keeping systems and data before 2009 and data irregularities in 2009. **Exhibit 2-3** summarizes the City’s annual water demand in ADD, MDD, MMD and peaking factor. The demand is displayed as “raw water,” which is the water diverted from the source, and “finished water,” which is the treated water entering the City’s distribution system. The difference between raw water and finished water is the water used in the treatment process. For the purposes of this WMCP, the raw water

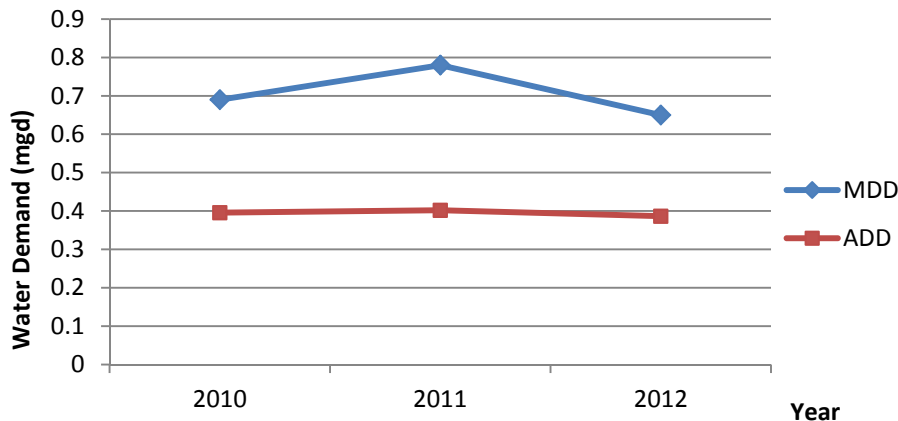
value is used for historical demand analyses and the finished water value is used for evaluating unaccounted for water. As depicted in **Exhibit 2-3**, annual raw water demand averaged 143.8 MG and annual finished water demand averaged 116.9 MG. The City’s raw water average ADD was 0.39 mgd and average MDD was 0.71 mgd.

Exhibit 2-3. Historical Annual Water Demand and Average Day Demand, Maximum Day Demand, Maximum Month Demand, and Peaking Factors, 2010-2012.

Year	Raw Water						Finished Water	
	Annual Volume (MG)	ADD (mgd)	MDD (mgd)	MMD (MG)	MMD (mgd)	Peaking Factor (MDD:ADD)	Annual Volume (MG)	ADD (mgd)
2010	143.9	0.39	0.69	17.3	0.56	1.8	119.0	0.33
2011	146.6	0.40	0.78	18.2	0.59	1.9	120.5	0.33
2012	141.0	0.39	0.65	16.7	0.54	1.7	113.5	0.31
Average	143.8	0.39	0.71	17.4	0.56	1.8	117.7	0.32
Max	146.6	0.40	0.78	18.2	0.59	1.9	120.5	0.33

Exhibit 2-4 illustrates the City’s ADD and MDD for 2010 through 2012. MDD has been somewhat variable over the past three years while ADD has remained relatively steady. The MDDs occurred in the months of July and August.

Exhibit 2-4. Average Day Demand (ADD) and Maximum Day Demand (MDD), 2010-2012.



MDD can be strongly influenced by weather patterns and the economy. Weather patterns often cause fluctuations in MDD from year to year. Weather patterns that influence MDD include: maximum temperatures, the number of consecutive days with high temperatures, when high temperatures occur in the summer, overall rainfall levels during the summer, and consecutive days without rainfall. Unusually hot and/or dry weather results in more outdoor irrigation, which increases the MDD. The economy can affect MDD, as well. Customers may choose to

irrigate less to save in an economic downturn. The economy also influences the number of new homes with landscapes needing intense irrigation for plant establishment.

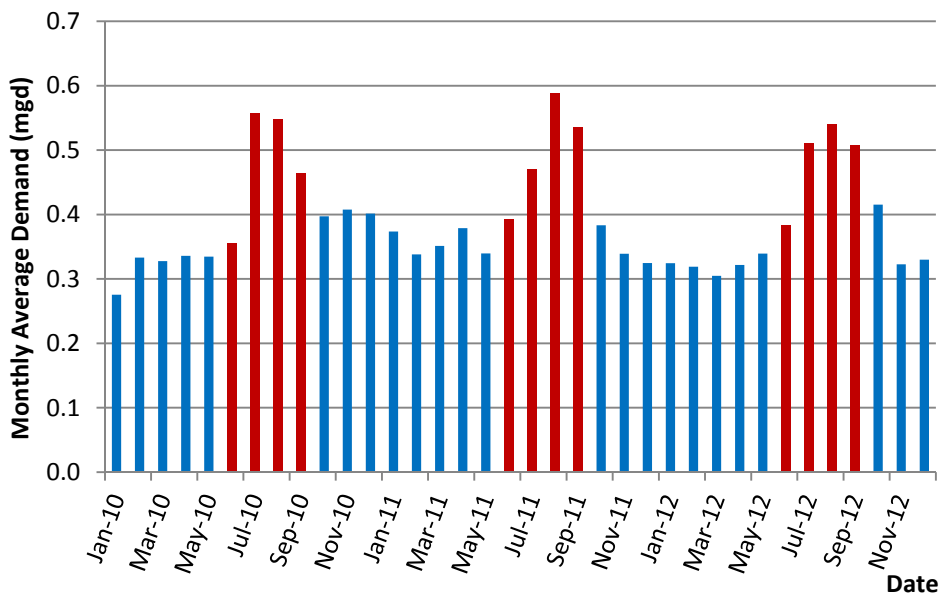
Peaking Factors

Peaking factors are the ratios of one demand value to another, and the most common and important 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 for demand forecasting. The City’s MDD data came from actual recorded values of demand. From 2010 through 2012, the City’s average peaking factor was 1.8. This value is slightly lower than the typical value for Willamette Valley water utilities, which generally ranges between 1.9 and 2.2.

Monthly Demand

Exhibit 2-5 shows monthly demand data from 2010 through 2012 expressed as an average daily demand for the month, with the peak season months of June through September in red. During this period, the highest monthly ADD recorded was 0.59 mgd in August 2011, as shown in Exhibits 2-3 and 2-5. This exhibit highlights the seasonal change in demand that the City experiences and the months with the greatest demand, July and August. Consequently, these months should be the focus of water conservation efforts.

Exhibit 2-5. Monthly Average Day Demand (mgd), 2010-2012. Red indicates peak season months (June through September) while blue indicates non-peak season months.

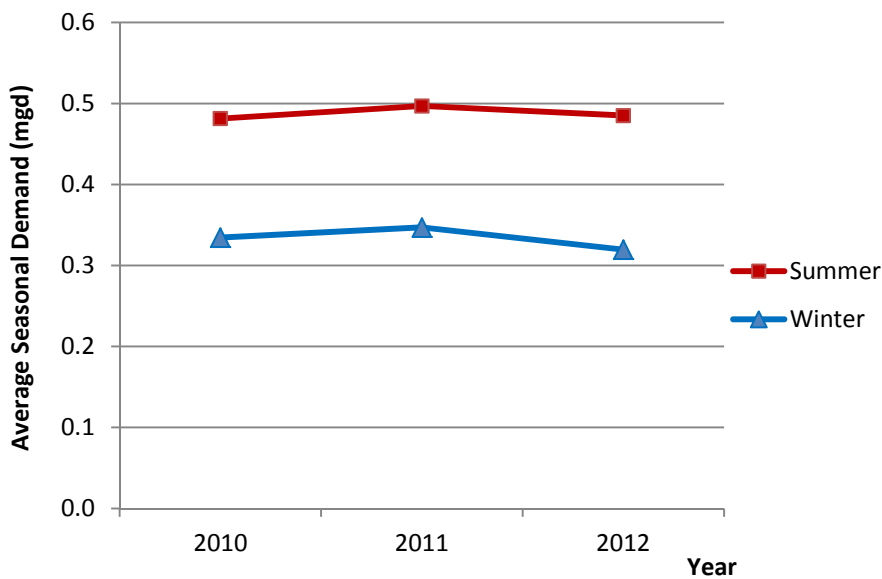


Seasonal Demands

Exhibit 2-6 shows historical monthly ADD for summer and winter seasons from 2010 through 2012. During this period, monthly ADD during the 4 summer months (June-September) ranged from 0.48 mgd to 0.50 mgd and monthly ADD during the winter months (December-March) ranged from 0.32 mgd through 0.35 mgd.

Summer production accounted for an average of approximately 41 percent of the City’s annual demand and winter demand (December-March) accounted for an average of 28 percent of the annual demand. The shoulder seasons (April through May and October through November) accounted for the remaining 31 percent of the annual demand. The City’s water demand increases substantially during the summer months as a result of outdoor water use, largely irrigation, which is typical for western Oregon utilities.

Exhibit 2-6. Historical Seasonal Demand (mgd), 2010-2012. Summer = June to September. Winter = December to March.



Authorized Consumption

Authorized consumption is equal to the metered and certain unmetered water uses within the system. All customers served by the City are metered and all known authorized water consumption is metered except for the City’s periodic use of hydrants to flush the system and the Fire Department’s use from hydrants for training or emergencies.

Customer Characteristics and Use Patterns

OAR 690-086-0140(6)

The City’s billing system classifies water users by rate codes. **Exhibit 2-7** provides a summary of water users by rate code inside and outside of the City Limits/UGB in 2012. The City

upgraded its software in mid-2008 and did not transfer customer class information due to the inability of the new billing system to distinguish between residential, commercial or industrial, and other users within the rate codes. Furthermore, the City's new billing system does not provide a simple method of updating customer class information when changes occur. Consequently, the City only has reliable consumption data from 2009 to present, is not able to describe consumption by customer category, and is only able to provide an estimate of accounts by customer class. Based on these estimates, the City had approximately 823 residential accounts (residential and rentals), 62 business accounts, and 6 city accounts for a total of 891 accounts in 2012.

