City of Toledo

LINCOLN COUNTY, OREGON

Water Master Plan Update

February 2017

Civil West
Engineering Services, Inc.

REGISTERED PROFESSIONAL ENGINEER
83524PE
OREGON
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MATTHEW D. WADLINGTON
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Table of Contents

Executive Summary

The City of Toledo owns and operates a water system with in-service components dating back to the 1930's. The City provides water to residential, commercial, and industrial customers within the 2630-acre Urban Growth Boundary (UGB) and is a wholesale supplier of treated water to the Seal Rock Water District. The City is defined as a "wholesale system" and the District defined as the "purchasing water system" per OAR 333-061-0020.

The City's previous Water System Master Plan was completed in 2010. Portions of the previous master plan recommended improvements have been completed. However, significant hurdles, including cost and environmental concerns, have delayed initiation of other needs. Water treatment plant, storage, and transmission improvements have been completed since the past Master Plan. To reevaluate the current situation considering the regulatory issues and rules in place today, and to refine improvement needs and a Capital Improvement Plan, a new Water System Master Plan was needed. This Master Plan investigates the needs within the current UGB plus areas encompassing the raw water supply and transmission facilities for a 20-year period into the future, ending in the year 2036.

The estimated service population of 9,260 persons (2016 figure) is projected to grow to 11,779 persons by the year 2036. The growth projections are based on a 0.7% average annual growth in Toledo to increase the population from 3,514 to 4,041 and a 1.5% average annual growth in Seal Rock to increase its population from 5,745 to 7,738.

According to the 2010 Toledo Economic Opportunities Analysis, The City of Toledo has significant available land for future industrial development. Projected water needs from industrial uses vary significantly depending on the industry. For this reason, this report recognizes the possibility of industrial growth but evaluates required infrastructure improvements based solely on anticipated domestic growth. Any significant water demand from industrial growth will require an individual analysis of the supply, treatment, and storage capacities available.

Water Demand

Current Water Demand

Production records from 2015 show that 330 million gallons of treated water was produced at the Toledo Water Treatment Plant. Billing data for the years 2011 – 2015 shows that an average of 52% of all water sold went to the Seal Rock Water District.

The average daily demand for 2015 was 0.90 million gallons per day (ADD=0.90 mgd). The maximum day demand for 2015 was 1.71 million gallons per day (MDD=1.71 mgd).

Based on treatment plant records, (the 5-year average totals 2011-2015) of the 314 million gallons produced per year; 10 million is used for backwashing the filters at the plant, 225 million gallons goes to metered water sales, and 79 million gallons is unaccounted water. The 5-year average unaccounted water totals 26% of water produced.

Future Water Demand

Water demand projections over the planning period are estimated by multiplying the current per capita demand numbers by the projected future population estimates. The ADD is projected to increase to 1.17 mgd while the MDD is projected to increase to 2.21 mgd.

20-Year Water Demand Design Values

Toledo 2036 Data		4,041	persons
Unit	ADD	MDD	PHD
gpd	560,000	1,061,000	2,240,000
P.F.	1.00	1.89	4.00
gpcd	139	263	396
Seal Rock 2036 Data		7,738	persons
Unit	ADD	MDD	PHD
gpd	606,000	1,150,000	2,424,000
P.F.	1.00	1.90	4.00
gpcd	78	149	396
Combined 2036 Data		11,779	persons
Unit	ADD	MDD	PHD
gpd	1,166,000	2,211,000	4,664,000
P.F.	1.00	1.90	4.00
gpcd	99	188	396

Based on the 20-year water demand projections, supply and treatment facilities must be designed to handle 2.21 mgd or 1,530 gpm. In the current configuration, the supply, treatment and storage systems are adequate for the design period.

Existing Water System

Water Supply

The sources of raw water supply for the City are the Siletz River and Mill Creek. Water Rights held by the City on the Siletz River date back to 1929. Water Rights held by the City on Mill Creek date back to 1911. Mill Creek includes a dam built around 1965 with a reservoir providing 250 acre-feet of storage. Due to seasonal variations in water quality, Mill Creek is used in winter months when turbidity in the Siletz is high, and the Siletz is used in summer when algae blooms degrade Mill Creek water quality and Mill Creek flows are inadequate. Stream flows in Mill Creek drop low enough during summer periods that even with the storage behind the dam; it is unlikely that Mill Creek alone could supply the entire system for prolonged periods in the summer. Water rights are adequate for the planning period and beyond.

Both sources require significant amounts of piping to convey water to town. The Mill Creek transmission piping is approximately 5.3 miles long. The Siletz River transmission piping is approximately 6.4 miles long. Water from the Mill Creek Reservoir flows by gravity to the 47+ year old Mill Creek pump station in town which then lifts the water to the treatment plant. The Siletz pump station on the bank of the Siletz River pumps water all the way to the treatment plant.

The building and electrical components of the Mill Creek Raw Water Pump Station are in good condition but the 50-year-old pumping equipment is undersized for the planning period and past its expected life.

The Mill Creek transmission piping is in poor condition and is too small to properly convey the planning period design flows. Most of the piping is 67-year-old asbestos cement (AC) and much lies in inaccessible areas including wetlands, buried creek crossings, eroded original construction alignments through forest, and even under buildings. Repairs to the Mill Creek piping are required on a regular basis.

The Siletz River transmission piping is in good condition, and recently a section of 57-year-old AC piping submerged under the Olalla Reservoir was replaced.

Water Treatment

The Toledo Water Treatment Plant is in good condition and the major components have sufficient capacity for the planning period. The 1976 plant is a conventional treatment plant consisting of chemical addition, rapid mix, dual-stage flocculation, sedimentation, and mixed-media gravity filtration. Instrumentation and controls improvements were constructed in 1999 along with the installation of new filter media in 2000. The anthracite was replaced in 2013. Current flows through the plant range from 850 to 1,200 gpm.

A cleaning and condition assessment was conducted on the concrete clearwell in December of 2009. At that time, it was suggested that the City should: “Perform a regular cleaning, inspection and repair cycle every 2-3 years in order to ensure superior water quality and proper maintenance of coating condition and appurtenances is performed." After the 2010 Master Plan, contact time testing was done on the clearwell and found that the contact time was 111 minutes, which is more than adequate.

Treated Water Storage

The City has 3.35 million gallons (MG) of treated water storage provided by three steel storage tanks.

The Ammon Road Storage Tank is a 1.00 MG welded steel tank constructed in the 1970s. The tank is 30 feet tall and has a water surface elevation of 300 feet matching that in the plant clearwell tank. The Ammon Road Storage Tank coating is over 32 years old and past the expected coating life. The tank interior and exterior should be refurbished soon. The exterior coating still has good adhesion and likely can be overcoated. The interior was reported to be significantly corroded during inspections 17 years ago, and will need to be sand-blasted and fully recoated.

The Graham Street Storage Tank is a 0.45 MG tank built in 1968. The tank has a water surface elevation of 240 feet. The tank exterior was repainted in 2008 and is in good condition however some isolated areas of delamination are occurring. The interior was reported to be significantly deteriorated during inspections 20 years ago, and will need to be sand-blasted and fully recoated. Due to the age of the tank, lead-based paint on the interior should be anticipated which will significantly increase the cost of the repainting project.

The newest storage tank is a 1.90 MG glass fused to steel tank built in 2014 named the Skyline Drive Storage Tank. This tank has a water surface elevation of 398 feet.

Distribution System – Pressure Zones

The City's water piping system consists of over 35 miles of piping with 33% of the total being raw water piping.

The system is separated into three pressure zones including:

- Main intermediate pressure zone (hydraulic grade of 300 feet) controlled by the water surface in the clearwell and Ammon Road Tank
- Low-level pressure zone (hydraulic grade of 240 feet) controlled by the water surface in the Graham Street Tank
- High-level pressure zone (hydraulic grade of 400 feet) controlled by the water surface in the Skyline Drive Tank

Improvement Needs

Water Supply

Replacement and repair of the aging raw water supply infrastructure is the City's most challenging and expensive water system need. Without the ability to supply raw water to the treatment plant, the entire remainder of the water system becomes useless.

As recommended in a 2002 report specifically prepared to address raw water transmission needs; this Master Plan also recommends complete replacement of the 67-year-old Mill Creek Raw Water Transmission Piping and Pump Station. The 2002 Raw Water Transmission System Replacement and Rehabilitation Preliminary Design Report by Lee Engineering looked at several alignment alternatives and included an Environmental Review Report by Adolfson Associates, Inc. to estimate environmental impacts to the various alternatives. The recommended alternative based on accessibility, environmental impacts, and cost is to reconstruct the pipe on a new route along improved roadways. The estimated cost for the Mill Creek supply project is $11.3 million.

Various alternatives for the Siletz River supply were investigated in the 2010 Plan, including two options utilizing the Olalla Reservoir as potential raw water storage. Based on feasibility and cost, the recommended option was to reconstruct the Siletz River Intake/Pump Station at or near its current location and to replace only the section of transmission piping which lies under the Olalla Reservoir. The Siletz pump station and intake were completed in 2015.

Water Treatment

The existing water treatment plant is well operated and maintained and should remain in service for the planning period. A plant capacity of 1,530 gpm is needed to meet the planning period demands and all primary components of the existing plant (flocculation volume, sedimentation area, and filtration area) are adequate to allow flows to be increased to 1,530 gpm. Currently, the treatment plant is rated for a maximum flow rate of 2,080 gpm.

Maintenance items at the water plant should include a maintenance program to exercise and maintain all valves. The cost of a valve maintenance program at the water treatment plant is estimated to be $2,500 annually. The clearwell should also be refurbished to seal the cracks and prevent further corrosion of the interior reinforcing steel.

Treated Water Storage

The storage goal is to provide storage for 3 average days of water demand plus equalization volume (to account for the regular daily fluctuation in tank level) plus fire storage. For the schools and other significant commercial structures, fire storage equal to at least 3,500 gpm for 3 hours is recommended. It is recommended that the City provide storage for City needs alone rather than for the needs of the City plus Seal Rock. Based upon the stated 2036 storage goal; a total of 1.98 million gallons (MG) of storage in the water system is needed for the City.

Both the Ammon Road and Graham Street tanks need to be recoated. The Ammon Road tank should be recoated on the interior and exterior. The Graham Street tank should be recoated on the interior only. Sand-blast to bare metal and full recoat is recommended for the interiors. Special provisions for lead-based paint removal should be anticipated for the Graham St. Tank.

To minimize costs, these projects should take place during dry summer months. The estimated project cost to refurbish both existing tanks is $494,000.

Distribution System

Computer hydraulic modeling was conducted on the entire distribution system in 2010. Per OAR, the system must maintain at least 20 psi at all service connections (at the property line) at all times, even during fire flow events. In addition, at least 40 psi is typically desirable at any structure during normal peak flows but is not expected during fire flows. Piping deficiencies noted on the 2010 plan have been corrected. It is recommended that system modeling be redone to confirm that the distribution system upgrades have been effective.

Capital Improvement Plan

The various improvements recommended in the Master Plan are prioritized and separated into two phases of work as shown below. The total cost for all improvement in the Capital Improvement Plan (CIP) is $11.8 million. Costs for improvements due to industrial growth are outside of the scope of this report and are not included in the CIP.

Water CIP - Phase 3			*Potential Cost Share Distribution*	
Item	*Description*	*Opinion of Probable Project Cost*	*Toledo Share*	*Seal Rock Share*
S2	Ammon Rd. Storage Tank Refurbishment	$318,000	$318,000	$0
S3	Graham St. Storage Tank Refurbishment	$176,000	$176,000	$0
		$494,000	**$494,000**	**$0**

Water CIP - Phase 4			*Potential Cost Share Distribution*	
Item	*Description*	*Opinion of Probable Project Cost*	*Toledo Share*	*Seal Rock Share*
WS3	Mill Creek Pump Station and Transmission Piping	$11,300,000	$5,650,000	$5,650,000
		$11,300,000	**$5,650,000**	**$5,650,000**

CAPTIAL IMPROVEMENT PLAN

		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Mill Creek Transmission Line & Pump Station Project																						
WS3	**Phase 1 Design**		$271,200																			
	Phase 1 Transmission Line & Pump Station			$1,988,800																		
	Phase 2 Design				$271,200																	
	Phase 2 Transmission Line & Pump Station					$1,988,800																
	Phase 3 Design						$271,200															
	Phase 3 Transmission Line & Pump Station							$1,988,800														
	Phase 4 Design								$271,200													
	Phase 4 Transmission Line & Pump Station									$1,988,800												
	Phase 5 Design										$271,200											
	Phase 5 Transmission Line & Pump Station											$1,988,800										
Water Storage Tank Projects																						
S2	**Predesign**		$12,720																			
	Design			$25,440																		
	Ammon Rd. Refurbishment				$279,840																	
S3	**Predesign**					$7,040																
	Design						$14,080															
	Graham Street Refurbishment							$154,880														
	Fiscal Year Totals:		**$283,920**	**$2,014,240**	**$551,040**	**$1,995,840**	**$285,280**	**$2,143,680**	**$271,200**	**$1,988,800**	**$271,200**	**$1,988,800**										

Financing

Based on 2011 - 2015 water sales records, the average single-family dwelling uses an average of 3,970 gallons of water per month. Under the existing rate structure this average home has a monthly water bill of $46.07 ($0.012 per gallon). Funding agencies often use a value of 7,500 gallons per month as the normal residential use. Under the current rate structure, the average residential rate per EDU then becomes $61.78 for 7,500 gallons ($0.008 per gallon).

Revenue of $1,586,000 was generated through water sales in the last fiscal year. Of that total, $388,000 (24%) resulted from wholesale water sales to the Seal Rock Water District. Seal Rock currently pays a wholesale rate of $0.00335 per gallon.

To qualify for grant assistance for any water system improvements it is likely that water rates must first reach a level such that a bill of around $42 or more per month occurs for a residential 5/8-inch meter using 7,500 gallons. Currently the bill for a 5/8" meter using 7,500 gallons would be greater than $42, so grant monies should be available for funding CIP projects. Other options for funding municipal capital improvements include General Obligation (GO) Bonds and Revenue Bonds.

Funding assistance for municipal water improvements in Oregon primarily comes through programs administered through the Infrastructure Finance Authority (IFA) – which formerly was known as the Oregon Economic and Development Department (OECDD) – and USDA Rural Development Rural Utilities Service (RUS). Programs through IFA include Block Grants, the Safe Drinking Water Revolving Loan Fund, Special Public Works Fund, and Water/Wastewater Financing. Federal money is available with grant and loans through RUS. Each program has various advantages and disadvantages and various requirements. To determine which programs are available to the City for any specific project or projects, a "One-Stop" financing meeting should be conducted once this Master Plan is adopted and a decision to move forward on specific improvements is made. The One-Stop meetings are held in Salem once per month and it is recommended that this step be initiated as soon as possible after Master Plan adoption.

1 Introduction

1.1 Background and Need

1.1.1 Water System Background

The city of Toledo is in Lincoln County, Oregon approximately 6 miles inland from Newport on the Oregon Coast. The town is accessed off Highway 20 which runs from Newport to Corvallis. The City water system serves residential, commercial, and industrial customers through approximately 1,350 water service connections. The study area is described in section 2.

In the 1860s, logging and mining attracted settlers to the area with the Yaquina River and Bay used as easy transport. In 1896 Toledo became the County Seat of Lincoln County. In 1910 the Port of Toledo was officially opened with the formation of a Port Commission with the shipping of rock, timber and other goods creating healthy growth. The City's oldest water right (Certificate No. 905) is on Mill Creek and has a priority date of January 14, 1911. This water right certificate allows for the withdrawal of 5.0 cubic feet per second (cfs) from Mill Creek.

With the entry of the U.S. into the World War I in 1917, and the significant supply of Sitka spruce needed to build aircraft, Toledo's population boomed as the U.S. Army began building a large sawmill on Depot Slough. Early records describing the town water system center on the need for water to supply the large Sitka spruce mill and the City in 1918 during the war. An additional 10.0 cfs water right (Certificate No. 9040) on Mill Creek was obtained in 1919 coinciding with the construction of a small 6-foot-tall wooden dam and 12-inch piping to serve the government saw mill and town. Records in the Monthly Bulletin of the Spruce Production Division and the Loyal Legion of Loggers and Lumbermen (Vol. 2, No. 2, Oct. 1918) describe 50 men trenching for the water piping and the ongoing construction of the dam.

With continued growth, the small storage provided with the wooden dam on Mill Creek, and likely water quality issues in summer months, the City began to look to the Siletz River for additional future water supply and in 1929 a 4.0 cfs permit (Permit No. S9370) was issued. A water intake structure was constructed along with over 6 miles of piping to deliver water to the town.

In 1938, a concrete storage tank was constructed on top of a hill in town and water was pumped directly to the tank without treatment. At some point chlorination was added. This lack of filtration resulted in several feet of sediment in the concrete tank accumulating over time. The now 78-year old concrete tank functions as the clearwell adjacent to the water treatment facility today.

The original 12-inch wooden pipe from Mill Creek to town was replaced with 12-inch asbestos cement pipe in around 1950. In 1968, the Graham Road Storage Tank and the current Mill Creek Raw Water Pump Station were constructed along with various distribution piping improvements. Construction on the current 65-foot-tall Mill Creek Dam also was completed around 1968 in approximately the same location as the original timber dam constructed by the Army. The current raw water piping from the Mill Creek Pump Station to the 1938 concrete storage tank was primarily constructed in the 1960s and 1970s. Much of the Siletz River raw water piping was also replaced in the 1970s.

In 1972 the city of Toledo coordinated with the Seal Rock Water District to utilize the Siletz River as a mutual water source and to construct an intertie between the two communities with treatment occurring in Toledo. This long-range water supply plan was approved by the Lincoln County Board of Commissioners in 1974. The two communities then split the costs and constructed the 1979 Toledo Water Treatment Plant (WTP), some improvements to the Siletz River raw water piping, and the Seal Rock intertie pipeline and pumping station. The SRWD forfeited water rights on smaller coastal streams to obtain water rights on the Siletz River. Water Use Permit No. S40277 with a priority date of February 28, 1973 was issued to the SRWD allowing for withdrawal of 2.6 cfs from the Siletz River. The SRWD permit on the Siletz River is junior to the instream water rights and therefore could be restricted during low streamflow periods. The city of Toledo has 5.75 cfs of water rights on the Siletz which are senior to the instream water rights.

The 37-year old water plant received updates to instrumentation and controls in the year 2000 along with some piping improvements and new filter media. Today, including the Seal Rock

Water District, this plant serves a growing population of 9,260 persons, requiring on average almost 1 million gallons of water per day.

1.1.2 Need for Plan

Almost 7 years have elapsed since the analysis work was done for the 2010 Master Plan. Phases one and two of the 2010 Water Master Plan CIP have been completed, however significant issues remain regarding raw water supply. Large expense and difficult environmental protection challenges will be faced with past recommended raw water supply improvements. The raw water supply improvement work has not been undertaken to date. At this point, the City considers it prudent to reevaluate overall system needs and to complete a new 20-year Water System Master Plan in accordance with OAR 333-061-0060(5).

The city of Newport completed a new Water System Master Plan in 2008. The Seal Rock Water District has completed a separate Water System Master Plan in 2010. Seal Rock obtains water from Toledo and the city of Newport has a water piping intertie with Seal Rock which is normally closed. Certainly, there is a benefit from both Toledo and Seal Rock having concurrent and up-to-date water system planning due to their direct connection. There may also be some benefit in the future with the city of Newport having a similar planning timeline as Seal Rock and Toledo.

1.1.3 Plan Authorization

The City contracted with Civil West Engineering Services, Inc. on August 3, 2016 to complete this Plan and to provide other engineering services.

1.1.4 Past Studies and Reports

- Master System Master Plan, 2010 – Civil West Engineering Services, Inc.
- Master System Master Plan, 1999 – KPFF Consulting Engineers
- Raw Water Transmission System Replacement and Rehabilitation, 2002 – Lee Engineering, Inc.
- Sanitary Survey Deficiency Summary Report, 2008 – Bill Goss, DHS Drinking Water Program

1.2 Study Objective

The purpose of the Water System Master Plan is to furnish Toledo with a comprehensive planning document that provides engineering assessment of system components and guidance for future planning and management of the water system over the next 20 years.

Principal plan objectives include:

- Description and mapping of existing water system
- Prediction of future population and water demands
- Creation of digital hydraulic model based on available mapping
- Evaluation of existing water system components
- Evaluation of the capability of the existing system to meet future needs and regulations
- Recommendations for improvements needed to meet future needs and/or address deficiencies
- Background provisions to support updated water system SDCs

This Plan details infrastructure improvements required to maintain compliance with State and Federal standards as well as provide for anticipated growth. Capital improvements are presented as projects with estimated costs to allow the District to plan and budget as needed.

1.3 Scope of Study

1.3.1 Planning Period

The planning period for this Water System Master Plan must be at least 20 years in accordance with OAR 333-061-0060(5)(b) and OAR 690-086-0170. The period must be short enough for current users to benefit from system improvements, yet long enough to provide reserve capacity for future growth and increased demand. Existing residents should not pay an unfair portion for improvements sized for future growth, yet it is not economical to build improvements that will be undersized in a relatively short period of time. The end of the planning period for this Master Plan is the year 2036, or 20 years from the completion of the Plan.

1.3.2 Planning Area

The Master Plan planning area is that contained within the Toledo Urban Growth Boundary (UGB), as well as the immediate area surrounding water system components outside the boundary, such as the raw water intakes and transmission piping. The area within the UGB includes approximately 2,630 acres. Additional information and maps for the planning area are presented in section 6.

1.3.3 Work Tasks

In compliance with Drinking Water program standards, this plan provides descriptions, analyses, projections, and recommendations for the water system over the planning period. The following elements are included:

- Study area characteristics, including land use and population trends and projections
- Description of the existing water system including transmission, storage and distribution
- Existing regulatory environment including regulations, rules and plan requirements
- Current water usage quantities and allocations
- Projected water demands
- Existing system capacity analysis and evaluation
- Improvement alternatives and recommendations with associated costs
- A summary of recommendations with a Capital Improvement Plan
- Funding options
- Maps of the existing system
- Recommended improvements

1.4 Acknowledgments

Various members of the City Staff have contributed efforts to ensure complete information and proper planning of the community's water system needs. Water treatment operators, water distributions staff, billing records personnel, the public works director and the city manager have all helped to complete this effort. We wish to acknowledge and thank the following persons in particular:

- Craig Martin, City Manager
- Polly Chavarria, Finance Director
- Arlene Inukai, Planner
- Ric Saavedra, Water Plant Senior Operator
- Caleb Stokes, Junior Water Plant Operator

2 Study Area

2.1 Physical Environment

2.1.1 Planning Area Location

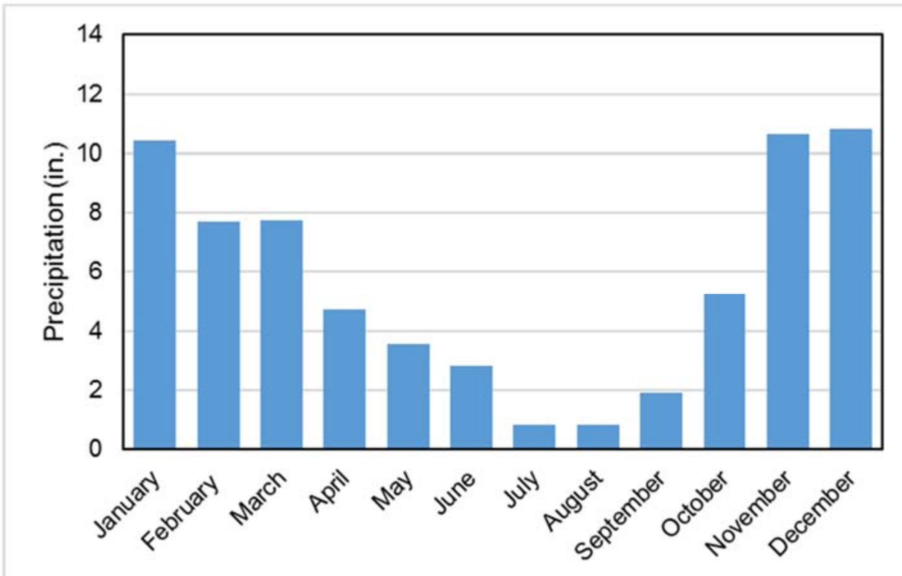
The city of Toledo is located in Lincoln County Oregon approximately 7 miles east from the city of Newport and the Yaquina Bay, and approximately 130 miles southwest of Portland. The town is located at 44°37’18”N, 123°56’14”W in Township 11S, Range 10W. The Urban Growth Boundary (UGB) extends from the Yaquina River in the south to Highway 20 in the north. The current UGB Boundary encompasses 2,629 acres or 4.1 square miles. The city limits encompass 1,497 acres or 2.3 square miles.

This Master Plan planning area is primarily that contained within the Toledo Urban Growth Boundary (UGB). A map detailing the UGB and main town area can be seen in section 6.4.1. A larger area map showing the town and the two raw water supply source locations is shown in section 6.1.1.

2.1.2 Climate

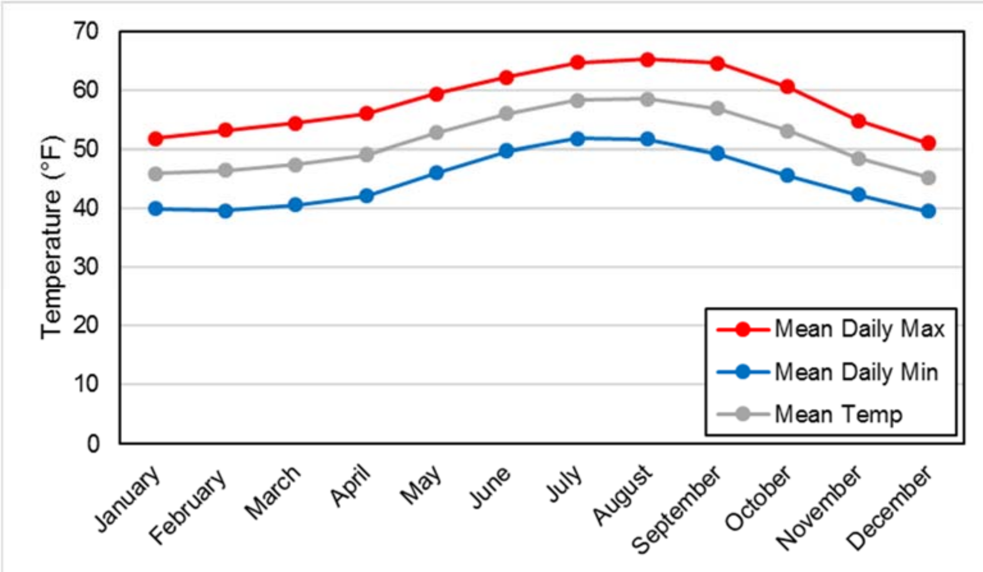
Climate data from 1981-2010 was obtained using records collected at the Newport, OR Station (GHCND: USW00024285) as reported by the National Centers for Environmental Information (NCEI). The Newport Station is the closest weather recording station to the City of Toledo.

Average annual precipitation is approximately 67-inches in Newport. Record low and high precipitation years recorded were 43-inches in 1944 and 111-inches in 1968. The maximum recorded 24-hour rainfall was 4.99-inches on November 19, 1996. Between 1981 and 2010, an average of 47% of the annual precipitation occurs in November, December, and January. Snowfall is rare with most years recording little or no snowfall; however, record annual snowfall of 11-inches was reported in 1942-43 and again in 1972-73. The mean annual snowfall during the period from 1930 to 2007 is 1.02-inches. No statistically significant increasing or decreasing trend in annual rainfall is evident. Based on the NOAA Atlas 2, Volume X Isopluvial maps, the 5-year storm 24-hour rainfall for Toledo is 4.5 inches.



Precipitation Normals, NCEI 1981- 2010

The average annual temperature in Newport ranges from 45 to 58°F with an annual mean of 51°F. A record high temperature of 100°F was recorded on July 11, 1961. A record low temperature of 1°F was recorded on December 8, 1972. August is statistically the warmest month with a mean of 58°F while December is the coldest with a mean of approximately 45°F.



Temperature Normals, NCEI 1981-2010

2.1.3 Land Use

Land use within Toledo is a mixture of residential, commercial, recreational, and industrial. It is the only inland coastal community in Oregon with a deep-water channel provided by the Yaquina River along the south part of town. Once home to the largest spruce sawmill in the world, Toledo still has significant industrial resource land along the river and Depot Slough. The largest employer is the Georgia Pacific Corporation paperboard mill.