Exhibit 2-7. Water User Classifications (Rate codes) Inside and Outside City Limits/UGB.

Inside City Limits/UGB		
User Classification (Rate Code)		# of Accounts
Single	(Rate Code 1)	764
Double	(Rate Code 4)	10
Triple	(Rate Code 5)	1
Quad	(Rate Code 6)	1
"15"	(Rate Code 8, Carlton Apartments)	1
"38"	(Rate Code 10, Carlton Oaks MHP)	1
"Seven"	(Rate Code 17)	3
"17"	(Rate Code 19, Elementary School)	1
Public	(Rate Code 20)	6
Inside City Limits/UGB Total		788
Outside City Limits/UGB		
User Classification (Rate Code)		# of Accounts
Single	(Rate Code 2)	99
	(Rate Code 9)	1
Double	(Rate Code 15)	1
Valley View Water District		1
Triple	(Rate Code 18)	1
Outside City Limits/UGB Total		103

Exhibit 2-8 shows annual metered consumption from 2009 through 2012. Consumption shows a slight decrease in 2010 and 2011.

Exhibit 2-8. Annual Metered Consumption, 2009-2012.

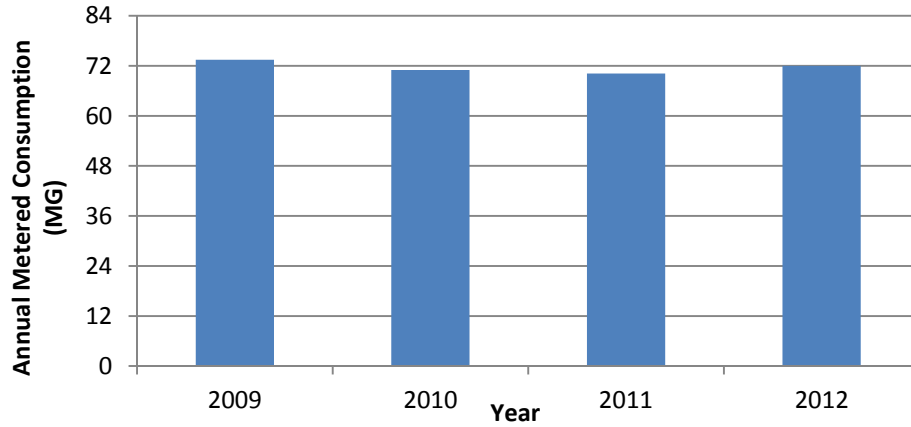
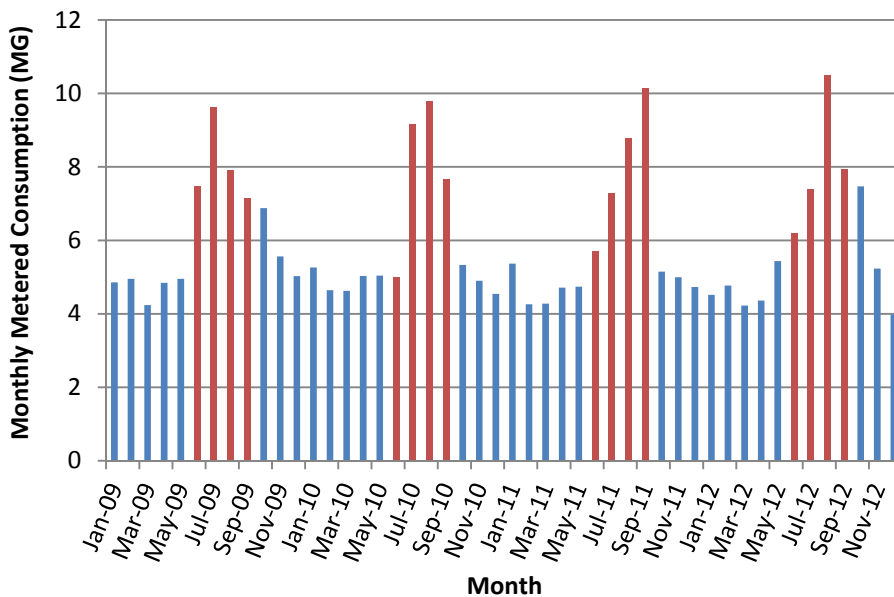


Exhibit 2-9 shows the City’s monthly metered consumption from 2009 through 2012. Consumption increases in the summer months annually, depicted in red, which is typical and likely the result of outdoor irrigation. The highest monthly consumption was 10.5 MG in August 2012.

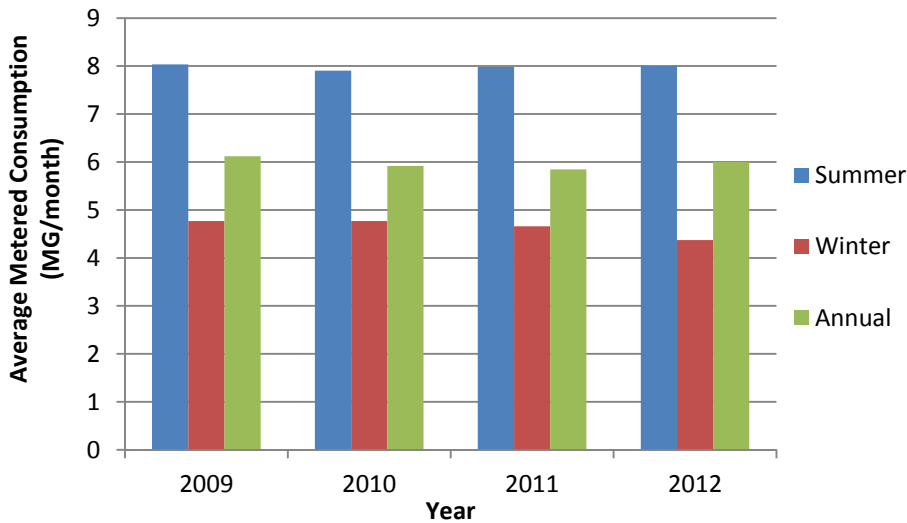
Exhibit 2-9. Monthly Metered Consumption, 2009-2012. Red indicates peak season months (June through September) while blue indicates non-peak season months.



Seasonal Water Use

Exhibit 2-10 shows the average monthly metered consumption by season from 2009 through 2012, with Summer representing June through September and Winter representing December through March. The ratio of the average from 2009 through 2012 of the City’s summer season use to winter season use was 1.7.

Exhibit 2-10. Average Seasonal Water Consumption, 2009-2012.



Largest Water Users

Exhibit 2-11 lists the City’s top 10 water consumers. These customers used 16.5 MG in 2012, which represents 15 percent of the City’s total water consumption in 2012. Focusing water conservation efforts on these customers could result in significant water savings.

Exhibit 2-11. Top 10 Water Consumers, 2012.

Facility	Volume Used (MG)
Business	5.4
Wholesale Customer	4.0
School	2.0
Trailer Park	1.4
Apartments	1.0
City Pool	0.7
Residential	0.6
Business	0.5
City Park	0.5
Residential	0.4
Total	16.5

Water Losses and Non-Revenue Water

OAR 690-086-0140(9)

Water loss, or unaccounted-for water, is comprised of the difference between the finished water produced and the water consumed, and consists of all unmetered uses and system leakage. It is important to differentiate these two categories of water loss.

Unmetered use is commonly the result of incomplete or inaccurate metering of consumer demand, including the following typical categories that may be applicable to the City.

- Unmetered or unauthorized connections
- Inaccurate or unrecorded flows for hydrant and main flushing
- Unmetered water for construction activities
- Unmetered water for operations & maintenance uses (street cleaning)
- Unmetered water for fire fighting
- Reservoir overflows
- Data collection errors

System leakage, as the name implies, is water lost due to deteriorating pipe, compromised pipe joints, service connections, valves, etc.

Exhibit 2-12 presents annual finished water demand, metered consumption, and water loss from 2010 through 2012. Average annual water loss is approximately 40 percent of demand. It should be noted that the leaks detected in the 2013 Leak Detection Survey (described in Chapter 3) and subsequently repaired by Public Works staff in July 2013 are not reflected in this analysis.

Exhibit 2-12. Historical Water Loss, 2010-2012.

Year	Finished Water Annual Volume (MG)	Annual Metered Consumption (MG)	Distribution System Water Loss (MG)	Distribution System Water Loss (%)
2010	119.0	71.0	48.0	40.3
2011	120.5	70.2	50.3	41.8
2012	113.5	72.0	41.5	36.6
Average				39.6

According to analysis in the City's 2014 Draft WSMP, approximately two-thirds of the water loss occurs within the approximately 7 mile long transmission main running from the City's water treatment plant (WTP) to the 1 MG steel reservoir. As shown in **Exhibit 2-1**, this 7-mile long transmission main is west of the City. The WSMP states that the City's 2013 leak detection survey did not identify much leakage in this section of the transmission line due to the long distances between points where a surface contact can be made directly to the waterline (i.e. service connections, valves, etc.), which made the acoustic equipment less effective at locating

and estimating the magnitude of leaks. However, analysis of metering data for the WSMP revealed a significant volume of water loss.

The distribution system east of the 1 MG steel reservoir serves the remainder of the water delivery area. The City's 2014 Draft WSMP notes that five leaks are estimated to account for approximately 11-17 MG of the 15-20 MG total estimated loss volume east of the 1 MG reservoir. Fixing those leaks (several of which were repaired in July 2013) should result in significant loss reduction, likely with a relatively small cost. At the same time, new leaks should be expected in certain portions of the transmission and distribution system east of the 1 MG water tank as a result of the age. Consequently, leakage will likely remain an ongoing issue until the older waterlines can be replaced.

Water Rights

OAR 690-086-0140(5)

The City holds a number of water rights for the use of surface water for municipal purposes. The sources include natural stream flow from Panther Creek, stored water in Panther Reservoir, Fall Creek, and the Willamette River. To date, the City holds certificated water rights to store and use 75 AF from Panther Creek Reservoir and 0.789 cfs of natural stream flow from Panther Creek. The City has partially perfected (partially certificated) two permits, Permits S-34661 and S-50218, and has 0.229 cfs and 0.052 cfs, respectively, remaining in permit status. The City holds two additional permits in the Panther Creek drainage: Permit S-32489 for up to 2.5 cfs from Panther Creek natural stream flow and Permit S-32488 for use of up to 2.0 cfs from Fall Creek. All of the above mentioned permits currently need an extension of time.

Finally, as a member of the Yamhill Regional Water Authority, 2.98 cfs of the 44.18 cfs allowed under Permit S-54792 for Willamette River water is allocated to the City.

Exhibit 2-13 provides detailed information about these municipal water rights that supply potable water through the City's municipal distribution system. These water rights also are described in more detail below.

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Exhibit 2-13. City of Carlton Water Rights.

Source	Application	Permit	Certificate	Priority Date	Type of Beneficial Use	Authorized Rate (cfs)/ Volume (AF)	Authorized Date for Completion	Maximum Rate of Withdrawal to Date		2012 Average Withdrawal		Three-Year (2010-2012) Average Withdrawal		Comments
								Instantaneous (cfs)	Annually (MG)	Daily (mgd)	Monthly (MG)	Daily (mgd)	Monthly (MG)	
Surface water														
Panther Creek	R-46504	R-5527	85744	10/22/69	Municipal	66 AF	N/A	N/A	24.4 (75 AF)	N/A	N/A	N/A	N/A	
Panther Creek	R-69512	R-10900	85747	11/30/87	Municipal	9 AF	N/A	N/A						
Panther Creek	S-1609	S-914	1868	8/12/1911	Municipal	0.50 cfs	N/A	0.50	146.6	0.39	11.8	0.39	12.0	
Panther Creek and Panther Creek Reservoir	S-46505	S-34661	86064	10/22/69	Municipal	0.271 cfs from Panther Creek/ 66AF from Panther Creek Reservoir	N/A	0.271						
Panther Creek and Panther Creek Reservoir	S-69513	S-50218	86065	11/30/87	Municipal	0.018 cfs from Panther Creek/ 9AF from Panther Creek Reservoir	N/A	0.018						
Panther Creek and Panther Creek Reservoir	S-46505	S-34661		10/22/69	Municipal	0.229 cfs from Panther Creek	10/1/1998	-	-	-	-	-	-	Extension of time pending at OWRD. Fish persistence advice from ODFW and extension conditions will likely limit the amount of natural stream flow available for use.
Panther Creek and Panther Creek Reservoir	S-69513	S-50218		11/30/87	Municipal	0.052 cfs from Panther Creek	10/1/2000	-	-	-	-	-	-	Extension of time to be developed and submitted.
Panther Creek	S-44208	S-32489		10/27/67	Municipal	2.5 cfs	10/1/1997	-	-	-	-	-	-	Extension of time application pending. OWRD proposed to approve extension of time on 11/2/2010. Protest filed by WaterWatch on 12/17/2011
Fall Creek	S-44207	S-32488		10/27/1967	Municipal	2.0 cfs	10/1/2000	-	-	-	-	-	-	Extension of time pending at OWRD. Fish persistence advice from ODFW and extension conditions will likely limit the amount of natural stream flow available for use.
Willamette River	S-87762	S-54792		11/2/2011	Municipal	44.18 cfs	1/17/2033	-	-	-	-	-	-	Up to 2.98 cfs for meeting City's demands.

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Aquatic Resource Concerns

The City has water rights authorizing the use of surface water from Panther Creek, Fall Creek, and the Willamette River. Spring chinook salmon and winter steelhead are federally listed as threatened in the Upper Willamette Evolutionarily Significant Unit (ESU), which includes the North Yamhill Watershed. Coho salmon is federally listed as threatened in the Oregon Coast ESU and the Oregon chub is federally listed as threatened in multiple ESUs. The state listing for Spring Chinook and Oregon chub is sensitive-critical, for winter steelhead is sensitive-vulnerable, and for coho salmon is endangered. Pacific lamprey and western brook lamprey are currently state listed as sensitive-vulnerable. **Exhibit 2-14** shows the listed fish species in Panther Creek and Fall Creek, and in some cases, the Willamette River within the reach of the City's point of diversion.

Exhibit 2-14. Fish species potentially found in the North Yamhill Watershed and found in the Willamette River within the reach of the City's Point of Diversion (approx. RM 59.5) listed under the Oregon Sensitive Species List or Federal Endangered Species Act.

Species	Evolutionarily Significant Unit (ESU) (if applicable)	Federal Listing	State Listing
Spring Chinook	Upper Willamette River	Threatened	Sensitive-Critical
Winter Steelhead	Upper Willamette River	Threatened	Sensitive-Vulnerable
Coho salmon	Oregon Coast	Threatened	Endangered
Oregon Chub	All	Threatened	Sensitive-Critical
Pacific Lamprey		Petitioned for Listing	Sensitive-Vulnerable
Western Brook Lamprey		-	Sensitive-Vulnerable

Sources:

North Yamhill Watershed Assessment, 2001:

<https://nrimp.dfw.state.or.us/DataClearinghouse/default.aspx?pn=viewrecord&XMLname=687.xml>

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>

[ODFW's advice on fish persistence conditions for Permits S-32488 and S-34661](#)

The point of diversion on Panther Creek is located at approximately river mile (RM) 12.9. At the authorized diversion, Panther Creek is on DEQ's 303(d) list of water quality limited streams for the following parameters: biological criteria, dissolved oxygen, and *E. coli* (Summer), temperature, and turbidity. No water quality assessment has occurred on Fall Creek.

The point of diversion on the Willamette River for Permit S-54792 is currently authorized at approximately RM 59.5 (the Yamhill River intersects the mainstem Willamette River at approximately RM 54.5). At the authorized diversion, the Willamette River is on DEQ's 303(d) list of water quality limited streams for the following parameters: aldrin, biological criteria, DDT Metabolite (DDE), DDT, dieldrin, dioxin (2,3,7,8-TCDD) (TMDL approved), *E. coli* (Fall/Winter/Spring) (TMDL approved), fecal coliform (Fall/Winter/Spring) (TMDL approved), flow modification (TMDL not required), iron, mercury (TMDL approved), PCBs, dissolved oxygen, and temperature (TMDL approved).

The 303(d) listing information was obtained from:

<http://www.deq.state.or.us/wq/assessment/rpt2010/search.asp>

Evaluation of Water Rights/Supply

OAR 690-086-0140(3)

The City's water rights and water supply reliability are influenced by priority date, stream flows in Panther Creek, potential permit extension conditions on the City's Panther Creek and Fall Creek water right permits, water system capacity, and access to redundant water supplies.

The City's primary water source is Panther Creek, tributary to the North Yamhill River. The City's natural stream flow water rights on Panther Creek are generally senior in priority date and have not been subject to regulation for senior users. There is an instream water right in the lower portion of Panther Creek held by the State of Oregon, but this water right (Certificate 72585) is junior in priority date to all of the City's Panther Creek water rights.

The main limitation with the City's Panther Creek water supply is the amount of natural stream flow available in summer (peak season demand) months. When stream flows are sufficient, the City can meet its demand largely from natural stream flows. When natural stream flows are not sufficient, the City can meet its demand with the 75 acre-feet of stored water in Panther Creek Reservoir or a combination of stored water and natural stream flow. In other words, even though the City has up to 3.57 cfs of water rights for use of Panther Creek natural stream flow, this amount of natural stream flow is generally not available during peak season demand months. For example, in July 2013 a measurement of Panther Creek (above Panther Creek Reservoir) calculated a stream flow of approximately 1.5 cfs. Over time, the City's stored water may be insufficient to meet projected demands; hence the need for alternative/redundant water supplies.

The City intends to establish a program to measure stream flows on a regular basis in Panther Creek above Panther Creek reservoir. Panther Creek stream flow data will enable the City to understand natural stream flow availability compared to water rights in Panther Creek, to inform the City of when it must rely on stored water, to inform the City how much "stored water" is being used, and to assist the City in developing a timeframe for developing other sources of supply (Fall Creek and the Willamette River via the Yamhill Regional Water Authority).

As previously described, the City has four water right permits that require additional effort to complete. The City has three permit extensions currently pending at OWRD and one that will be submitted. In February 2012, as part of the permit extension process, ODFW provided its fish persistence advice and proposed conditions for Permit S-34661, a water right permit for use of 0.229 cfs from Panther Creek, and Permit S-32488, a water right permit for use of 2.0 cfs from Fall Creek. Permit extension conditions currently proposed for permits S-34661 and S-32488 will likely restrict water diversion when stream flow falls below a particular level in Panther Creek. As a result, a portion of the water from these two sources could become unavailable earlier in the summer even though natural stream flow may be available.