2.1.4 Floodplains

Areas within the City are within the 100-year floodplain. Floodplain areas occur along the river and sloughs.

2.1.5 Wetlands

Several wetland designations occur in the city along the river and sloughs. Most of the designated wetland area within the City is along Olalla Slough. Of special concern are the significant wetland areas outside the UGB crossed by the old raw water transmission piping from the Mill Creek source making access today for maintenance or repairs difficult or impossible.

2.1.6 Cultural Resources

According to the National Register of Historic Places, three historical sites are listed for Toledo as shown in Table 2.1.6. No other historical sites or structures are listed.

Lincoln County is part of the Siletz Service Area of the Confederated Tribes of Siletz Indians. Areas around Yaquina Bay and River were once home to the Yaquina Tribe (now included in the Siletz Tribe). Areas around Alsea Bay and River were once home to the Alsea Tribe (also now included in the Siletz Tribe). Several remnants of tribal settlements in the area have been discovered including fishing-weirs at Yaquina Bay at the Ahnkuti site (near Toledo).

Table 2.1.6 – Archaeological and Historic Sites

Historic Property/Site Name	Street Address	Period of Significance	Listed Date	NR Number
The Ahnkuti Site (Fishing Site)	~	500-1900 AD	2001	01000133
Pacific Spruce Saw Mill Tenant Houses	146-192 NE 6th St.	1900-1949	1999	99000602
St. John's Episcopal Church	110 NE Alder St.	1925-1949	1990	90001510

2.1.7 Biological Resources

Biological resources in the area include numerous fish, birds and mammals. Fish species include white sturgeon, steelhead, flatfishes, coho, chinook salmon, chum salmon. Marine mammals in the area downriver include California sea lions, harbor seals, and the threatened northern sea lion. Biological habitat in the area includes tidal and forest habitat.

2.1.8 Coastal Resources

The Oregon Coastal Zone roughly includes all land west of the crest of the Coast Range. The entire planning area is therefore within the Coastal Zone. Coastal resources in the area include coastal and marine habitat, tidal wetlands, commercial and sport fisheries, the Yaquina Bay deep draft estuary, and tourism related to the beach.

2.2 Population

2.2.1 Historic and Existing Population

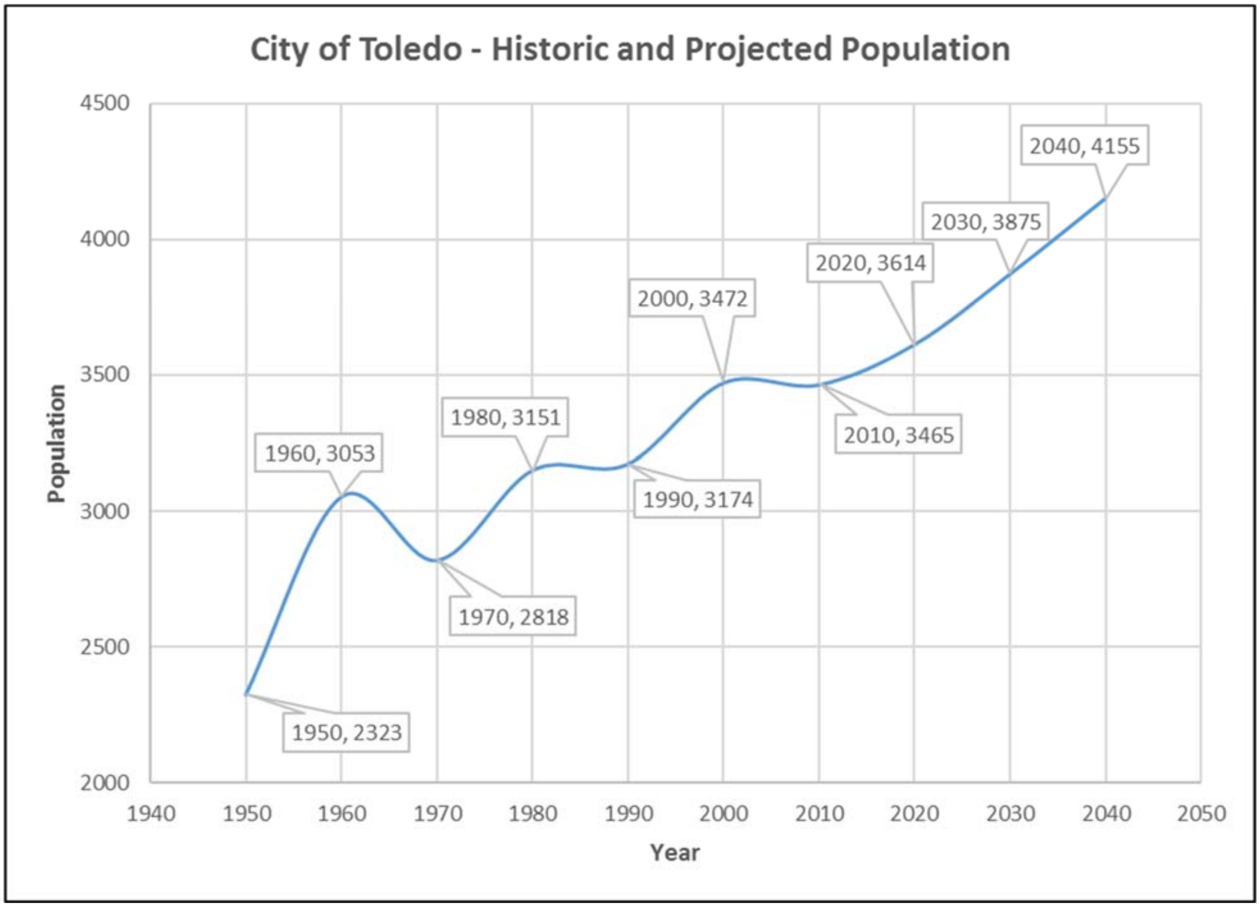
Per US Census data, the City of Toledo population increased from 2,818 in 1970 to 3,465 in the year 2010. The most recent estimate available at the time of this writing is 3,490 persons based on Portland State University's Population Research Center (PSU PRC) for the July 2015 certified population of Toledo. From 1970 to 2010 the average annual growth rate in Toledo was 0.52%. For this report, a conservative AAGR of 0.7% will be used for Toledo. Toledo's 2016 population is estimated at 3,514.

The SRWD 2014 Water Management and Conservation Plan indicates an average annual growth of 1.5% in the SRWD. Both population and historical water demand projections for the SRWD will also be "grown" at an AAGR of 1.5% in this report. For this report, we will use the peak summer season population estimate from the 2014 WMCP of 5,177 in the year 2009. Applying the 1.5% AAGR, brings the 2016 SRWD population to 5,745.

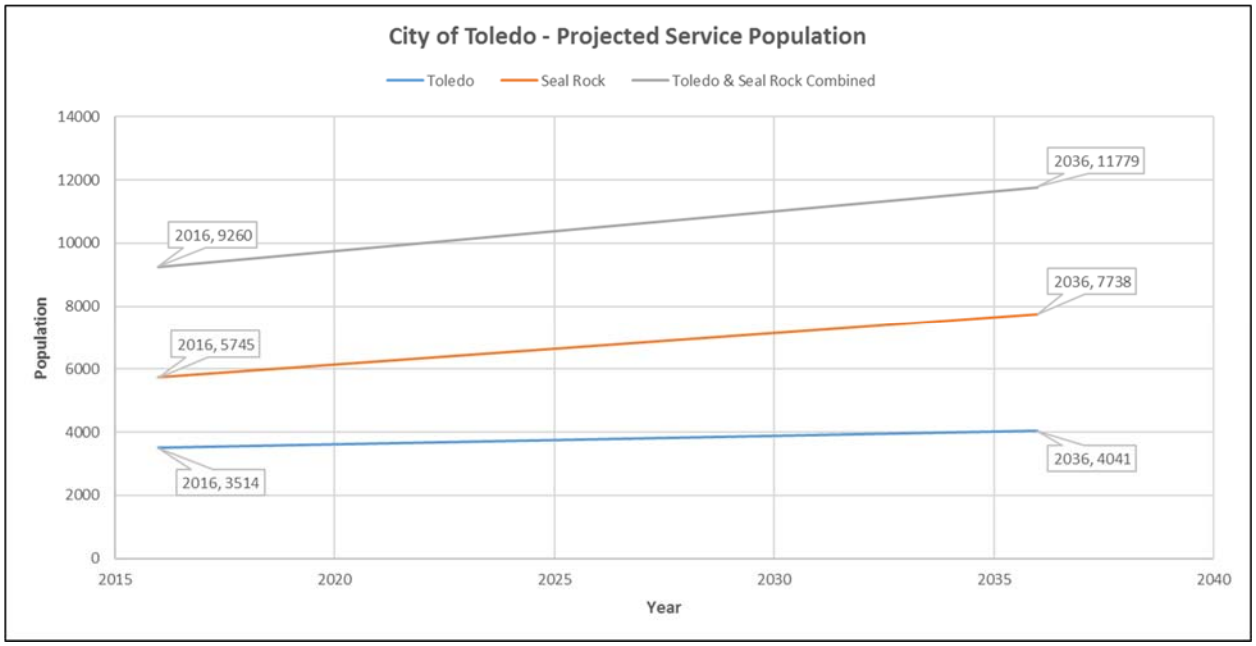
Combining the current estimated population of Toledo plus the current estimated population of the Seal Rock Water District results in a 2016 service population estimate of 9,260 persons.

2.2.2 Projected Population

The Oregon Office of Economic Analysis long-term population forecast (as updated March 2013) indicates an average annual population increase of 0.56% for Lincoln County from 2016 to 2036. This is the growth rate experienced by Lincoln County based on estimates from the PSU PRC for 2014-2015. To be conservative, an average annual growth rate of 0.7% was adopted for this plan.



Toledo Historic and Projected Population



Service Population Growth Projections

For the 20-year planning period ending in the year 2036, the estimated population is 4,041 persons in Toledo and 7,738 persons in Seal Rock based upon a 0.7% growth rate in Toledo and a 1.5% growth rate in Seal Rock.

Based on data from the 2010 US Census showing an average of 2.60 persons per occupied housing unit, an average of approximately 10 new, occupied housing units per year would be required to accommodate projected population growth in Toledo over the planning period.

Service Population Growth Projections

Year	Toledo Population (0.7% AAGR)	SRWD Population (1.5% AAGR)	Total Population
2010	3370	5255	8624
2011	3393	5333	8727
2012	3417	5413	8831
2013	3441	5495	8936
2014	3466	5577	9043
2015	3490	5661	9151
2016	3514	5745	9260
2017	3539	5832	9371
2018	3564	5919	9483
2019	3589	6008	9597
2020	3614	6098	9712
2021	3639	6190	9829
2022	3665	6282	9947
2023	3690	6377	10067
2024	3716	6472	10188
2025	3742	6569	10311
2026	3768	6668	10436
2027	3795	6768	10563
2028	3821	6869	10691
2029	3848	6972	10820
2030	3875	7077	10952
2031	3902	7183	11085
2032	3929	7291	11220
2033	3957	7400	11357
2034	3985	7511	11496
2035	4012	7624	11636
2036	4041	7738	11779

3 Water Demand Analysis

3.1 Definitions

System water demand is the quantity of water that must enter the system in order to meet all water needs in the community. Water demand includes water delivered to the system to meet the needs of consumers as well as water used for firefighting and system flushing, and other unaccounted water. Additionally, virtually all systems have a certain amount of leakage that cannot be economically removed and thus total demand typically includes some leakage. The difference between the amount of water metered and sold and the total amount delivered to the system is referred to as unaccounted water. Unaccounted water is discussed later in this section. Water demand varies seasonally with the lowest usage in winter months and the highest usage during summer months. Variations in demand also occur with respect to time of day. Diurnal peaks typically occur during the morning and early evening periods, while the lowest usage occurs during nighttime hours.

The objective of this section is to determine the current water demand characteristics and to project future demand requirements that will establish system component adequacy and sizing needs. Water demand is described in the following terms:

Average Annual Demand (AAD) - The total volume of water delivered to the system in a full year expressed in gallons. When demand fluctuates up and down over several years, an average is used.

Average Daily Demand (ADD) - The total volume of water delivered to the system over a year divided by 365 days. The average use in a single day expressed in gallons per day.

Maximum Day Demand (MDD) - The largest volume of water delivered to the system in a single day expressed in gallons per day. The water supply and treatment facilities should be designed to handle the maximum day demand.

Peak Hourly Demand (PHD) - The maximum volume of water delivered to the system in a single hour expressed in gallons per day or gallons per minute. Distribution systems should be designed to adequately handle the peak hourly demand or maximum day demand plus fire flows, whichever is greater. During peak hourly flows, storage reservoirs supply the demand in excess of the maximum day demand.

Demands described above, expressed in gallons per day (gpd), can be divided by the population or Equivalent Dwelling Units (EDUs) served to come up with a demand per person or per capita which is expressed in gallons per capita per day (gpcd), or demand per EDU (gpd/EDU). These unit demands can be multiplied by future population or EDU projections to estimate future water demands for planning purposes.