A constraint on certification of the remaining Panther Creek natural stream flow permits held by the City is the City’s system capacity. On July 1, 2009, a peak day in early summer with additional operational water needs, the City collected information demonstrating the beneficial use of 2.979 cfs over a 4 hour period. Thus, of the 3.57 cfs of Panther Creek water rights, 0.591 cfs remain to be used for beneficial use, a demonstration of beneficial use in addition to all the existing water rights at the same point of diversion. When system capacity is increased, the City could demonstrate beneficial use of the unperfected portions of Permits S-32489, S-34661, and S-50218.

The City’s Fall Creek water right (Permit S-32488) and Willamette River water right via the Yamhill Regional Water Authority (Permit S-54792) are intended to provide water supply redundancy when Panther Creek and Panther Creek Reservoir are unable to meet City demand or are not usable, such as due to contamination, landslides, etc. The diversion and conveyance infrastructure for both permits have not been constructed yet. The amount of water available and the quality of the water in Fall Creek and the Willamette River will need to be understood prior to development. The future adequacy and reliability of Permit S-54792 will depend on whether permit conditions related to “flow targets” are met in the Willamette River. Permit S-54792 is conditioned so that water can only be diverted under the permit when flows fish flow targets are met or exceeded on a 7-day rolling average at the Willamette River at Salem, OR (USGS gage 14191000) as shown in **Exhibit 2-15**.

EXHIBIT 2-15. Required Fish Flow Targets in the Willamette River, Measured at Salem, Oregon (USGS Gage 14191000).

Month	Flow Target (cfs)
January 1 – March 31	6,000
April 1 – April 15	15,000
April 16 – April 30	17,000
May 1 – May 31	15,000
June 1 – 15	12,600
June 16 – 30	8,500
July 1 – October 31	5,630
November 1 – December 31	6,000

Since the early 2000s, as part of its effort to implement the Biological Opinion for the Willamette Basin Projects, (13 federal storage reservoirs in the Willamette Basin), the U.S. Army Corps of Engineers (USACE) has managed the Project reservoirs to try to meet the fish flow targets at Salem, and has been largely successful. Based on analysis of stream flow records from the USGS Gage 14191000 in Salem, fish flow targets on the Willamette River were met from 2006 to 2010, with the exception of approximately 23 days in May and June of 2007, or 99 percent of the time. Fish flow targets were met 100 percent of the time in 2012. However, in 2013, fish flow targets were missed 8 days in May and 5 days in June. Although fish flow targets are typically met, the inability to access water under Permit S-54792 when fish flow targets are not met presents a limitation on use of the Willamette River. As a result, in the long-term the City's Panther Creek and Fall Creek sources will continue to be important sources of water supply.

System Description

OAR 690-086-140(8)

The City operates a public drinking water system (Public Water System Identification Number is 4100171). **Exhibit 2-1** is a schematic of the City's existing water distribution system. The City of Carlton WTP was built in 2002 and is a direct filtration plant with a capacity of 1.2 mgd. The City has a total of 1.38 MG of storage in two storage tanks that are approximately 1 mile west of the City, which are described in **Exhibit 2-16**. The City has 62,694 feet of distribution pipes that are composed primarily of cast iron, ductile iron, and PVC. The City has 46,592 feet of transmission pipes that are composed primarily of steel. **Exhibits 2-17 and 2-18** summarize the distribution and transmission pipes, respectively.

Exhibit 2-16. Summary of system storage tanks.

Storage Tank	Volume (MG)	Over Flow Elevation (feet)	Completion Date
Steel	1	371.4	2003
Concrete	0.38	371.4	1918
Total	1.38		

Exhibit 2-17. Summary of distribution pipes.

Pipe Material	Pipe Diameter							Total
	2-inch	3-inch	4-inch	6-inch	8-inch	10-inch	12-inch	
PVC	2,757	-	713	4,496	6,375	-	-	14,341
Ductile Iron	-	-	-	1,218	7,307	5,593	1,725	15,843
Cast Iron	-	-	9,493	9,936	737	1,620	-	21,786
Galvanized Iron	1,337	-	-	-	-	-	-	1,337
Steel	-	269	580	514	-	-	-	1,363
Unknown	1,547	-	3,510	2,967	-	-	-	8,024
Total	5,641	269	14,296	19,131	14,419	7,213	1,725	62,694

Exhibit 2-18. Summary of transmission pipes.

Pipe Material	Pipe Diameter				Total
	6-inch	10-inch	12-inch	16-inch	
Ductile Iron	-	-	-	1,435	1,435
Cast Iron	-	7,887	-	-	7,887
Steel	60	7,310	29,900	-	37,270
Total	60	15,197	29,900	1,435	46,592

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3. Water 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 has been implementing water conservation measures despite staff and resource limitations. The City's water system is fully metered. The City has a monthly consumption charge based on the quantity of water metered at the service connections over 500 cubic feet. The City conducts leak detection surveys of its water system, the most recent occurring in 2013. In addition, the City provides water conservation tips and free showerheads to customers at an annual community event.

Use and Reporting Program

OAR 690-086-0150(2)

The City records its water use and has compiled and submitted these measurements to OWRD consistent with the requirements of OAR Chapter 690, Division 85.

The City measures, records and reports the amount of raw water entering the City's WTP, which has four filter cells. WTP Filter 3 and 4 each have their own propeller meter and Filter 1 and 2 have a common propeller meter. The City has an electromagnetic meter that measures finished water entering the water distribution system. The City estimates the volume of water stored in Panther Creek Reservoir.

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 currently does not conduct an annual water audit, but the City does collect daily water production and monthly metered consumption data. In 2013, the City will begin installation of Automated Meter Reading (AMR) technology, which will aid the City's water auditing efforts.

The City's water loss in 2012 was 36.6 percent. (It should be noted that the leak repairs completed by Public Works on the WTP finished water transmission line in July 2013 are not reflected in this water loss figure.) The majority of this water loss is likely attributed to leaks in the water distribution system, which are described in detail in this section under Leak Detection and Repair, as well as in Section 2 under Water Losses and Non-Revenue Water. The City's goal is to reduce water loss to 15 percent or below.

Five-Year Benchmarks: Within the next two years, the City will implement an annual water audit program that compares finished water production to metered consumption on a quarterly or more frequent basis.

2. System-wide Metering.

The City's water system is fully metered.

Five-Year Benchmarks: The City will continue to require that all new connections are metered.

3. Meter Testing and Maintenance.

The City has had a meter replacement schedule instead of regular residential meter testing. Over the past 10 years, the City has replaced 20 to 30 residential meters per year. The meters of the City's two largest commercial customers, the elementary school and Carlton Farms, are tested every two years. The City's master meters are tested only periodically due to lengthy process involved, the last test being approximately 4 years ago. For all meters, when metered consumption appears low (slow readings) or metering stops, the City replaces the meter.

Beginning in 2013, the City will start installing AMR technology in its water system. The City plans to replace 50 meters per year, such that all 950 accounts should have AMR within 10 years. AMR technology allows meter readings multiple times per day, which

will enable the City to spot meter malfunctions and leaks sooner than with a monthly reading system.

Five-Year Benchmarks: Over the next 5 years, the City will continue to annually test the elementary school and Carlton Farms meters. The City, provided adequate budget resources are available, will also annually replace up to 50 meters with AMR.

4. Water Rate Structure.

The City has a monthly water service charge (base rate) that includes use of up to 500 cubic feet (cu ft), which depends on the customer’s location inside or outside of city limits. In addition, the City has a monthly consumption charge based on the quantity of water metered at the service connection beyond 500 cu ft. **Exhibit 3-1** shows the monthly service charges including water use up to 500 cu ft and consumption charges per cubic feet beyond 500 cu ft for customers located inside and outside of city limits.

Exhibit 3-1. Monthly water service charges, effective July 1, 2012.

Location	Base Rate per EDU (0-500 cu ft)	Consumption Charge
Inside City Limits	\$40.06	\$3.30 per 100 cu ft once over 500 cu ft
Outside City Limits	\$42.75	\$3.98 per 100 cu ft once over 500 cu ft \$6.35 per 100 cu ft once over 1000 cu ft

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.

The City had a leak detection survey of its water system in 2010 and the City repaired seven leaks identified in the survey.

In March 2013, a consultant hired by the City conducted a sonic leak detection survey of the transmission main from the City’s WTP to town, water mains in town, and East Carlton Water Company. The 2013 survey found nine leaks and these leaks are estimated to cause between 12 MG and 20 MG of water loss annually; five of those leaks accounted for the majority (approximately 80 percent) of that water loss.

The survey’s water loss estimate (12-20 MG) compares well with the City’s draft 2014 WSMP’s water loss analysis of the water system between the City’s WTP and town, but the WSMP concludes that the leak detection survey underreported leaks in the 7 mile long transmission line between the WTP and finished water reservoir. This section west of the reservoir, has approximately 33 service connections along with a few valves and other components. The low number of connections and components results in long distances between points where a surface contact can be made directly to the waterline, which is the acoustic method used in sonic leak detection surveys to locate and estimate

the magnitude of leaks. Consequently, the survey only identified leaks estimated to produce losses of 0.25 to 0.5 MG per year while the WSMP estimates that as much as 33 MG of water loss is likely occurring in this part of the transmission line, based on water production and consumption data analysis.

The WSMP stated that fixing the five major leaks identified in the leak detection survey (several of which were repaired in July 2013) would likely result in significant leak reduction at a relatively small cost. However, given the age of certain portions of the transmission and distribution system east of the City's 1 MG finished water reservoir, the WSMP concluded that new leaks should be expected until the older waterlines can be replaced.