3.2 Current Water Demand

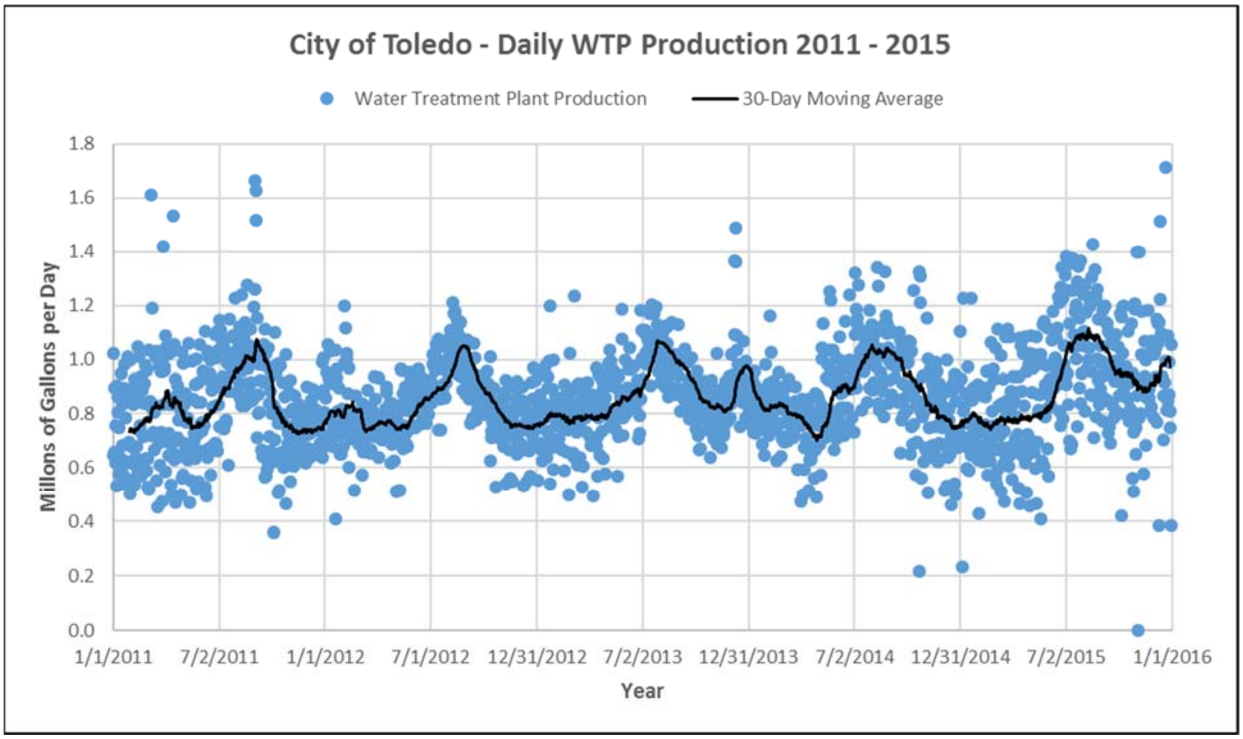
3.2.1 Treatment Plant Records

Daily plant records for January 1, 2011 through December 31, 2015 show a daily production range of 0.22 MG to 1.71 MG to meet overall system demand including that of the Seal Rock Water District. In 2015, on average 0.90 MG is treated daily. The maximum day demand was 1.71 MG in 2015.

Table 3.2.1-1 – Toledo Treatment Plant Water Production Data 2011 - 2015

Demand	2011	2012	2013	2014	2015
ADD (gallons per year)	302,126,000	303,580,000	318,995,000	315,298,000	329,910,300
ADD (gpd)	827,742	829,454	873,959	863,830	903,864
MMD (gpd)	990,742	1,047,484	1,061,613	1,036,871	1,094,710
MDD (gpd)	1,663,000	1,210,000	1,488,000	1,343,000	1,714,000
MMD Peaking Factor	1.20	1.26	1.21	1.20	1.21
MDD Peaking Factor	2.01	1.46	1.70	1.55	1.90
Unit	2015 ADD	2015 MMD	2015 MDD	2015 PHD	
gallons per day	903,864	1,094,710	1,714,000	3,615,455	
Peaking Factor	1.00	1.21	1.90	4.00	
gpcd	99	120	187	395	

Daily Water Production, Toledo Water Treatment Plant 2011 - 2015



Approximately 60% of annual water need is taken from the Siletz River. The remaining 40% of the annual water needed is taken from the Mill Creek Reservoir in the winter and spring months. The Siletz is used in the summer due to algae blooms in Mill Creek as compared to high water quality in the Siletz during the summer. Mill Creek is used in the winter due to high turbidity in the Siletz and relatively high water quality in Mill Creek in the winter.

3.2.2 Seal Rock Demand

The Seal Rock Water District (SRWD) obtains all its system water through a single pipeline conveying treated water from the City of Toledo. Seal Rock is the “purchasing water system” and Toledo is the “wholesale system” as defined in OAR 333-061-0020. A master meter records the quantity of water sent to and purchased by the SRWD. Average annual demand (AAD) for the SRWD over the last 3 years is 119.3 million gallons.

3.2.3 Current Demand Summary

Based on the water demand records discussed and shown graphically in previous parts of this section and the population estimates discussed in section 2, the following water demand summary applies to the system for conditions occurring from 2011 - 2015. As would be expected, per capita demand values are higher in Toledo than in Seal Rock due to larger commercial and industrial use in Toledo versus primarily residential use in Seal Rock.

For the 2016 MDD of 1.74 mgd, the current raw water supply as well as the treatment plant capability should be at least 1,200 gpm.

Table 3.2.3-1 – Current Water Demand Summary

Toledo 2016 Data		3,514	persons
Unit	ADD	MDD	PHD
gpd	440,000	834,000	1,760,000
P.F.	1.00	1.90	4.00
gpcd	125	237	396
Seal Rock 2016 Data		5,745	persons
Unit	ADD	MDD	PHD
gpd	477,000	904,000	1,908,000
P.F.	1.00	1.90	4.00
gpcd	83	157	396
Combined 2016 Data		9,260	persons
Unit	ADD	MDD	PHD
gpd	917,000	1,738,000	3,668,000
P.F.	1.00	1.90	4.00
gpcd	99	188	396

P.F. = Peaking Factor. Multiple of ADD. P.F. for PHD assumed at 4.0.

Water use in America in 2010 is documented by the U.S. Department of the Interior in the 2014 US Geological Survey Circular 1405. According to the study, the average per capita water use for Oregon is 166 gallons per capita per day (gpcd) including domestic, commercial, industrial, public use and loss. Of the total 166 gpcd, 63% is residential, commercial and public use/loss;

34% is industrial; and 3% is related to thermoelectric power generation. Note that the ADD value for Toledo (99 gpcd) is less than the State average as documented in the USGS Survey.

3.2.4 Water Sales Records

Based on sales records from January 2011 to December 2015, on average out of the 225 million gallons of water sold per year, 30% of water sold goes to residential use, 4% to commercial users, 15% to industrial use, and 52% to the Seal Rock Water District.
As is typical for most communities, the quantity of water sold in the Toledo system is less than the quantity of water entering the system (water demand) due to leakage and other unaccounted water loss. Whereas on average, 314 million gallons of water per year is treated at the Toledo plant, only about 225 million gallons of water per year is sold. The next section 3.2.5 discusses unaccounted water.

3.2.5 Unaccounted Water

The difference between the quantity of water measured entering the distribution system (water demand) and the quantity of water measured exiting the distribution system is unaccounted water. This comparison is typically called a “water balance”. Measured water exiting the system is primarily that measured through individual customer water meters (water sold). Other sources of exiting water include authorized non-consumptive uses such as pipeline flushing and firefighting and unauthorized uses such as water theft, line breaks, and leakage.

In addition to “real” water loss resulting from leakage, unmetered flushing, etc., unaccounted water can also include “apparent” water loss due to meter inaccuracies or meter reading errors. In general, as water meters age they tend to read lower and lower resulting in higher and higher “apparent” water loss.

If there were no leakage in the system, all water meters were 100% accurate, and all water used for firefighting and system flushing was measured, there would be zero unaccounted water. Every water system has a certain amount of leakage, water meters are not 100% accurate, and it is rare for all water used in town to be metered and measured.

The volume of unaccounted water varies significantly month by month due to meter discrepancies, differences in dates of reading master meters versus individual customer meters, and the number of days in takes to read individual meters. These factors make monthly unaccounted water comparisons of little value and annual comparisons (annual water audits) are used to lessen the impact of these variables. The 5-year averages show approximately 314 million gallons per year treated, 10 million gallons per year used for backwashing the filters, and 225 million gallons per year sold. Annual values for Toledo indicate a 5-year average unaccounted water total of 79 million gallons per year or 26% of the total water demand.
The water treatment plant has recently installed a meter to account for daily water usage at the water treatment plant. Recent water treatment plant usage is averaging ~17 gpm, or 9 million gallons per year, which would bring the percentage of unaccounted water down to 22%.

Per OAR 690-086 (Water Resources Department – Water Management and Conservation Plans), if the annual water audit indicates leakage exceeding 10%, a regularly scheduled and systematic program should be in place to detect leaks in the transmission and distribution system using methods and technology appropriate to the size and capabilities of the municipal water supplier. Other provisions in OAR 690-086 can require system-wide leak repair or line replacement programs to reduce leakage to no more than 15% under certain circumstances such as water permit extension requests or water diversion expansions or initiations.

Records are not available to determine how much of the current 26% unaccounted water is actual leakage. Some of the unaccounted water can be attributed to water system flushing through fire hydrants, unmetered sales of water, and meter inaccuracies. Efforts should be made to measure and record water used for flushing and other authorized non-metered uses. Metering and recording of all plant use water should also begin. The City should also continue efforts to detect and repair leaks when discovered.

3.2.6 EDU Analysis

Based on water sales records for the last 5 years, the average quantity of water sold to a typical single-family dwelling unit on a 5/8” meter inside the District boundary is 3,970 gallons per month. This volume sold per month becomes the basis for Equivalent Dwelling Unit (EDU) calculations with 1 EDU = 3,970 gallons per month in metered sales. Other users can then be described as an equivalent number of EDUs based on their relative water consumption. For example, a commercial business that had an average metered consumption of 7,940 gallons per month uses twice the amount of water as the typical single-family dwelling and can be considered 2 EDUs.

The Table 3.2.6-1 shows sales data and total EDU numbers month by month for the last 5 years. Table 3.2.6-2 shows the 5-year average water sold per month per account type and the corresponding number of EDUs. The current total number of system EDUs is estimated at 4,724.

Table 3.2.6-1 – EDU Values

Date	Number of 5/8" SFR Accounts	5/8" SFR Useage (gallons)	Monthly Use per Meter		Total Water Sales (gallons)	EDU Total
Jan-11	1,056	4,131,004	3,912		15,898,804	4,064
Feb-11	1,053	3,543,202	3,365		14,672,602	4,361
Mar-11	1,055	4,360,890	4,134		18,839,790	4,558
Apr-11	1,056	3,663,700	3,469		15,617,342	4,501
May-11	1,057	4,562,768	4,317		18,506,760	4,287
Jun-11	1,064	4,414,039	4,149		19,679,419	4,744
Jul-11	1,061	4,397,990	4,145		19,633,263	4,736
Aug-11	1,066	5,339,005	5,008		23,952,302	4,782
Sep-11	1,052	6,227,243	5,919		26,552,802	4,486
Oct-11	1,053	4,210,438	3,999		18,660,638	4,667
Nov-11	1,054	4,276,837	4,058		15,697,737	3,869
Dec-11	1,055	3,808,354	3,610		16,291,254	4,513
Jan-12	1,049	4,691,572	4,472		20,593,962	4,605
Feb-12	1,056	3,631,109	3,439		15,366,971	4,469
Mar-12	1,056	3,712,132	3,515		21,455,200	6,103
Apr-12	1,059	4,029,255	3,805		18,399,598	4,836
May-12	1,056	4,434,920	4,200		16,038,520	3,819
Jun-12	1,056	4,227,639	4,003		21,314,721	5,324
Jul-12	1,055	4,423,699	4,193		19,769,329	4,715
Aug-12	1,053	5,235,508	4,972		26,573,288	5,345
Sep-12	1,054	4,292,086	4,072		19,405,537	4,765
Oct-12	1,050	4,559,100	4,342		19,607,100	4,516
Nov-12	1,049	3,770,770	3,595		15,454,200	4,299
Dec-12	1,045	3,433,000	3,285		15,047,700	4,580
Jan-13	1,040	4,302,000	4,137		18,049,000	4,363
Feb-13	1,040	3,734,500	3,591		15,362,500	4,278
Mar-13	1,039	3,632,856	3,496		15,023,856	4,297
Apr-13	1,041	4,287,008	4,118		17,768,748	4,315
May-13	1,042	3,812,000	3,658		15,693,740	4,290
Jun-13	1,039	4,201,775	4,044		17,462,775	4,318
Jul-13	1,038	5,364,942	5,169		23,450,942	4,537
Aug-13	1,041	4,781,715	4,593		22,488,844	4,896
Sep-13	1,046	4,092,099	3,912		19,571,109	5,003
Oct-13	1,039	3,911,119	3,764		18,197,977	4,834
Nov-13	1,039	3,439,657	3,311		15,062,707	4,550
Dec-13	1,039	4,154,652	3,999		20,875,022	5,220
Jan-14	1,030	3,894,178	3,781		17,585,237	4,651
Feb-14	1,034	3,407,761	3,296		15,945,332	4,838
Mar-14	1,031	3,707,231	3,596		16,400,360	4,561
Apr-14	1,031	3,700,931	3,590		16,866,151	4,699
May-14	1,028	3,587,232	3,490		15,722,924	4,506
Jun-14	1,028	4,080,590	3,969		19,178,325	4,831
Jul-14	1,028	4,548,071	4,424		24,233,891	5,478
Aug-14	1,031	4,436,635	4,303		23,374,172	5,432
Sep-14	1,037	4,695,857	4,528		22,856,456	5,047
Oct-14	1,035	3,708,470	3,583		18,921,640	5,281
Nov-14	1,040	3,519,145	3,384		15,589,557	4,607
Dec-14	1,039	3,826,948	3,683		16,220,379	4,404
Jan-15	1,037	3,685,174	3,554		17,369,487	4,888
Feb-15	1,041	3,472,784	3,336		15,264,684	4,576
Mar-15	1,037	3,715,408	3,583		16,976,783	4,738
Apr-15	1,043	3,613,024	3,464		17,818,482	5,144
May-15	1,045	3,467,808	3,318		15,744,808	4,745
Jun-15	1,041	4,540,640	4,362		19,777,504	4,534
Jul-15	1,050	5,743,671	5,470		26,149,376	4,780
Aug-15	1,051	5,122,558	4,874		23,291,236	4,779
Sep-15	1,047	4,490,232	4,289		22,481,232	5,242
Oct-15	1,050	3,767,679	3,588		18,834,049	5,249
Nov-15	1,052	3,221,673	3,062		15,371,913	5,020
Dec-15	1,049	4,097,067	3,906		21,816,530	5,586
		AVE EDU:	3,970		SYSTEM EDUs:	4,724

Table 3.2.6-2 – EDU Values by Account Type

Customer Class	Average Monthly Use	EDUs
Single Family	4,484,618	1,130
Multi Family	726,167	183
Commercial	793,512	200
Industrial	2,810,622	708
Outside Residential	363,232	91
Outside Commercial	65,237	16
Districts	9,488,430	2,390
Totals:	18,731,818	4,718

3.3 Future Water Demand

3.3.1 Basis for Projections

Water demand estimates for future years are determined by multiplying the current unit demand values (gallons per person or per EDU) by the projected number of future users in the water system. It is assumed new users added to the system will consume water at the same rate as current users. Population projections are presented in section 2.2.3. The unit water demand values are presented in section 3.2.3. The projections are based on an average annual growth rate of 0.7% in the city of Toledo and a growth rate of 1.5% in the Seal Rock Water District.