Beyond leak detection surveys every few years, the City's leak detection program consists of addressing leaks that come to the surface, which are either found by City staff or people that call in. The identified leaks are assessed, a work order is developed, and the pipeline is repaired or replaced as soon as possible.

Five-Year Benchmarks: In the next two years, if adequate budget resources are available, the City will complete the repair of the major leaks in the water system identified by the 2013 leak detection survey. In the next five years, the City will begin to address in-City leaks recommended for repair in the WSMP. In the next five years, the City will also develop a strategy to fund the replacement of transmission line between the WTP and finished water reservoir. Finally, over the next five years, the City will strive to reduce its unaccounted for water in half. Assuming resources are available, the City will dedicate \$50,000 from its annual budget towards its effort to reduce its unaccounted for water.

6. Public Education.

The City provides customers with water conservation information in its annual Consumer Confidence Report and in a brochure at City hall. The City also hosts a booth at an annual community event called Carlton Fun Days to share water conservation tips with customers and to offer them water efficient showerheads.

Five-Year Benchmarks: Over the next 5 years the City will continue its' current public education programs and develop a water conservation section on its Web site.

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.

As previously described, the City holds four water right permits that require additional effort to complete. The City has three permit extensions currently pending at OWRD and one that will be submitted. The City does not currently have any “extended permits.” Although the City is not seeking access to an extended permit, it recognizes that its water loss of 36.6 percent in 2012 (before some leaks were fixed in 2013) needs to decrease. The City’s goal is to reduce water loss to 15 percent or below. The City has been proactively implementing system-wide leak repair or line replacement program measures to reduce system leakage. As described above under Leak Detection and Repair, the City had a leak detection survey conducted on its water system in March 2013 that revealed five major leaks. The repair of these five leaks (several of which were repaired in July 2013) should likely result in significant leak reduction at a relatively small cost, according to the City’s 2014 draft WSMP. In the next two years, if adequate budget resources are available, the City will repair the remaining major leaks in the water system identified by the 2013 leak detection survey. In the next five years, the City will begin to address in-City leaks recommended for repair in the WSMP. In the next five years, the City will also develop a strategy to fund the replacement of transmission line between the WTP and finished water reservoir. The WSMP analysis concluded that leaks in the 7 mile long transmission line between the City’s WTP and finished water reservoir were responsible for 20 MG to 28 MG of water loss per year. Consequently, in the next five years, the City will investigate how to identify and address leaks in this transmission line. In addition, the City will seek to allocate \$50,000 of its annual budget over the next five years to address its unaccounted for water.

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 currently have any “extended permits”; therefore, OAR 690-086-0150(6) does not apply. However, the City has additional conservation measures it is currently implementing or plans to implement in the next five years, which are detailed below.

1. Leak Repair or Line Replacement Program

As described above, the City’s has leak detection surveys of its water system every few years, the most recent of which was March 2013. The City’s also addresses leaks that come to the surface that are found by City staff or people calling in. The City assesses the identified leak, develops a work order, and then repairs or replaces the pipeline.

Five-Year Benchmarks: In the next two years, if adequate budget resources are available, the City will complete repair of the major leaks in the water system identified by the 2013 leak detection survey. In the next five years, the City will begin to address in-City

leaks recommended for repair in the WSMP. In the next five years, the City will also develop a strategy to fund the replacement of transmission line between the WTP and finished water reservoir. Finally, over the next five years, the City will strive to reduce its unaccounted for water in half. Assuming resources are available, the City will dedicate \$50,000 from its annual budget towards its effort to reduce its unaccounted for water.

2. Technical and Financial Assistance Programs

Upon request by a customer, City staff provides a water use audit.

City Ordinance 13.04.130 states that if a leak between the meter and a building/residence is repaired within 10 days after receiving notification from the City of the leak, the customer's bill spanning the period of time with the leak will be reduced by 50 percent.

Five-Year Benchmarks: Over the next five years, the City will continue its water audit and bill reduction programs and will initiate a program to provide toilet leak detection tablets at City Hall.

3. Supplier Financed Retrofit or Replacement of Inefficient Fixtures

For the past five years, the City has provided customers with water saving showerheads at Fun Days, a community event.

Five-Year Benchmarks: Over the next 5 years, the City will continue to offer customers free water efficient faucet aerators at Fun Days.

4. Rate Structure and Billing Practices that Encourage Conservation

As described in the Water Rate Structure discussion in the section responsive to OAR 690-086-0150(4), the City has a monthly water service charge (base rate) that includes use of up to 500 cubic feet (cu ft), which depends on the customer's location inside or outside of city limits. The City also has a monthly consumption charge based on the quantity of water metered at the service connection beyond 500 cu ft.

The City bills its customers on a monthly basis, which aids water conservation efforts by providing quick feedback on water usage. The City's installation of AMR will provide even quicker feedback on water usage, greatly improving the identification and response to leaks. The City currently uses Springbook billing software to manage customer consumption. While this software is an upgrade, it does not provide a simple method of updating customer class when changes occur.

Five-Year Benchmarks: In the next 5 years, the City will determine how to set up its billing system to update customer class changes in order to analyze consumption by customer class and bill customer classes under different rate structures. In the next 5 years, the City will hire a water rate specialist to develop a report with recommendations to the City Council of water conservation pricing strategies.

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

The City currently has no water reuse, recycling, and non-potable initiatives.

Five-Year Benchmarks: In the next 5 years, the City will investigate water reuse opportunities.

6. Other Conservation Measures

The City has the following ordinance that prohibits the wasteful use of water:

- Municipal code 13.04.580 states that the City may immediately discontinue water service to a customer that violates mandatory curtailment orders or to a customer whose wasteful or negligent water use seriously affects general water service, if that water use is not corrected within five days after receiving a written notice from the City.

Five-Year Benchmarks: In the next 5 years, the City will review City codes and the building permit review process to find opportunities to encourage water conservation practices.

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4. Municipal Water Curtailment Element

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

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

Introduction

Water curtailment plans outline proactive measures that water suppliers may take to reduce demand and to find alternative supply during short-term water supply shortages. The intent of water curtailment plans is to minimize the impacts of water supply shortages, which may result from incidents such as: prolonged drought, mechanical or electrical equipment failure in the system, unanticipated catastrophic events (flooding, landslides, earthquakes and contamination), or events not under control of the water supplier (e.g., localized or area-wide power outages and intentional malevolent acts).

History of System Curtailment Episodes

OAR-690-086-0160(1)

The City originally approved water curtailment measures in 1999 and it has needed to implement curtailment measures in the past 10 years. Prior to 2002, the City implemented periodic odd/even water schedules (curtailment) due to a lack of finished water storage. However, in 2002 the City constructed a new 1 MG finished water reservoir and a 300,000 gallon finished water clear well at the City's WTP. This additional in-system storage has decreased the frequency of curtailment, nevertheless it has been required. In 2003, the City declared a Stage 4 Alert due to the combination of a power surge that caused the water treatment plan to backwash the filters continually and community water usage, which together produced a water supply shortage. In the summers of 2008/2009 the City also needed to implement curtailment measures to address a water shortage stemming from the dry conditions that year and the reduced stream flow into Panther Creek Reservoir (believed to be due to the lowering of McGuire Reservoir during dam modification construction). During this curtailment episode, the City used flyers and the newspaper to inform customers of the odd/even outdoor watering schedule.

Curtailment Event Triggers and Stages

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

The City has developed this updated curtailment plan to describe the standards and procedures that will be employed in the event of a water shortage that requires the City to invoke water curtailment. Scenarios that could trigger curtailment could include droughts, natural disasters, source water contamination, fire, lower than normal reservoir levels, or a system or facility failure.

The City has developed a five-stage curtailment plan to be invoked in the event of a water supply shortage. These stages are designed to be initiated and implemented in progressive steps. **Exhibit 4-1** presents the five curtailment stages, as well as their potential initiating conditions (i.e. triggers).

Exhibit 4-1. Curtailment Stages 1 through 5.

Curtailment Stages	Potential Initiating Conditions
Stage 1: Limited Water Shortage Alert	<ul style="list-style-type: none"> • Minor maintenance work or damage repair is required at water mains or reservoirs • A prolonged period of hot dry weather is forecasted
Stage 2: Moderate Water Shortage Alert	<ul style="list-style-type: none"> • Moderate maintenance work or damage repair is required at water pumps, mains, or reservoirs • A prolonged period of hot dry weather has begun
Stage 3: Serious Water Shortage Alert	<ul style="list-style-type: none"> • Minor damage to the water system has resulted from a natural disaster or criminal act • Prolonged period of hot dry weather is ongoing • Failure of minor parts of the water system • Source water flow is much lower than normal • Reservoir levels are much lower than normal • Finished water reservoir levels are much lower than normal
Stage 4: Severe Water Shortage Alert	<ul style="list-style-type: none"> • Serious damage to the water system has resulted from a natural disaster or criminal act • Failure of a significant part of the water system • Serious drought • Source water flow is critically low • Reservoir levels are critically low • Finished water reservoir levels are critically low • Isolated contamination of the water supply
Stage 5: Emergency Water Shortage Alert	<ul style="list-style-type: none"> • Extensive damage to the water system resulting from a natural disaster or criminal act • Failure of a critical water system component • Source water flow is unavailable • Reservoir levels are insufficient • Finished water reservoir levels are insufficient • Potentially harmful contamination of the entire water supply

Authority & Enforcement

The City's Public Works Superintendent has the authority to implement Stage 1 and Stage 2 alerts. The City's Manager has the authority to implement a Stage 3 alert and to determine and enforce reduced hours of usage for watering of lawns. By joint declaration, the City Council and City Manager have the authority to implement a Stage 4 or Stage 5 alert.