As discussed earlier in this section, unaccounted water levels in the City of Toledo are relatively high with an average annual loss of 26% from 2011-2015. However, it should be emphasized that this does not necessarily constitute a high rate of leakage. It does, however, mean that the City is not currently capable of accounting for all of the water they produce. This could be a result of:

- Meter inaccuracies (master and/or consumption)
- Accounting or entry errors
- Software glitches or errors
- Timing problems (between reading master vs. consumption)
- Not recording public water use (fire, water plant, City Hall, parks, etc.)
- Administrative processes
- Some amount of leakage

With this in mind, we recommend the City investigate all internal processes and procedures to eliminate or correct administrative issues to close the gap on unaccounted water. Until we know how much of the unaccounted water levels are a result of leakage, it is not appropriate to assume any change in the future water production rates. Making assumptions that future water demands would be less due to efforts or results that are only hypothetical at this point could potentially leave the City in a water supply deficit. However, if in the future, the City reduces demand through leak repairs, conservation, or other proactive means, modifying projected water demands in future plan updates would be appropriate. Until that time, the projected demands in this report should stand. Therefore, the projected water demands described include the current level of unaccounted water. The actual future demands may go down if the unaccounted water is largely due to leakage that can be corrected or, it may stay the same if the unaccounted water is a result of administrative issues.

3.3.2 Water Demand Projections

For the 20-year planning period ending in the year 2036, the following table presents water demand projections:

2010 - 2036 Water Demand Projections

Year	Toledo Population	Seal Rock Population	Toledo ADD	Toledo MDD	Seal Rock ADD	Seal Rock MDD	Total ADD	Total MDD
2010	3,370	5,255	391,000	741,000	423,000	802,000	814,000	1,543,000
2011	3,393	5,333	398,000	754,000	430,000	816,000	828,000	1,570,000
2012	3,417	5,413	400,000	757,000	432,000	820,000	832,000	1,577,000
2013	3,441	5,495	420,000	795,000	454,000	862,000	874,000	1,657,000
2014	3,466	5,577	415,000	786,000	449,000	852,000	864,000	1,638,000
2015	3,490	5,661	434,000	823,000	470,000	891,000	904,000	1,714,000
2016	3,514	5,745	440,000	834,000	477,000	904,000	917,000	1,738,000
2017	3,539	5,832	446,000	844,000	482,000	915,000	928,000	1,759,000
2018	3,564	5,919	451,000	854,000	488,000	926,000	939,000	1,780,000
2019	3,589	6,008	456,000	865,000	494,000	937,000	950,000	1,802,000
2020	3,614	6,098	461,000	875,000	500,000	948,000	961,000	1,823,000
2021	3,639	6,190	467,000	886,000	506,000	959,000	973,000	1,845,000
2022	3,665	6,282	473,000	896,000	512,000	971,000	985,000	1,867,000
2023	3,690	6,377	479,000	907,000	518,000	983,000	997,000	1,890,000
2024	3,716	6,472	485,000	918,000	524,000	995,000	1,009,000	1,913,000
2025	3,742	6,569	490,000	929,000	531,000	1,007,000	1,021,000	1,936,000
2026	3,768	6,668	496,000	940,000	537,000	1,019,000	1,033,000	1,959,000
2027	3,795	6,768	502,000	952,000	544,000	1,031,000	1,046,000	1,983,000
2028	3,821	6,869	508,000	963,000	550,000	1,044,000	1,058,000	2,007,000
2029	3,848	6,972	514,000	975,000	557,000	1,056,000	1,071,000	2,031,000
2030	3,875	7,077	520,000	987,000	564,000	1,069,000	1,084,000	2,056,000
2031	3,902	7,183	526,000	999,000	571,000	1,082,000	1,097,000	2,081,000
2032	3,929	7,291	533,000	1,011,000	578,000	1,095,000	1,111,000	2,106,000
2033	3,957	7,400	539,000	1,023,000	585,000	1,109,000	1,124,000	2,132,000
2034	3,985	7,511	546,000	1,036,000	592,000	1,122,000	1,138,000	2,158,000
2035	4,012	7,624	553,000	1,049,000	599,000	1,136,000	1,152,000	2,185,000
2036	4,041	7,738	560,000	1,061,000	606,000	1,150,000	1,166,000	2,211,000

3.3.3 Design Values

For the 20-year planning period ending in the year 2036, the following water demand design values result from the analysis:

20-Year Water Demand Values

Toledo 2036 Data		4,041	persons
Unit	ADD	MDD	PHD
gpd	560,000	1,061,000	2,240,000
P.F.	1.00	1.89	4.00
gpcd	139	263	396
Seal Rock 2036 Data		7,738	persons
Unit	ADD	MDD	PHD
gpd	606,000	1,150,000	2,424,000
P.F.	1.00	1.90	4.00
gpcd	78	149	396
Combined 2036 Data		11,779	persons
Unit	ADD	MDD	PHD
gpd	1,166,000	2,211,000	4,664,000
P.F.	1.00	1.90	4.00
gpcd	99	188	396

The sizing criteria therefore for future supply and treatment needs is 2.21 mgd or 1,530 gpm.

4 Design Criteria and Service Goals

4.1 Design Life of Improvements

The design life of a water system component is the time that the component is expected to be useful based on its intended use and required function. Design life is sometimes referred to as service life or life expectancy. Actual realized design life can depend on factors such as the type and intensity of use, type and quality of materials used in construction, and the quality of workmanship during installation. The estimated and actual design life for any particular component may vary depending on the above factors. The establishment of a design life provides a realistic projection of service upon which to base an economic analysis of new capital improvements.

The planning period for a water system and the design life for its components may not be identical. The typical 20-year planning period is limited due to the need to limit economic burdens on current generations and inaccuracies that result from attempts at projecting needs too far into the future. Design life can be greater to or less than the planning period. For example, a properly maintained steel storage tank may have a design life of 60 years, but the projected fire flow and consumptive water demand for a planning period of 20 years determine its size. At the end of the initial 20-year planning period, water demand may be such that an additional storage tank is required; however, the existing tank with a design life of 60 years would still be useful and remain in service for another 40 years. The typical design life for system components are discussed below.

4.1.1 Equipment and Structures

Equipment used in water systems such as pumps, valves, and other major treatment related equipment is sized for a 20-year demand and has a similar 20-year expected design life. Minor equipment such as less expensive chemical feed pumps, turbidimeters, and other instrumentation sometimes must be replaced or updated when less than 20-years old, typically at 10 to 15 years old. The useful life of some equipment can be extended with proper maintenance if sufficient capacity still exists. It is not uncommon to see larger pumps still in service after 30 years or more if properly maintained.

Filter media such as sand and anthracite should be replaced at 12 to 15 years. Membranes used in filtration plants typically have an expected life of 10 years.

Major structures used in water systems such as concrete basins and intake wetwells can last 50 years or more when properly constructed.

4.1.2 Transmission and Distribution Piping

Water transmission and distribution piping should easily have a useful life of 50 to 60 years if quality materials and workmanship are incorporated into the construction and the pipes are adequately sized. Steel piping used in the 1950s and 60s that has been buried, commonly exhibits significant corrosion and leakage within 30 years. Cement mortar lined ductile iron piping can last up to 100 years when properly designed and installed. PVC and HDPE pipe manufacturers claim a 100-year service life for pipe as well.

4.1.3 Treated Water Storage

Treated water storage tanks should have a design life of 60 years (painted steel construction) to 80 years (concrete construction). Steel tanks with a glass-fused coating can have a design life similar to concrete construction. Actual service life will depend on the quality of materials, the workmanship during installation, and the timely administration of maintenance activities. Several practices, such as the use of cathodic protection, regular cleaning and frequent painting can extend or assure the service life of steel reservoirs. Painting intervals for steel tanks is 15 to 25 years. The life of steel tanks is greatly reduced if not repainted periodically as needed.

4.2 Sizing and Capacity Criteria and Goals

The 20-year projected water demands presented in section 3 are used to size improvements. Various components of the system demand are used for sizing different improvements. Methods and demands used are discussed below.

4.2.1 Water Supply

The current water supply, including pumping capacity, should at minimum be sufficient to meet the projected 20-year maximum daily demand (MDD). Considering the difficulty in obtaining new water rights, raw water supply should meet a longer-term need and it is not unreasonable to plan today for 60-year demand water sources. Currently the MDD is 1.73 million gallons per day (mgd) or 3.21 cubic feet per second (cfs). At the end of the 20-year planning period, the projected MDD is 2.20 mgd or 4.09 cfs. To plan for long-term water supply options, projections beyond the planning period are shown assuming the same growth rate as the planning period.

Planning Period Supply Capacity Goal – 20-year MDD of 2.20 mgd (4.09cfs)
40-year Projected Supply Capacity Goal – 40-year MDD of 2.81 mgd (5.22cfs)
60-year Projected Supply Capacity Goal – 60-year MDD of 3.60 mgd (6.69 cfs)

4.2.2 Water Treatment

Water treatment plant equipment and components such as pumps, filters, flocculators, etc. are typically sized to provide for the 20-year MDD. Conventional filter basins are sized for 20 year flows and media may have to be replaced once during that 20-year period. Membrane filters are more modular and initial designs must have space for 20-year flow capacity but fewer modules may be installed initially. Any discussion of treatment sizing must include an additional 5-10% allowance for water use that would occur at a treatment plant itself (90-95% of water going to town) if demand estimates do not already include such allowances. Difficult to construct items with a long design life such as buried piping and concrete wetwells for surface water intakes should be sized to accommodate at least a 40 to 50-year flow capacity need. Other components such as concrete clearwells and buildings may be oversized beyond the 20-year MDD depending on future expansion ease.

Treatment Capacity Goal – 2.21 mgd (1,530 gpm)

4.2.3 Fire Protection

Per the 2014 Oregon Fire Code, the minimum fire-flow requirements for one- and two-family dwellings not exceeding 3,600 square feet shall be 1,000 gpm. When square footage exceeds 3,600 or for other types of buildings the minimum fire flow is 1,500 gpm. When flows of 1,750 gpm or less are required a single fire hydrant is required to be accessible within 250 feet (200 feet on dead-end streets) resulting in a maximum hydrant spacing of 500 feet (400 feet on dead-end streets).

For other types of structures, the requirements of the Oregon Fire Code require flows up to 8,000 gpm (2014 OFC Table B105.2). For fire flows less than 2,750 gpm a flow duration of 2 hours is required. For flows between 3,000 and 3,750 gpm a duration of 3 hours is required. For flows of 4,000 gpm and above a duration of 4 hours is required. The minimum number of hydrants available at a specific location, the average spacing between hydrants, and the maximum distance from any point on the street to a hydrant are dependent on the fire-flow requirement. For structures, which require 4,000 gpm, at least 4 hydrants must be available spaced not more than 350 feet apart.

Fire Flow Capacity Goals – Residential Only Outlying Areas; 1,000 gpm
Fire Flow Capacity Goals – General Commercial Areas; 1,500 gpm
Fire Flow Capacity Goals – Central Town Area, Industrial, and Schools; 3,500 gpm

4.2.4 Treated Water Storage

Total storage capacity must include reserve storage for fire suppression, equalization storage, and emergency storage. In larger communities, it is common to provide storage capacity equal to the sum of equalization storage plus the larger of fire storage or emergency storage. In small communities, it is recommended that total storage be the sum of fire plus equalization plus emergency storage. This is considered prudent since it is possible for fire danger to increase during water emergencies, such as power failures when alternative sources of heating and cooking might be used. Note that storage goals for the City do not include SRWD water demands, as the SRWD provides its own storage.

Equalization storage is typically set at 20-25% of the MDD to balance out the difference between peak demand and supply capacity. When peak hour flows are known, equalization storage is the difference between the MDD and PHD for a duration of 8 hours [PHD-MDD x 8 hrs.]. Equalization storage typically rises and falls daily or hourly as storage tank water levels fluctuate normally.

Emergency storage is required to protect against a total loss of water supply such as would occur with a broken transmission line, an electrical outage, equipment breakdown, or source contamination. Emergency storage should be an adequate volume to supply the system's average daily demand for the duration of a possible emergency. For most systems, emergency storage should be equal to one maximum day of demand or 2.5 to 3 times the average day demand.

Fire reserve storage is needed to supply fire flow throughout the water system to fight a major fire. The fire reserve storage is based on the maximum flow and duration of flow required to confine a major fire. Fire flows are discussed in section 4.2.3.

With many miles of raw water transmission piping separating water supply from treatment facilities in Toledo, it is considered prudent to set emergency storage equal to 3 normal days of water demand. Since the PHD is estimated for Toledo with peaking factors rather than being measured the equalization storage should be set to 20% of the MDD (PHD-MDD x 8 hrs. is overly conservative). Fire storage volume is 3500 gpm for 3 hours. In addition to the basic volume needs calculations, storage locations and hydraulic distribution must be considered to assure each area of the system has sufficient flow and volume. The approximate overall storage goal for the City is:

Storage Capacity Goal – 3.0 x $ADD_{20\text{-}year}$ + 0.2 x $MDD_{20\text{-}year}$ + 630,000 fire storage = 1.98 MG

Another important design parameter for treated water storage reservoirs is elevation. Efforts should be made to locate all reservoirs at the same elevation when possible within a pressure zone. As a consistent water surface is maintained in all reservoirs, the need for altitude valves, pressure reducing valves (PRVs), booster pumps, and other control devices may be minimized. Distribution reservoirs should also be located at an elevation that maintains adequate water pressure throughout the system; sufficient water pressures at high elevations and reasonable pressures at lower elevations. The ideal pressure range for a distribution system is between 40 and 80 psi.

For subdivisions at higher elevations than allowed within the main pressure zone, storage tanks should be required when possible rather than hydropneumatic tank booster pump stations. Tank size needs to be determined on a case-by-case basis as part of the design review. Fire pumps with a capacity of at least 1,000 gpm together with standby generators should be provided when a storage tank is not possible. Minimum tank size should be 120,000 gallons fire storage (1,000 gpm for 2 hours) plus 1 times the MDD per EDU. For very small developments, individual sprinkler systems may be most appropriate.