Municipal ordinance 608 "Rules for Water System (13.04)" authorizes citations and fines for customers violating curtailment restrictions. The first conviction is punishable by a fine up to \$150. The second conviction is punishable by a fine up to \$300. The third conviction is punishable by a fine of up to \$300 or by imprisonment for up to 30 days, or both.

Municipal code 13.04.580 states that the City may immediately discontinue water service to a customer that violates mandatory curtailment orders or to a customer whose wasteful or negligent water use seriously affects general water service, if that water use is not corrected within five days after receiving a written notice from the City.

Curtailment Plan Implementation

OAR-690-086-0160(4)

Stage 1: Limited Water Shortage Alert

Stage 1 is activated when the City's Public Works Superintendent determines that the potential for a water shortage exists based on the presence of one or more of the previously described triggers. In Stage 1, the City will inform customers of a growing water shortage and of mandatory odd-even day restriction by address for watering of lawns. Public notification of the curtailment stage will be distributed using at least one of the following methods: newspaper, radio, television, City website, and notices delivered to water utility customers.

Stage 2: Moderate Water Shortage Alert

Stage 2 is activated when the City's Public Works Superintendent determines that a moderate water shortage exists based on the presence of one or more of the previously described triggers. In Stage 2, the City will inform customers of the water shortage and of the following mandatory restrictions:

- No outside lawn watering
- No car washing
- No filling outside swimming pools except for the City Pool, if approved by the City Council
- No filling decorative water features, except in limited amounts necessary for maintaining aquatic animal life
- No wetting down impervious surfaces, such as sidewalks, driveways, parking lots, or other hard surfaces except to meet public health or safety requirements

The City will prohibit washing of City-owned vehicles.

Stage 3: Serious Water Shortage Alert

Stage 3 is activated when the City Manager determines that a serious water shortage exists based on the presence of one or more of the previously described triggers. In Stage 3, the City will inform customers of the water shortage and of the following additional mandatory restrictions:

- Odd-even day restriction by address for watering of gardens

The City will reduce water use for irrigation, discontinue fire system flushing activities, and cease washing down impervious surfaced areas except where necessary for public health and safety.

Stage 4: Severe Water Shortage Alert

Stage 4 is activated when the City Council and City Manager jointly determines that a severe water shortage exists based on the presence of one or more of the previously described triggers. In Stage 4, the City will inform customers of the water shortage and of the following additional mandatory restrictions:

- No watering of gardens
- Reduced hours for commercial uses of water

The City will stop issuing permits for hydrant use and establishing new residential and commercial water connections. Method(s) of public notification of the curtailment stage may also include phone/text messages, other print media, and signs.

Stage 5: Emergency Water Shortage Alert

Stage 5 is activated when the City Council and City Manager jointly determines that a severe water shortage exists based on the presence of one or more of the previously described triggers. In Stage 5, the City will inform customers of the emergency water shortage and that water use is only authorized for life support and basic household use. Public notification of the curtailment stage will be distributed using several of the methods described in earlier curtailment stages. The water emergency will be in effect until the City Council and City Manager jointly determine that the water shortage is over and an emergency situation no longer exists.

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 their 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 is expected to experience continued moderate growth in the future, generally due to its proximity to the Newberg and McMinnville areas, both of which have a comparatively larger employment base but less affordable housing than Carlton. During the 20-year planning period of this WMCP, the City anticipates future residential development to continue as both new subdivisions and as infill development (ie. partitions & redevelopment). Major commercial or industrial developments that would dramatically increase the employment opportunities in Carlton are not anticipated over the next 20 years. Anticipated future development is not expected to require an expansion of the current water delivery area over the next 20 years. The City's current and future water service area is shown in **Exhibit 2-1**.

Population Projections

OAR 690-086-0170(1)

The City's population projections only take into account population within the City Limits and Urban Growth Boundary, which are the same boundary. The population outside of the City Limits served by connections to the City's water system serve is not explicitly known. This population is connected on the basis of long-term historical circumstances and the City expects future connections to its water system outside the City Limits to be extremely limited. Thus, this WMCP assumes that water demand outside the City Limits will not increase in proportion to population growth.

The City's population projection is based on the population growth rates from the report "Population Forecasts for Yamhill County, its Cities and Unincorporated Area 2011-2035," which have been adopted by Yamhill County. The forecasts for Yamhill County's smaller cities, including the City of Carlton, are based on housing growth that incorporates current population composition and recent demographic trends. The City's housing growth rates are assumed to increase over the next decade and peak in 2025, at which point growth rates will remain steady. Housing occupancy rates are assumed to fluctuate slightly over time while the number of people per household is expected to retain relatively stable with a small, gradual decrease. The report projects an average growth rate of 1.5 percent in 2011, 1.4 percent from

2012 through 2014, 0.2 percent from 2015 through 2019, 1.5 percent from 2020 through 2024, 1.8 percent from 2025 through 2029, and 1.6 percent from 2030 through 2035. These growth rates result in a projected population of 2,375 in 10 years (2023) and 2,801 in 20 years (2033). The adopted Yamhill County coordinated populations and the associated growth rates for the City are shown in **Exhibit 5-1** and in more detail in **Appendix B (pg 58, 60, 78)**.

Exhibit 5-1. Projected Population, based on the report "Population Forecasts for Yamhill County, its Cities and Unincorporated Area 2011-2035."

Year	Projected Population
2012	2065
2023	2375
2033	2801

Demand Forecast

OAR 690-086-0170(3)

This WMCP uses the demand forecast developed by the City's 2014 draft WSMP, which uses finished water demand data to develop finished water and raw water demand projections. The City's projected water demands are based on the following assumptions:

- The ratio of residential to non-residential use (commercial, industrial and public uses) will remain constant. In other words, future commercial and industrial developments will track population growth.
- The long-term per capita water demands presented below will not exceed the City's historical averages. Since the efficacy of planned water conservation programs is unknown at this time, these water demand projections exclude conservation measures beyond those already implemented by the City.
- New commercial and industrial developments will not be large water users given that no provision has been made for new industries with heavy water demands, such as food processing or beverage production.
- Population projections are reasonable estimates of the City's future populations and that the forecasted peaking factors are reasonable estimates of future demand variations.
- Future water loss will not exceed the City's historical averages.

Historical per capita finished water demand from 2010 through 2012 was calculated by dividing finished water demand by the population then multiplying by one million and dividing by 365 days. **Exhibit 5-2** shows historical per capita demand of finished water. The average of 159 gpcd was rounded to 160 gpcd, of which 72 gpcd (45 percent of current values) will be adjusted for population growth inside city limits and 88 gpcd (55 percent of current values) will be held

steady over time when calculating future finished water demands as growth is not anticipated to increase outside of city limits.

Exhibit 5-2. Per capita finished water demand.

Year	Finished Water Demand (MG)	Population	Per Capita Demand (gpcd)
2010	119.4	2007	163
2011	120.5	2036	162
2012	113.5	2065	151
Average			159

The historical finished water peaking factor was then calculated from 2010 through 2012 for water consumption inside the City limits. **Exhibit 5-3** shows the finished water ADD and MDD based on demand from the entire system, the ADD and MDD from inside the City Limits only, and the peaking factor for demand within the City Limits only.

Exhibit 5-3. Finished water peaking factor inside City Limits.

	2010 (mgd)	2011 (mgd)	2012 (mgd)	Average (mgd)
ADD	0.327	0.33	0.311	0.323
ADD Inside City Limits Consumption*	0.144	0.142	0.149	0.145
MDD	0.527	0.655	0.561	0.581
MDD Inside City Limits Consumption*	0.245	0.309	0.345	0.299
Peaking Factor Inside City Limits	1.7	2.17	2.31	2.06

¹ADD Inside City Limits Consumption calculated from full year ratios of total consumption inside the City Limits vs. total demand.

²MDD Inside City Limits calculated from Maximum Month ratios for total consumption inside the City Limits vs. total demand for the month in which the maximum day occurred.

The projected finished water MDD was calculated by summing projected consumption inside the City Limits, projected consumption outside the City Limits, and projected water losses.

Projected consumption inside the City Limits was calculated by multiplying the projected population by the adjusted per capita finished water demand of 72 gpcd and then multiplying that value by the average historical finished water peaking factor (2.06). Only the consumption

inside the City Limits was adjusted for population growth. The projected consumption outside the City Limits was held constant.

The projected consumption outside the City Limits of 0.095 mgd was calculated by multiplying the 2012 population of 2065 by 160 gpcd and then multiplying that value by 15 percent, which is the percentage of billed consumption outside City Limits.

The projected total losses was estimated by multiplying the 2012 population of 2065 by 160 gpcd and then multiplying that value by the approximate percentage of total consumption attributed to water losses. The WSMP uses 40 percent water losses and this WMCP assumes that water losses will be reduced to 20 percent for the 10 year and 20 year projections. The City’s goal is to reduce water loss to 15 percent or below, but the City is using 20 percent water losses in the event that the aggressive water loss goal is not fully achieved within the 20 year planning period.

Finally, the projected raw water MDD was calculated by multiplying the projected finished water demand by 1.22, given that approximately 18 percent of the raw water entering the City’s WTP goes to WTP operations (backwashing, system flushing, etc). **Exhibit 5-4** shows projected finished water and raw water MDD using the 40 percent water loss estimate, and **Exhibit 5-5** shows projected finished water and raw water MDD using the 20 percent water loss estimate.

Exhibit 5-4. Projected finished water and raw water MDD, with 40 percent water losses.