4.2.5 Distribution System

Distribution mains are typically sized to convey projected maximum day flows plus simultaneous fire flows while maintaining at least 20 psi at all connections, or projected peak hourly flows while maintaining approximately 40 psi, whichever case is more stringent. Looped mains should be at least six inches in diameter to provide minimum fire flow capacity. The State of Oregon requires a water distribution system be designed and installed to maintain a pressure of at least 20 psi at all service connections (at the property line) at all times, even during fire flow conditions. OAR 333-061-0050 governs the construction standards for water systems including distribution piping. The size and layout of pipelines must be designed to deliver the flows indicated above.

The installation of permanent dead-end mains and dependence of relatively large areas on a single main should be avoided. In all cases, except for minor looping using 6-inch or larger pipe, a hydraulic analysis should be performed to ensure adequate sizing.

Distribution Capacity Goal – Worst Case of projected MDD + fire flow with at least 20 psi residual pressure or Projected PHD with 40 psi residual pressure

4.2.6 Transmission Piping

When un-looped transmission piping is designed, such as raw water supply mains or long runs of treated water transmission along rural routes, it is often prudent to size this piping to convey quantities beyond the 20-year demands. Since it is likely that the pipe itself will be in good condition in 20 years, and the cost increase to upsize slightly is small (approximate same labor cost with small increase in material cost), it may be desirable to ensure the piping can adequately convey 40 or 50-year flows.

4.3 Basis for Cost Estimates

The cost estimates presented in this Plan will typically include four components: construction cost, engineering cost, contingency, and legal/non-engineering project management costs. Each of the cost components is discussed in this section. The estimates presented herein are preliminary and are based on the level and detail of planning presented in this Study. Construction costs are based on competitive bidding as public works projects with State prevailing wage rates. As projects proceed and as site-specific information becomes available, the estimates may require updating.

4.3.1 Construction Costs

The estimated construction costs in this Plan are based on actual construction bidding results from similar work, published cost guides, and other construction cost experience. Construction costs are preliminary budget level estimates prepared without design plans and details.

Future changes in the cost of labor, equipment, and materials may justify comparable changes in the cost estimates presented herein. For this reason, common engineering practices usually tie the cost estimates to an index that varies in proportion to long-term changes in the national economy. The Engineering News Record (ENR) construction cost index (CCI) is most commonly used. This index is based on the value of 100 for the year 1913. Average yearly values for the past 17 years are summarized in Table 4.3.1-1 below.

Table 4.3.1-1 – ENR Index 2000-2016

YEAR	INDEX	% CHANGE/YR
2000	6221	2.67
2001	6343	1.96
2002	6538	3.07
2003	6694	2.39
2004	7115	6.29
2005	7446	4.65
2006	7751	4.10
2007	7967	2.78
2008	8310	4.31
2009	8570	3.13
2010	8801	2.70
2011	9070	3.06
2012	9309	2.64
2013	9547	2.56
2014	9807	2.72
2015	10036	2.34
2016	10403	3.38
	Average since 2000	3.22%

Cost estimates presented in this Plan are based on the average of 2016 dollars with an ENR CCI of 10403. For construction performed in later years, costs should be projected based on the then current year ENR Index using the following method:

Updated Cost = Plan Cost Estimate x (current ENR CCI / 10403)

4.3.2 Contingencies

A contingency factor equal to approximately twenty percent (20%) of the estimated construction cost has been added to the budgetary costs estimated in this Plan. In recognition that the cost estimates presented are based on conceptual planning, allowances must be made for variations in final quantities, bidding market conditions, adverse construction conditions, unanticipated specialized investigation and studies, and other difficulties which cannot be foreseen, but may tend to increase final costs. Upon final design completion of any project, the contingency can be reduced to 10%. A contingency of at least 10% should always be maintained going into a construction project to allow for variances in quantities of materials and unforeseen conditions.

4.3.3 Engineering

The cost of engineering services for major projects typically includes special investigations, predesign reports, surveying, foundation exploration, preparation of contract drawings and specifications, bidding services, construction management, inspection, construction staking, start-up services, and the preparation of operation and maintenance manuals. Depending on the size and type of project, engineering costs may range from 18 to 25% of the contract cost when all the above services are provided. The lower percentage applies to large projects without complicated mechanical systems. The higher percentage applies to small or complicated projects.

Engineering costs for basic design and construction services presented in this Plan are estimated at 20% of the estimated total construction cost. Other engineering costs such as specialized geotechnical exploration, easement research and preparation, and/or specific pre-design reports will typically be in addition to the basic engineering fees charged by firms.

4.3.4 Administrative Costs

An allowance of three percent (3%) of construction cost has been added for legal and other administrative services. This allowance is intended to include internal project planning and budgeting, funding program management, interest on interim loan financing, legal review fees, advertising costs, wage rate monitoring, and other related expenses associated with the project that could be incurred.

4.3.5 Land Acquisition

Some projects may require the acquisition of additional right-of-way, property, or easements for construction of a specific improvement. The need and cost for such expenditures is difficult to predict and must be reviewed as a project is developed. Effort was made to include costs for land acquisition, where expected, within the cost estimates included in this Plan.

5 Regulatory Conditions

5.1 Responsibilities as a Water Supplier

Per OAR 333-061-0025, water suppliers are responsible for taking all reasonable precautions to assure that the water delivered to water users does not exceed maximum contaminant levels, to assure that water system facilities are free of public health hazards, and to assure that water system operation and maintenance are performed as required by these rules. This includes, but is not limited to, the following:

- Routinely collect and submit water samples for laboratory analyses at the frequencies and sampling points prescribed by OAR 333-061-0036 “Sampling and Analytical Requirements”;
- Take immediate corrective action when the results of analyses or measurements indicate that maximum contaminant levels have been exceeded and report the results of these analyses as prescribed by OAR 333-061-0040 “Reporting and Record Keeping”;
- Continue to report as prescribed by OAR 333-061-0040, the results of analyses or measurements which indicate that maximum contaminant levels (MCLs) have not been exceeded;
- Notify all customers of the system, as well as the general public in the service area, when the maximum contaminant levels have been exceeded;
- Notify all customers served by the system when the reporting requirements are not being met, or when public health hazards are found to exist in the system, or when the operation of the system is subject to a permit or a variance;
- Maintain monitoring and operating records and make these records available for review when the system is inspected;
- Maintain a pressure of at least 20 pounds per square inch (psi) at all service connections at all times (at the property line);
- Follow-up on complaints relating to water quality from users and maintain records and reports on actions undertaken;

- Conduct an active program for systematically identifying and controlling cross connections;
- Submit, to the DWP, plans prepared by a professional engineer registered in Oregon for review and approval before undertaking the construction of new water systems or major modifications to existing water systems, unless exempted from this requirement;
- Assure that the water system is in compliance with OAR 333-061-0032 relating to water treatment;
- Assure that the water system is in compliance with OAR 333-061-0210 through 333-061-0272 relating to certification of water system operators; and
- Assure that Transient Non-Community water systems utilizing surface water sources or groundwater sources under the influence of surface water are in compliance with OAR 333-061-0065(2)(c) relating to required special training.

5.2 Public Water System Regulations

Water providers should always be informed of current standards, which can change over time, and should also be aware of pending future regulations. As of this writing, OAR Chapter 333, Division 61 covering Public Water Systems is over 300 pages in length and the latest effective version is dated 4-1-2016. This section is not meant to be a comprehensive list of all requirements but a general overview of the requirements.

Specific information on the regulations concerning public water systems may be found in the Oregon Administrative Rules (OAR), Chapter 333, Division 61. The rules can be found on the Internet at *https://public.health.oregon.gov/HealthyEnvironments/DrinkingWater/Rules/Documents/pwsrules.pdf* where copies of all the rules and regulations can be printed out or downloaded for reference.

Drinking water regulations were established in 1974 with the signing of the Safe Drinking Water Act (SDWA). This act and subsequent regulations were the first to apply to all public water systems in the United States. The Environmental Protection Agency (EPA) was authorized to set standards and implement the Act. With the enactment of the Oregon Drinking Water Quality Act in 1981, the State of Oregon accepted primary enforcement responsibility for all drinking water regulations within the State. Requirements are detailed in OAR Chapter 333, Division 61. The SDWA and associated regulations have been amended several times since inception with the goal of further protection of public health.

SDWA requires the EPA to regulate contaminants which present health risks and are known, or are likely, to occur in public drinking water supplies. For each contaminant requiring federal regulation, EPA sets a non-enforceable health goal, or maximum contaminant level goal (MCLG). This is the level of a contaminant in drinking water below which there is no known or expected health risk. The EPA is then required to establish an enforceable limit, or maximum contaminant level (MCL), which is as close to the MCLG as is technologically feasible, taking cost into consideration. Where analytical methods are not sufficiently developed to measure the concentrations of certain contaminants in drinking water, the EPA specifies a treatment technique instead of an MCL to protect against these contaminants.

Water systems are required to collect water samples at designated intervals and locations. The samples must be tested in State approved laboratories. The test results are then reported to the State, which determines whether the water system is in compliance or in violation of the regulations. There are three main types of violations:

> (1) MCL violation — occurs when tests indicate that the level of a contaminant in treated water is above the EPA or State's legal limit (states may set standards equal to, or more protective than, EPA's). These violations indicate a potential health risk, which may be immediate or long-term.
>
> (2) Treatment technique (TT) violation — occurs when a water system fails to treat its water in the way prescribed by EPA (for example, by not disinfecting). Similar to MCL violations, treatment technique violations indicate a potential health risk to consumers.
>
> (3) Monitoring and reporting violation — occurs when a system fails to test its water for certain contaminants or fails to report test results in a timely fashion. If a water system does not monitor its water properly, no one can know whether or not its water poses a health risk to consumers.

If a water system violates EPA/State rules, it is required to notify the State and the public. States are primarily responsible for taking appropriate enforcement actions if systems with violations do not return to compliance. States are also responsible for reporting violation and enforcement information to the EPA.

To comply with the regulations, water systems must provide adequate treatment techniques, operate treatment processes to meet performance standards, and properly protect treated water to prevent subsequent contamination after treatment.

5.3 Current Standards

There are now EPA-established drinking water quality standards for 91 contaminants, including 7 microbials and turbidity, 7 disinfectants and disinfection byproducts, 16 inorganic chemicals (including lead and copper), 56 organic chemicals (including pesticides and herbicides), and 5 radiologic contaminants. These standards either have established MCLs or treatment techniques. In addition, there are secondary contaminant levels for 15 contaminants that represent desired goals, and in the case of fluoride, may require special public notice.

Revised Total Coliform Rule

The total coliform rule was established by the EPA in 1989 to reduce the risk of waterborne illness resulting from disease-causing organisms associated with animal or human waste. The Revised Total Coliform Rule (RTCR) was published in the Federal Register in 2013 (with minor corrections in 2014) and went into effect for all public water systems on April 1, 2016.

The RTCR was created to limit fecal contamination in water distribution systems and established an MCLG of zero for *E. coli*. To comply with the RTCR, samples are collected from throughout the water distribution system and analyzed for total coliform. Samples that test positive for total coliform are then tested for *E. coli*. Samples that test positive for both total coliform and *E. coli* must be reported to the state. Repeat sampling is required in cases where samples are positive for total coliform. An overview of the RTCR can be found at: https://www.epa.gov/dwreginfo/revised-total-coliform-rule-and-total-coliform-rule

Surface Water Treatment Rules

All water systems using surface water must provide a total level of filtration and disinfection treatment to remove/inactivate 99.9 percent (3-log) of *Giardia lamblia*, and to remove/inactivate 99.99 percent (4-log) of viruses. In addition, filtered water systems must physically remove 99 percent (2-log) of *Cryptosporidium.* Systems with source water *Cryptosporidium* levels exceeding specified limits must install and operate additional treatment processes.

Filtered water systems must meet specified performance standards for combined filter effluent turbidity levels, and water systems using conventional and direct filtration must also record individual filter effluent turbidity and take action if specified action levels are exceeded. When more than 1 filter exists, each filter's effluent turbidity must be monitored continuously and recorded at least every 15 minutes. The combined flow from all filters must have a turbidity measurement at least every four hours by grab sampling or continuous monitoring. Turbidity monitoring must occur prior to any storage such as a clearwell or contact tank. Turbidity monitoring equipment must be calibrated using an approved method at least once per quarter. General requirements for systems utilizing conventional or direct filtration are:

- Individual filter turbidity monitored continuously and recorded every 15 minutes or less
- Combined filter turbidity monitored continuously or grab sample taken at least every 4 hours
- Combined filter turbidity less than 1 NTU in 100% of measurements
- Combined filter turbidity less than or equal to 0.3 NTU in 95% of measurements in a month
- Specific follow-up actions if individual filter turbidity exceeds 1.0 NTU twice

General requirements for systems utilizing slow sand, and alternative filtration (membrane filtration and cartridge filtration) are:

- Combined filter turbidity monitored continuously or grab sample taken at least every 4 hours Department may reduce to once per day if determined to be sufficient
- Combined filter turbidity less than 5 NTU in 100% of measurements

- Combined filter turbidity less than or equal to 1 NTU in 95% of measurements in a month
- Department may require lower turbidity values if the above levels cannot provide the required level of treatment

All water systems must meet specified CxT [concentration x time] requirements for disinfection, and meet required removal/inactivation levels. In addition, a disinfectant residual must be maintained in the distribution system.

- Continuous recording of disinfectant residual at entry point to the distribution system. Small system may be allowed to substitute 1-4 daily grab samples.
- Daily calculation of CxT at highest flow (peak hourly flow)
- Provide adequate CxT to meet needed removal/inactivation levels
- Maintain a continuous minimum 0.2 mg/L disinfectant residual at entry point to the distribution system
- Maintain a minimum detectable disinfectant residual in 95% of the distribution system samples (collected at coliform bacteria monitoring points)

Filtered water systems that recycle spent filter backwash water or other waste flows must return those flows through all treatment processes in the filtration plant. Systems wishing to recycle filter backwash water must provide notice to the State including a plant schematic showing the origin, conveyance, and return location of recycled flows. Design flows, observed flows, and typical recycle flows are also required along with a state-approved plant operating capacity.

Long-Term 2 Enhanced Surface Water Treatment Rule

LT2ESWTR was published by the U.S. EPA on January 5, 2006. The rule requires source water monitoring for public water systems that use surface water or ground water under the influence of surface water. Based on the system size and filtration type, systems must monitor for *Cryptosporidium*, *E. coli*, and turbidity. Source water monitoring data will be used to categorize the source water *Crypto* concentration into four “bin” classifications that have associated treatment requirements. Systems serving 10,000 or more people are required to conduct 24 months of *Crypto* monitoring. Systems serving fewer than 10,000 people are required to conduct 12 months of *E. coli* monitoring and 12-24 months of *Crypto* monitoring if E. coli trigger levels are exceeded. The rule provides other options to comply with the initial source water monitoring that include either submitting previous *Crypto* data meeting (grandfathered data) the requirements or committing to provide a total of at least 5.5-log treatment for *Cryptosporidium*. A second round of source water monitoring will follow 6 years after the system makes its initial bin determination.

<u>Critical Deadlines for LT2ESWTR for systems serving less than 10,000 persons include:</u>

Submit sample schedule and sample location description:	July 1, 2008 (July 1, 2010*)
Begin first round of source water monitoring:	Oct. 2008 (April 2010*)
Submit Grandfathered Data (if applicable):	Dec. 1, 2008 (June 1, 2010*)
Submit Bin Classification:	Sept. 2012
Comply with Rule:	Oct. 1, 2014
Begin second round of source water monitoring:	Oct. 1, 2017 (April 1, 2019*)

** Cryptosporidium monitoring - applies to filtered systems that exceed E. coli trigger*

Disinfectants and Disinfection Byproducts

Disinfection treatment chemicals used to kill microorganisms in drinking water can react with naturally occurring organic and inorganic matter in source water, called DBP precursors, to form disinfection byproducts (DBPs). Some disinfection byproducts have been shown to cause cancer and reproductive effects in lab animals and suggested bladder cancer and reproductive effects in humans. The challenge is to apply levels of disinfection treatment needed to kill disease-causing microorganisms while limiting the levels of disinfection byproducts produced. The primary disinfection byproducts of concern in Oregon are the total trihalomethanes (TTHM) and the haloacetic acids (HAA5).

Disinfection byproducts must be monitored throughout the distribution system at frequencies of daily, monthly, quarterly, or annually, depending on the population served, type of water source, and the specific disinfectant applied, and in accordance with an approved monitoring plan. Disinfectant residuals must be monitored at the same locations and frequency as coliform bacteria.

Total organic carbon (TOC) is an indicator of the levels of DBP precursor compounds in the source water. Systems using surface water sources and conventional filtration treatment must monitor source water for TOC and alkalinity monthly and practice enhanced coagulation to remove TOC if it exceeds 2.0 mg/L as a running annual average.

Compliance is determined based on meeting maximum contaminant levels (MCLs) for disinfection byproducts and maximum levels for disinfectant residual (MRDLs) over a running annual average of the sample results, computed quarterly.

The following tasks should be performed:

- TTHM/HAA5 monitoring required in distribution system. One sample per plant per quarter for systems serving 500-9,999 persons. One sample per plant per year in warmest month required for systems serving less than 500.
- MCL for TTHM is 0.080 mg/L. MCL for HAA5 is 0.060 mg/L.
- Any system having TTHM > 0.064 mg/L or HAA5 > 0.048 based on a running annual average must conduct disinfection profiling.
- TOC and alkalinity monitoring in source water monthly. Enhanced coagulation if TOC greater than 2.0 mg/L
- Comply with MRDLs. Limit for chlorine (free Cl_2 residual) is 4.0 mg/L. Limit for chloramines is 4.0 mg/L (as total Cl_2 residual). Limit for chlorine dioxide is 0.8 mg/L (as ClO_2)
- Bromate MCL of 0.010 mg/L
- Chlorite MCL of 1.0 mg/L

Stage 2 Disinfectants and Disinfection Byproducts Rule

The Stage 2 DBPR was published by the U.S. EPA on January 4, 2006. The rule builds on existing regulations by requiring water systems to meet disinfection byproduct (DBP) MCLs at each monitoring site in the distribution system. Whereas the Stage 1 Rule controls average DBP levels across distribution systems, the Stage 2 Rule controls the occurrence of peak DBP levels within distribution systems.

The rule requires all community water systems to conduct an Initial Distribution System Evaluation (IDSE). The goal of the IDSE is to characterize the distribution system and identify monitoring sites where customers may be exposed to high levels of TTHM and HAA5. There are four ways to comply with the IDSE requirements: Standard Monitoring, System Specific Study, 40/30 Certification, and Very Small System (VSS) Waiver.

Standard monitoring (SM) is one year of increased monitoring for TTHM and HAA5 in addition to the data being collected under Stage 1 DBPR. These data will be used with the Stage 1 data to select Stage 2 DBPR TTHM and HAA5 compliance monitoring locations. Any system may conduct standard monitoring to meet the Initial Distribution System Evaluation (IDSE) requirements of the Stage 2 DBPR. The number of monitoring sites, the monitoring periods, and monitoring frequency vary depending on population served.

Systems that have extensive TTHM and HAA5 data (including Stage 1 DBPR compliance data) or technical expertise to prepare a hydraulic model may choose to conduct a system specific study (SSS) to select the Stage 2 DBPR compliance monitoring locations.

The term “40/30” refers to a system that during a specific time period has all individual Stage 1 DBPR compliance samples less than or equal to 0.040 mg/L for TTHM and 0.030 mg/L for HAA5 and no monitoring violations during the same period. These systems have no IDSE monitoring requirements, but will still need to conduct Stage 2 DBPR compliance monitoring.

The Very Small System (VSS) Waiver applies to systems that serve fewer than 500 people and have eligible TTHM and HAA5 data. These systems have no IDSE monitoring requirements, but will still need to conduct Stage 2 DBPR compliance monitoring.

Lead and Copper

Excessive levels of lead and copper are harmful and rules exist to limit exposure through drinking water. Lead and copper enter drinking water mainly from corrosion of plumbing materials containing lead and copper. Lead comes from solder and brass fixtures. Copper comes from copper tubing and brass fixtures. Protection is provided by limiting the corrosivity of water sent to the distribution system. Treatment alternatives include pH adjustment, alkalinity adjustment, or both, or adding passivating agents such as orthophosphates.

Samples from community systems are collected from homes built prior to the 1985 prohibition of lead solder in Oregon. One-liter samples of standing water (first drawn after 6 hours of non-use) are collected at homes identified in the water system sampling plan. Two rounds of initial sampling are required, collected at 6-month intervals. Subsequent annual sampling from a reduced number of sites is required after demonstration that lead and copper action levels are met. After three rounds of annual sampling, samples are required every 3 years. The number of initial and reduced samples required is dependent on the population served by the water system.

In each sampling round, 90% of samples from homes must have lead levels less than or equal to the Action Level of 0.015 mg/L and copper levels less than or equal to 1.3 mg/L. Water systems with lead above the Action Level must conduct periodic public education, and either install corrosion control treatment, change water sources, or replace plumbing.

The following tasks are recommended:

- Have Sampling Plan for applicable homes
- Collect required samples
- Meet Action Levels for Lead and Copper (0.015 mg/L for Lead and 1.3 mg/L for Copper)
- Rule out source water as a source of significant lead levels
- If Action Levels not met, provide corrosion control treatment and other steps

On October 10, 2007 EPA published the 2007 Final Revisions to the Lead and Copper Rule. The rule addresses confusion about sample collection by clarifying language that speaks to the number of samples required and the number of sites from which samples should be collected. The rule also modifies definitions for monitoring and compliance periods to make it clear that all samples must be taken within the same calendar year. Finally, the rule adds a new reduced monitoring requirement, which prevents water systems above the lead action level to remain on a reduced monitoring schedule.

Inorganic Contaminants

The level of many inorganic contaminants is regulated for public health protection. These contaminants are both naturally occurring and can result from agriculture or industrial operations. Inorganic contaminants most often come from the source of water supply, but can also enter water from contact with materials used for pipes and storage tanks. Regulated inorganic contaminants include arsenic, asbestos, fluoride, mercury, nitrate, nitrite, and others. . While the MCL for Nickel is no longer in effect, water systems are still required to monitor its presence.

Compliance is achieved by meeting the established MCLs for each contaminant. Systems that cannot meet one or more MCL must either install treatment systems (such as ion exchange or reverse osmosis) or develop alternate sources of water.

The following tasks should be performed:

- Sample quarterly for Nitrate (reduction to annual sampling may be available)
- Communities with Asbestos Cement (AC) pipe must sample every 9 years for Asbestos
- Sample annually for Arsenic. MCL of 0.010 mg/L
- Sample annually for all other inorganics. Waivers are available based on monitoring records showing three samples below MCLs. MCLs vary based on contaminant

Organic Chemicals

Organic contaminants are regulated to reduce exposure to harmful chemicals through drinking water. Examples include acrylamide, benzene, 2,4-D, styrene, toluene, and vinyl chloride. Major types of organic contaminants are Volatile Organic Chemicals (VOCs) and Synthetic Organic Chemicals (SOCs). Organic contaminants are usually associated with industrial or agricultural activities that affect sources of drinking water supply, including industrial and commercial solvents and chemicals, and pesticides. These contaminants can also enter from materials in contact with the water such as pipes, valves and paints and coatings used inside water storage tanks.

At least one test for each contaminant from each water source is required during every 3-year compliance period. Public water systems serving more than 3,300 people must test twice during each 3-year compliance period for SOCs. Public water systems using surface water sources must test for VOCs annually.

Compliance is achieved by meeting the established MCL for each contaminant. Quarterly follow up testing is required for any contaminants that are detected above the specified MCL. Only those systems determined by the State to be at risk must monitor for dioxin. Water systems using polymers containing acrylamide or epichlorohydrin in their water treatment process must keep their dosages below specified levels. Systems that cannot meet one or more MCL must either install or modify water treatment systems (such as activated carbon and aeration) or develop alternate sources of water.

The following tasks should be performed:

- At least one test for each contaminant (for each water source) every 3-year compliance period
- Sample twice each compliance period for each SOCs when system over 3,300 people
- Test VOCs annually
- Quarterly follow up testing required for any detects above MCL
- Maintain polymer dosages in treatment process below specified levels
- MCLs vary based on contaminant

Radiologic Contaminants

Radioactive contaminants, both natural and man-made, can result in an increased risk of cancer from long-term exposure and are regulated to reduce exposure through drinking water. Rules were revised to include an MCL for uranium (30 μg/L), and to clarify and modify monitoring requirements. Initial monitoring tests, quarterly for one year at the entry point from each source, were to be completed by December 31, 2007 for gross alpha, radium-226, radium-228 and uranium with subsequent compliance cycle lengths based on those results. Those compliance cycles range from continued quarterly monitoring to nine years until another sample is required. If a sample exceeds the MCL, the system returns to quarterly monitoring until contaminant concentrations in four consecutive samples are below the detection limits. Community water systems than cannot meet MCLs must install treatment (such as ion exchange or reverse osmosis) or develop alternate water sources.

5.4 Future Water System Regulations

The 1996 Safe Drinking Water Act (SDWA) requires EPA to review and revise as appropriate each current standard at least every six years. Data is continually collected on contaminants currently unregulated in order to support development of future drinking water standards. Drinking water contaminant candidate lists (CCL) are prepared and revised every five years. The first DWCCL (CCL1) was published on March 2, 1998 which included 51 chemicals and 9 microbials. In 2003, EPA decided not to regulate any of the 9 microbials from the initial list. In 2005 EPA published the second CCL (CCL2) consisting of the remaining 51 contaminants from the first list. The Agency published the preliminary regulatory determinations for 11 of the 51 contaminants listed on the second CCL in April of 2007. In 2008 EPA published the draft third Contaminant Candidate List (CCL3) to help identify unregulated contaminants that may require a national drinking water regulation in the future. In September 2009 EPA finalized CCL3 which includes 104 chemicals or chemical groups and 12 microbiological contaminants. In January 2016, the EPA announced a final decision not to regulate four contaminants from CCL3 and delayed a final decision on a fifth (strontium). In February 2015 EPA released a draft of the fourth CCL (CCL4) for public comment listing 100 chemicals or chemical groups and 12 microbial contaminants. The EPA must publish a decision on whether to regulate at least five contaminants from the CCL every 5 years. Thus, additional contaminants may be regulated in the future.

Long-Term Revisions to the Lead and Copper Rule

Long-term revisions to the Lead and Copper Rule are currently being considered by the EPA. These revisions are aimed at reducing exposure to lead and copper in drinking water through corrosion control and by requiring additional actions when corrosion control methods are insufficient.

Chromium

Chromium is currently regulated under the SDWA (MCL = 0.1 mg/L as total Chromium) and was selected for re-review as part of the 2010 SDWA review process. Because of research showing potential carcinogenic properties of hexavalent chromium, the EPA conducted a human health assessment. Hexavalent chromium and total chromium were monitored in public water systems under the third Unregulated Contaminant Monitoring Rule.

Perchlorate

The EPA announced its intention to regulate perchlorate under the SDWA in 2011. Since that decision, the EPA has been reviewing data related to perchlorate occurrence in drinking water, treatment method, and analytical techniques.

Water suppliers should be aware of and familiar with these mandates and deadlines, and plan strategically to meet them. DHS, under the Primacy Agreement with the EPA, has up to two years to adopt each federal rule after it is finalized. Water suppliers generally have at least three years to comply with each federal rule after it is finalized; however, some of these rules will likely establish a significant number of compliance dates for water suppliers that will occur prior to state adoption of the rules. These “early implementation” dates will likely have to be implemented in Oregon directly by the EPA, because the state program will not yet have the rules in place or the resources to carry them out.

5.5 Water Management and Conservation Plans

The Municipal Water Management and Conservation Planning (WMCP) program provides a process for municipal water suppliers to develop plans to meet future water needs. Municipal water suppliers are encouraged to prepare water management and conservation plans, but are not required to do so unless a plan is prescribed by a condition of a water use permit; a permit extension; or another order or rule of the Commission. These plans will be used to demonstrate the communities’ needs for increased diversions of water under the permits as their demands grow. A master plan prepared under the requirements of the Department of Human Resources Drinking Water Program or the water supply element of a public facilities plan prepared under the requirements of the Department of Land Conservation and Development which substantially meets the requirements of OAR 690-086-0125 to 690-086-0170 may be submitted to meet the requirements for WMCPs. Rules for WMCPs are detailed in OAR 690, Division 86.