Year	2012	2023	2033
Population	2065	2375	2801
Consumption Inside City Limit (mgd)	0.306	0.352	0.415
Consumption Outside City Limit (mgd)	0.095	0.095	0.095
Water Losses (mgd)	0.132	0.132	0.132
Total Finished Water MDD (mgd)	0.533	0.579	0.642
Total Raw Water MDD (mgd)	0.65	0.71	0.78
Total Raw Water MDD (cfs)	1.01	1.09	1.21

Exhibit 5-5. Projected finished water and raw water MDD, with 20 percent water losses.

Year	2012	2023	2033
Population	2065	2375	2801
Consumption Inside City Limits (mgd)	0.306	0.352	0.415
Consumption Outside City Limits (mgd)	0.095	0.095	0.095
Water Losses (mgd)	0.132	0.066	0.066
Total Finished Water MDD (mgd)	0.533	0.513	0.576
Total Raw Water MDD (mgd)	0.65	0.63	0.70
Total Raw Water MDD (cfs)	1.01	0.97	1.09

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 has 0.789 cfs in certificated water rights being 0.5 cfs (Certificate 1868), 0.271 cfs (Certificate 86064), and 0.018 cfs (Certificate 86065). In combination with its Panther Creek water rights permits, the City has authorization for up to 3.57 cfs of natural flow from Panther Creek.

While projections based on metered demand may suggest a MDD in 2033 of 1.09 to 1.21 cfs, these projections do not account for typical municipal operational requirements. These operational requirements can include but are not limited to maintaining full levels in finished water reservoirs and distribution lines to replenish water supply for fire protection and meeting anticipated and unanticipated demand. On July 1, 2009, in meeting municipal demands, the City documented the diversion and beneficial use of its 0.789 cfs of certificated water rights and 2.19 cfs of permit S-32489, for a total of 2.979 cfs. **Exhibit 5-6** presents the July 1, 2009 meter readings.

Exhibit 5-6. City of Carlton Water Treatment Plant Capacity Meter Readings, July 1, 2009.

Time	Filter Unit 1 & 2		Filter Unit 3		Filter Unit 4		
	Totalizer × 1000 gal	Rate gpm	Totalizer × 100 gal	Rate gpm	Totalizer × 100 gal	Rate gpm	
9:30 AM	222702	414	3370472	524	3501413	518	
10:30 AM	222727	390	3370807	489	3501756	512	
11:30 AM	222746	386	3371070	461	3502038	505	
12:30 PM	222768	366	3371346	433	3502350	501	
1:30 PM	222787	371	3371598	415	3502646	498	Totals
Production Rate (gpm)	354.2		469.2		513.8		1337.1
Production Rate (cfs)	0.7891		1.0453		1.1446		2.979

Therefore, upon approval of its extension of time for Permit S-32489 the City will seek a certificate for the 2.19 cfs portion of Permit S-32489 beneficially used to date. Upon perfecting 2.19 cfs of Permit S-32489, the City will have approximately 0.591 cfs remaining in permit status. Although projected (metered) demand for these remaining Panther Creek permits is theoretically many years out, similar to permit S-32489, the City estimates that operational needs will likely require their full beneficial use much sooner. Over the next 10 years, the City is planning to upgrade a large water main outside of town and to replace other water mains that will enable the City to meet current and future fire flow needs, as well as additional demand by

large water users, such as wineries. Interest in developing wineries has been expressed to the City, but water system capacity for fire flows has been too low to meet safety standards, and thereby, allow building to occur. In addition, the City will need a new finished reservoir in 20 to 25 years based on current demand projections, a need which could be accelerated once the water mains are replaced and fire flows are sufficient for development of wineries and other industries. The reservoir would likely be a 1 MG storage tank that would provide enough storage to replace the City's concrete reservoir and provide additional storage. The City will likely need to occasionally maintain that reservoir on a peak day and will need to replenish fire flow storage. Finally, the City's WTP will need to be upgraded in approximately 30 years, at which point system capacity will be available and operational needs will be increased, requiring the use of additional Panther Creek water right permits for meeting municipal demands. Consequently, assuming there is adequate stream flow in Panther Creek, the City estimates it will fully beneficially use the undeveloped portions of Permits S-32489, S-34661, and S-50218 by 2043.

The City also has water right permits on Fall Creek and on the Willamette River that can provide water supply redundancy when Panther Creek has insufficient flows to meet City demand or is not usable. The City intends to fully beneficially use the 2.0 cfs authorized under Permit S-32488 as a redundant supply upon completing the required construction of infrastructure. The City is currently considering whether construction is financially feasible; however, it is unlikely this redundant supply will be developed during the 20-year planning period of this WMCP.

As a member of the Yamhill Regional Water Authority, 2.98 cfs of the 44.18 cfs allowed under Permit S-54792 for use of the Willamette River is allocated to the City. The diversion, regional WTP, and other necessary infrastructure for Permit S-54792 remain to be built, which will take many years and makes access to the City's 2.98 cfs under the permit uncertain during a considerable portion of the 20-year planning period of this WMCP. To the extent this supply becomes available, it will likely be used as a redundant supply source and a source to meet peak season demands when Panther Creek stream flows are inadequate.

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. As described above, upon receiving an extension of time for permit S-32489, the City intends to seek a certificate for 2.19 cfs. The following subsections analyze the extent to which the projected water needs can be met through other alternatives.

(a) Conservation Measures

As described in Section 3, the City has been implementing water conservation measures to increase water conservation by its customers and it plans to continue its conservation program

activities and to monitor water use by customers. The largest conservation opportunity for the City is the reduction in water loss due to leaks. The 20-year demand projection in this WMCP assumes water loss will be cut in half. While this water conservation measure and others proposed by the City may delay the need for future additional surface water under permits S-32489, S-34661, and S-50218, the City has demonstrated the beneficial use of 2.19 cfs under permit S-32489 for municipal use. Therefore, increased water use under Permit S-32489, in addition to conservation, will be required to provide the water needed to meet the City's municipal water demands during the next 20 years.

(b) Interconnections

As described in Section 2, the City has interconnections with Valley View Water District and East Carlton Water Company to serve their customers water, as well as an interconnection with MWL for emergency purposes. In addition, the City has an IGA with neighboring water providers (MWL, Dayton, and Lafayette) to manage a water right for use of Willamette River water to meet their respective future water supply needs.

The need for Willamette River water by neighboring water suppliers is primarily based on the need for additional supplies by those communities. These communities do not have sufficient water supplies to meet the City's long-term future water demands through interconnections not related to the Willamette River. Consequently, additional interconnections with other water suppliers do not meet the City's need to develop all of its water rights to meet future water demands and to increase its system redundancy in the long term.

(c) Cost effectiveness

OAR 690-086-170(c) requires an assessment of whether the projected water needs can be satisfied through other conservation measures that would provide water at a cost that is equal or less than the cost of other identified sources.

As described above, conservation and interconnections cannot prevent the City's need to use Permit S-32489 and cannot prevent the need to provide system redundancy in the long-term. Given that the City's WTP has sufficient capacity to meet the City's demands over the next 20 years, and the City has demonstrated the use of 2.19 cfs under permit S-32489 to meet municipal demands, use of Permit S-32489 is the most cost effective option for helping the City meet its future water demands.

Quantification of Projected Maximum Rate and Monthly Volume

OAR 690-086-0170(6)

OAR 690-086-0170(6) requires a quantification of the maximum rate of withdrawal and maximum monthly use if any expansion or initial diversion of water allocated under an existing permit is necessary to meet demands in the 20-year planning horizon. Within the next 20 years, the City is planning to beneficially use up to 2.19 cfs under Permit S-32489 to help meet its projected water demands and municipal water system operational needs. Assuming that the

water right is used at its 2.19 cfs (1.42 mgd), 24 hours per day for 31 days during the maximum month (likely July, assuming adequate stream flow is available) the maximum monthly volume for the water right would be approximately 44.0 MG.

Mitigation Actions under State and Federal Law

OAR 690-086-0170(7)

Under OAR 690-086-0170(7), for expanded or initial diversion of water under an existing permit, the water supplier is to describe mitigation actions it is taking to comply with legal requirements of the Endangered Species Act, Clean Water Act, and other applicable state or federal environmental regulations. The City currently is not required to take any mitigation actions under state or federal law related to the City's water rights permits.

New Water Rights

OAR 690-086-0170(8)

Under OAR 690-086-0170(8), if a municipal water supplier finds it necessary to acquire new water rights within the next 20 years in order to meet its projected demand, an analysis of alternative sources of the additional water is required. The analysis must consider availability, reliability, feasibility and likely environmental impacts and a schedule for development of the new sources of water. As shown above, the City's Panther Creek natural flow water rights are sufficient to meet projected demands during the next 20 years, assuming adequate stream flow is available for appropriation. However, it is likely, in the future, that during peak demand months (when natural stream flows are typically inadequate) the City will fully utilize its stored water and the City will need additional/redundant supply. This future additional/redundant supply is anticipated to come from existing City permit S-32488 for use of Fall Creek and Permit S-54792 for use of the Willamette River. Consequently, the City currently has no plans to acquire additional water rights during the 20-year planning period for this WMCP.

Appendix A

Letters to Local Governments and Comments



August 25, 2014

Michael Brandt
Department of Planning and Development
Yamhill County
525 NE 4th Street
McMinnville, OR 97128

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

Dear Mr. Brandt:

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

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

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

If you have any questions, please feel free to contact me at 541-753-0745 x201. Thank you for your interest.

Sincerely,
GSI Water Solutions, Inc.

A handwritten signature in blue ink, appearing to read "Adam Sussman", is written over the typed name.

Adam Sussman
Principal Water Resources Consultant

Enclosure

cc. Chad Olsen, City of Carlton



August 25, 2014

Aneta Synan
Mid-Willamette Valley Council of Governments
100 High St. SE, Ste. 200
Salem, OR 97301

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

Dear Ms. Synan:

We understand that the City of Carlton contracts with the Mid-Willamette Valley Council of Governments for Planning Services, such as interpretation of comprehensive plans, which is why we are contacting you about the City of Carlton's Draft Water Management and Conservation Plan (WMCP).

The City of Carlton developed this Draft WMCP to fulfill the requirements of Oregon Administrative Rule Chapter 690, Division 86 of the Oregon Water Resources Department. Under these rules, the water supplier shall make its Draft WMCP available for review by affected local governments, such as the City of Carlton in this case, and seek comments relating to consistency with the local governments' comprehensive land use plans. Enclosed is a CD of the City's Draft WMCP for your review.

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

If you have any questions, please feel free to contact me at 541-753-0745 x201. Thank you for your interest.

Sincerely,
GSI Water Solutions, Inc.

A handwritten signature in blue ink, appearing to read "Adam Sussman", with a long horizontal flourish extending to the right.

Adam Sussman
Principal Water Resources Consultant

Enclosure



August 25, 2014

Yamhill Regional Water Authority c/o Kem Carr
McMinnville Water & Light
P.O. Box 638
McMinnville, OR 97128

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

Dear Kem:

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

Given the relationship between the City of Carlton and the Yamhill Regional Water Authority, we are providing you a courtesy copy of the WMCP. If you have any comments, please provide them to me within 30 days from the date of this letter. You may send your comments to me at the address on this letterhead or e-mail them to me directly at: asussman@gsiws.com.

If you have any questions, please feel free to contact me at 541-753-0745 x201. Thank you for your interest.

Sincerely,
GSI Water Solutions, Inc.

A handwritten signature in blue ink, appearing to read "Adam Sussman", is written over the typed name.

Adam Sussman
Principal Water Resources Consultant

Enclosure

cc. Chad Olsen, City of Carlton

Yamhill County

DEPARTMENT OF PLANNING AND DEVELOPMENT

525 NE 4TH STREET • McMINNVILLE, OREGON 97128

Phone: (503) 434-7516 • Fax: (503) 434-7544 • Internet Address: <http://www.co.yamhill.or.us/plan/>

GSI Water Solutions Inc.
Attn: Adam Sussman
1600 SW Western Blvd., Suite 240
Corvallis, OR 97333

September 12, 2014

Dear Mr. Sussman:

I have reviewed the Draft Water Management and Conservation Plan for the City of Carlton. The plan is very thorough and appears to be consistent with the Yamhill County Comprehensive Plan. I do have two observations that I believe are worth noting.

On page 5-4, under the heading Demand Forecast (OAR 690-086-0170(3)), *“The WSMP uses 40 percent water losses and this WMCP assumes that water losses will be reduced to 20 percent for the 10 year and 20 year projections.”* 20 percent water loss seems to be a bit on the high side and not in keeping with State requirements for reductions in water loss. You may want to expand your response to include language that the City of Carlton’s ultimate goal is to work towards reducing water losses to 15 or 10 percent.

On page 5-8, under the heading New Water Rights (OAR 690-086-0170(8)), *The City currently in not required to take any mitigation actions under state or federal law related to the City’s water rights permits.”* You may want to include language that should the City of Carlton were to expand its diversion of water the City shall seek consultation with Fish and Wildlife, NOAA and DEQ.

Please do not hesitate to call me if you have any questions.

Sincerely,



Mike Kemper
Planning Assistant

Appendix B

Population Forecasts for Yamhill County, its Cities
and Unincorporated Area 2011-2035

Population Forecasts for Yamhill County, its Cities and Unincorporated Area 2011-2035

**Prepared by:
Population Research Center
College of Urban and Public Affairs
Portland State University**

October 2012



Populations for Yamhill County, its Cities, and Unincorporated Area												
AREA	Historical →					Forecast →						
	2000*	2010	2011	2012	2015	2020	2025	2030	2032	2035		
Amity	1,481	1,623	1,635	1,650	1,719	1,779	1,879	1,984	2,026	2,097		
Carlton	1,514	2,007	2,036	2,065	2,080	2,247	2,465	2,669	2,757	2,890		
Dayton	2,244	2,708	2,731	2,762	2,835	3,021	3,266	3,520	3,625	3,765		
Dundee	2,642	3,162	3,210	3,259	3,437	3,772	4,185	4,592	4,764	4,985		
Lafayette	2,586	3,742	3,745	3,802	4,018	4,394	4,874	5,349	5,552	5,797		
Sheridan	5,581	6,164	6,228	6,296	6,417	7,276	7,573	8,366	8,488	8,657		
Willamina (Yamhill County portion only)	1,128	1,180	1,180	1,182	1,223	1,285	1,336	1,375	1,395	1,426		
Willamina (full)	1,859	2,046	2,055	2,063	2,112	2,179	2,243	2,295	2,321	2,361		
Yamhill	805	1,024	1,037	1,050	1,150	1,217	1,285	1,352	1,377	1,403		
Unincorporated Yamhill County ²	22,187	22,467	22,510	22,630	22,919	23,436	23,150	23,418	23,336	23,338		

*Population for 2000 is allocated to current boundaries.

¹Populations are allocated by Census block and include urban growth boundaries (UGBs) where applicable; current boundaries supplied by Yamhill County are used in the calculations.

²The unincorporated figures exclude current city limits and UGBs as supplied by Yamhill County.

Avg. Annual Growth Rate	Historical →		Forecast →					
	2000-2010	2010-2011	2012-2015	2015-2020	2020-2025	2025-2030	2030-2035	
AREA								
Amity	0.9%	0.7%	1.4%	0.7%	1.1%	1.1%	1.1%	
Carlton	2.8%	1.5%	0.2%	1.5%	1.8%	1.6%	1.6%	
Dayton	1.9%	0.8%	0.9%	1.3%	1.6%	1.5%	1.3%	
Dundee	1.8%	1.5%	1.8%	1.9%	2.1%	1.9%	1.6%	
Lafayette	3.7%	0.1%	1.8%	1.8%	2.1%	1.9%	1.6%	
Sheridan	1.0%	1.0%	0.6%	2.5%	0.8%	2.0%	0.7%	
Willamina (Yamhill County portion only)	0.5%	0.0%	1.1%	1.0%	0.8%	0.6%	0.7%	
Willamina (full)	1.0%	0.4%	0.8%	0.6%	0.6%	0.5%	0.6%	
Yamhill	2.4%	1.3%	3.0%	1.1%	1.1%	1.0%	0.7%	
Unincorporated Yamhill County ¹	0.1%	0.2%	0.4%	0.4%	-0.2%	0.2%	-0.1%	

¹The unincorporated figures exclude current city limits and UGBs as supplied by Yamhill County.

Amity (+UGB)	Pop	# Ave Ann Pop Growth	% Ave Ann Pop Growth	% Pop 65+	% Pop Hisp	HH	Hsg Units	# Ave Ann Hsg Growth	% Ave Ann Hsg Growth	Opcncy Rate	Average HH Size	GQ pop	Births	Schl Enrl*
2000	1,481			8.7%	11.5%	473	497			95.2%	3.13	0	10	876
2010	1,623	14	0.9%	7.9%	15.4%	540	576	8	1.48%	93.8%	3.01	0	17	840
2011	1,635	12	0.7%			540	576	0	0.00%	93.7%	3.03	0		
2012	1,650	15	0.9%			545	581	5	0.91%	93.7%	3.03	0		
2015	1,719	23	1.4%			564	597	5	0.89%	94.4%	3.05	0		
2020	1,779	12	0.7%			587	621	5	0.81%	94.4%	3.03	0		
2025	1,879	20	1.1%			623	660	8	1.20%	94.4%	3.01	0		
2030	1,984	21	1.1%			662	701	8	1.21%	94.4%	3.00	0		
2032	2,026	21	1.1%			678	718	9	1.21%	94.4%	2.99	0		
2035	2,097	24	1.1%			704	746	9	1.24%	94.4%	2.98	0		

*Total public school enrollment in school district(s) in which area is located (Amity 4J).

Carlton	Pop	# Ave Ann Pop Growth	% Ave Ann Pop Growth	% Pop 65+	% Pop Hisp	HH	Hsg Units	# Ave Ann Hsg Growth	% Ave Ann Hsg Growth	Opcncy Rate	Average HH Size	GQ pop	Births	Schl Enrl*
2000	1,514			9.2%	4.6%	537	577			93.4%	2.81	0	5	1,309
2010	2,007	49	2.8%	9.1%	6.0%	669	768	19	2.86%	91.4%	2.86	0	15	1,144
2011	2,036	29	1.5%			697	742	-26	-3.39%	93.9%	2.92	0		
2012	2,065	29	1.4%			707	753	11	1.41%	93.9%	2.92	0		
2015	2,080	5	0.2%			734	786	11	1.42%	93.4%	2.83	0		
2020	2,247	33	1.5%			800	857	14	1.73%	93.4%	2.81	0		
2025	2,465	44	1.8%			883	945	18	1.97%	93.4%	2.79	0		
2030	2,669	41	1.6%			969	1,037	18	1.85%	93.4%	2.76	0		
2032	2,757	44	1.6%			1,005	1,077	20	1.86%	93.4%	2.74	0		
2035	2,890	44	1.6%			1,059	1,134	19	1.73%	93.4%	2.73	0		

*Total public school enrollment in school district(s) in which area is located (Yamhill-Carlton 1).