A WMCP provides a description of the water system, identifies the sources of water used by the community, and explains how the water supplier will manage and conserve supplies to meet future needs. Preparation of a plan is intended to represent a pro-active evaluation of the management and conservation measures that suppliers can undertake. The planning program requires municipal water suppliers to consider water that can be saved through conservation practices as a source of supply to meet growing demands if the saved water is less expensive that developing new supplies. As such, a plan represents an integrated resource management approach to securing a community's long-term water supply.

Many of the elements required in a plan are also required under similar plans by the Drinking Water Services of the state Department of Human Services (water system master plans) and Department of Land Conservation and Development (public facilities plans). Water providers can consolidate overlapping plan elements and create a single master plan that meets the requirements of all three programs.

Every municipal water supplier required to submit a WMCP shall exercise diligence in implementing the approved plan and shall update and resubmit a plan consistent with the requirements of the rules as prescribed during plan approval. Progress reports are required showing 5-year benchmarks, water use details, and a description of the progress made in implementing the associated conservation or other measures.

The WMCP shall include the following elements:

1) <u>Water System Description</u> including infrastructure details, supply sources, service area and population, details of water use permits and certificates, water use details, customer details, system schematic, and leakage information.

2) <u>Water Conservation Element</u> including description of conservation measures implemented and planned, water use and reporting program details, progress on conservation measures, and conservation benchmarks.

3) <u>Water Curtailment Element</u> including current capacity limitations and supply deficiencies, three or more stages of alert for potential water shortages or service

difficulties, levels of water shortage severity and curtailment action triggers, and specific curtailment actions to be taken for each stage of alert.

4) Water Supply Element detailing current and future service areas, estimates of when water rights and permits will be fully exercised, demand projections for 10 and 20 years, evaluation of supply versus demand, and additional details should an expansion of water rights be anticipated.

Failure to comply with rules for WMCPs can result in enforcement actions by the Water Resources Department Director. Enforcement actions can include requirements for additional information and planning, water use regulation, cancellation of water use permits, or civil penalties under OAR 690-260-0005 to 690-260-0110.

6 Existing Water System

6.1 Water Supply

6.1.1 Water Sources

The City of Toledo holds water rights and obtains water from both Mill Creek and from the Siletz River (mid-coast basin). Mill Creek, a tributary to the Yaquina River, was the original supply for the town with water rights dating back to 1911. The Siletz was added as a source in 1929. The Mill Creek Dam and Reservoir is located approximately 2.75 miles by road to the south of town and the Siletz River Intake is located approximately 6 miles north of town, please see the map on the following page for more detail. Due to seasonal changes in water quality at each source, each water source is utilized at different times of the year. Mill Creek is primarily used in the winter and spring when high turbidity exists in the Siletz River and the Siletz is used primarily in the summer and fall when algae blooms in the Mill Creek Reservoir affect water quality. No contaminants of concern including excessive nitrates, radionuclides, arsenic, or other chemicals have ever been detected in the source water and total organic carbon (TOC) is typically less than 1 mg/L.

The Mill Creek source includes the Mill Creek Dam and Reservoir. Water from the reservoir flows by gravity through a single raw water transmission pipe to the Mill Creek Raw Water Pump Station where it is boosted up to the water treatment plant. The Siletz River source includes a screened river intake and pump station at the river bank which conveys water to the treatment plant through another raw water transmission pipe. The various components of the water supply system are discussed in following sections.

City of Toledo
Lincoln County, Oregon

Existing Raw/Finished Water Transmission System

Water System Master Plan

0 1"
1" = 8000 ft

Drawn By: DCV
Date: Oct. 2016

6.1.2 Water Rights

Water rights on the Siletz River held by Toledo total 9.8 cfs or 4398 gpm. The Seal Rock Water District water right of 2.6 cfs or 1,166 gpm may also be considered since the diversion point is the same as Toledo's and the Toledo infrastructure must be used to pump and treat that water. Instream Water Rights (ISWR) were established on the Siletz River in 1966, 1974 and 1991.

Table 6.1.2-1 – Water Rights Summary

Source Name	Permit	Certificate	Use	Priority Date	Rate (cfs)
Siletz River > Siletz Bay	S9370	~	Municipal	10/24/1929	4.0
Siletz River > Siletz Bay	S12553	14396	Municipal	2/12/1937	1.75
Siletz River > Siletz Bay	S44083	~	Municipal	3/23/1979	4.0
Siletz River (Seal Rock)	S40277	~	Municipal	2/28/1973	2.6
				Siletz Total	12.4
Mill Creek > Yaquina R.	S709	905	Domestic	1/14/1911	5.0
Mill Creek > Yaquina R.	S4085	9040	Domestic	5/15/1919	10.0
Mill Creek > Yaquina R.	S7192	9048	Municipal	12/22/1924	0.75
Unnamed Stream > Mill Cr.	S7191	9047	Municipal	12/22/1924	0.75
				Mill Creek Total	16.50
Storage	**Permit**	**Certificate**		**Priority Date**	**Storage (acre-feet)**
Mill Creek	S33124	42194		11/9/1959	250

At the point of diversion (POD) for Toledo's water supply near river mile 40, the 1966 ISWR reserves 100 cfs from July 1 to September 30. The 1974 ISWRs on the Siletz are upstream from the POD and should not affect Toledo's water rights. The 1991 ISWR modifies the 1966 ISWR only by slightly increasing the rights in November and December. Streamflow records for USGS Gauging Station 14-3055 near river mile 42.6 show that summer flows in the Siletz can often drop below the 100 cfs ISWR thereby potentially causing a restriction in use for water rights dated after 1966 (junior to ISWR). Toledo's water rights on the Siletz River senior to the ISWR total 5.75 cfs or 2,580 gpm.

Water rights held by Toledo on Mill Creek total 16.50 cfs or 7,405 gpm however only 15.0 cfs or 6,732 gpm can likely be used. The original 1911 water right has a POD upstream of the dam and the 1919 water right has a POD at the dam. The two 1924 water rights on Mill Creek and an unnamed tributary (possibly Slack Creek now) have PODs located downstream of the dam and are not being used. It is typically allowable to withdraw water downstream from a listed POD but not upstream therefore the 1924 rights likely cannot be withdrawn at the dam. The State filed for ISWR on Mill Creek in 1991 however Toledo’s rights are senior. A small 0.06 cfs water right was issued to ODFW in 2005 to operate a pelton wheel to develop energy necessary to operate batteries for a fish trap at the dam’s fish ladder.

6.1.3 Mill Creek Dam and Reservoir

Mill Creek Reservoir

A concrete-core earthen dam was constructed on Mill Creek in 1965 to 1967 to create the current Mill Creek Reservoir. The dam is approximately 65 feet tall from the original stream channel bottom and 265 feet long at the top. The permitted storage amount in the reservoir is 250 acre-feet (81.5 million gallons) with approximately 15 acres of surface area. Per the original permit, the depth averages 16.6 feet with a maximum of 55 feet. The spillway consists of three 5-foot diameter corrugated metal pipes (CMP). The outlet is a 30-inch concrete pipe. A concrete fish ladder also exists. According to the past Master Plan, the original dam design includes provisions to raise the height by 10 feet.

Mill Creek Dam Fish Ladder

The water surface elevation in the reservoir is approximately 145 feet based on the 2002 Lee Engineering report.

The City of Toledo owns approximately 400 acres of the Mill Creek watershed above the reservoir and the remainder is owned by the United States Forest Service, along with other private forestland owners.

Possibly due to the relatively shallow average water depth, algae problems are reported in summer months for water from the Mill Creek Reservoir creating taste and odor issues. In addition, higher than desired iron and manganese levels are reported creating more difficult treatment conditions. For these water quality reasons, Mill Creek water is historically used only in winter and spring months when water quality is high. Past plans report that during winter months, even during storm events, turbidity from the Mill Creek source rarely exceeds 1.0 NTU.

Even though certificated water rights on Mill Creek that can be withdrawn at the current dam POD total 15.0 cfs (9.7 mgd), the actual flow of water available is often substantially less than this amount. The original water treatment plant operations and maintenance manual indicates that the minimum dependable yield of the Mill Creek Reservoir over the worst case (July 1st to September 30th) period was estimated at 1.2 mgd based on a low streamflow in the basin itself of 0.4 mgd. It is unlikely that the Mill Creek source alone could supply the entire City for prolonged periods in the summer months without increasing the height of the dam.

6.1.4 Mill Creek Raw Water Pump Station

The existing Mill Creek Raw Water Pump Station was constructed in 1968. Raw water from the Mill Creek Dam flows by gravity to the pump station and the pump station adds energy to lift the water up to the treatment plant.

The station contains two Worthington vertical-turbine can pumps installed side by side. One pump is a 6-stage model 10M-50-5 and the other is a 5-stage model 10M-50-5. Each pump includes a 40 hp G.E. motor running on 480V, 3-phase power. Based on plant records, (no flowmeter exists in pump station) the station pumps 790-850 gpm to the plant with both pumps running simultaneously and approximately 425 gpm with a single pump running.

The pump station floor is at elevation 14 feet and the water surface behind the dam at the spillway is at ~145 feet providing an estimated suction pressure at the pump station of 56 psi under static conditions. The water treatment plant water level is at approximately 311 feet resulting in a static pressure of approximately 128 psi on the pump discharge. With existing conditions, the total dynamic head is approximately 190 feet at 425 gpm and 235 feet at 800 gpm.

At least one of the pump bowl assemblies has been replaced since installation 41 years ago. In 2003 electrical improvements were constructed at the Mill Creek Raw Water PS including a new 480/277V service with service transformer and CT style metering, a new motor control panel with 600-amp main breaker and full voltage starters, a new 600V transfer switch and a generator.

The Mill Creek Raw Water PS building is in good condition including the electrical system. The pumps and mechanical piping are in fair condition but are past their expected design life. Replacement of the pumps and valves during the planning period is likely to be required. Even with both pumps operating simultaneously, the station is not able to produce the current peak day demands although this goes unnoticed since summer peaks are pulled from the Siletz River. If problems were to occur preventing supply from the Siletz Intake in the summer, the Mill Creek PS would not be able to keep up with current demands. Future demands will further underscore this capacity deficiency.

6.1.5 Mill Creek Raw Water Transmission Pipe

The Mill Creek raw water transmission piping is approximately 28,230 feet long and is mostly 12-inches in diameter. Detailed descriptions of the condition and routing of the pipe were developed in the 2002 Raw Water Transmission System Replacement and Rehabilitation Preliminary Design Report by Lee Engineering, Inc.

The portion from the Mill Creek Dam to the Mill Creek Raw Water PS is about 18,130 feet long. This section consists of 12-inch AC pipe installed in 1950 (11.5-inch internal diameter) except for a 330-foot section of 12-inch cast iron pipe under the Yaquina River. This section of piping has numerous difficult to access areas including overgrown and eroded construction roads, buried creek crossings, marsh/wetland crossings, the Yaquina River crossing, and sections under buildings and the railroad. The capacity of this suction side portion of the transmission main is limited to approximately 1,540 gpm before negative pipeline pressures occur based on 130 feet of head between the dam and pump station. If the Mill Creek Reservoir water level is 10 feet below the spillway (120 feet of head to pump station), the capacity of the suction line drops to 1,475 gpm.

The portion from the Mill Creek Raw Water PS to the Water Treatment Plant is about 10,100 feet long. This section consists of 8,650 feet of 12-inch AC installed in 1968 and 1975, 250 feet of 14-inch DIP on Beech Street between 2nd and 3rd Streets installed around 2002, and about 1,200 feet of 8-inch AC leading up to the treatment plant installed prior to 1975. This section of piping also has difficult to access wetland crossing areas however much of the route is along roadways. The capacity of this discharge side portion of the transmission main is limited to approximately 1,000 gpm before pump discharge pressures greater than 150 psi occur.

In general, the 60-year-old Mill Creek Raw Water Transmission Pipe is undersized and deteriorating. If Mill Creek is to continue as a reliable source of water for the city the piping must be replaced. Numerous repairs have been required in the past and the frequency of leaks and failures can be expected to increase as the pipe continues to age.

The 1998 Water Master Plan recommended replacement of 15,000 feet of the Mill Creek piping. In 2002, another report focused purely on raw water transmission and further investigated alternative routes and environmental mitigations. The 2002 report recommended replacement of the entire Mill Creek Raw Water Transmission Pipe, except for the 14-inch section on Beech Street, with new 16-inch piping. The preferred route was selected based on input from environmental specialists and generally follows roadways thus eliminating much of the wetlands issues. Such rerouting requires the abandonment of the existing Mill Creek Raw Water Pump Station and its reconstruction near the Mill Creek Dam. Estimated construction cost for the 2002 recommended Mill Creek supply improvements were $5.5 million.

6.1.6 Siletz River Intake and Pump Station

The Siletz River Intake and Pump Station were rebuilt in 2015. The floor elevation at the pump station is approximately 120 feet and the bottom of the 19’-8” by 13’-6” wetwell is at 88.1 feet. The station has three American-Marsh 5-stage model 12NC vertical turbine pumps with 30-foot columns into the wetwell below. Each pump has a 125 hp motor running on 480V, 3-phase power. The pump station lifts water from the Siletz River near elevation 90 and pumps all the way to the treatment plant at elevation 311 feet.

Heavy sand and silt loads in the winter months in the Siletz destroy pump bearings and increase treatment difficulty. Due to the high seasonal turbidity, the Siletz pump station is not used in winter and spring months.

Testing in 2015 indicated that even with only one pump in operation flows exceeding 1200 gpm were possible, with two pumps in operation and the VFDs turned up the pump station can easily convey current and future peak demands to the treatment plant.

An analysis of Siletz River streamflows recorded at USGS gauging station 14305500 near the City’s intake was completed using data from 1905 to 2016. Average mean monthly flow ranged from a high of 2,364 cfs in 1933 to a low of 863 cfs in 1944 with an average of 1,524 cfs. The lowest streamflow month is August with a mean of 130 cfs. The lowest average monthly flow recorded was 62.5 cfs in August 2003. The lowest daily flow recorded was 42 cfs on September 6, 2003. In terms of streamflow, the driest year on record was 1944. The streamflow records indicate that sufficient flow should always be available to supply the Toledo water rights necessary for the planning period, as well as the full 5.75 cfs water right senior to the instream rights.

6.1.7 Siletz River Raw Water Transmission Pipe

The Siletz River Raw Water Transmission Pipe is approximately 33,975 feet long and consists of 19,075 feet of 18-inch DI, 2,100 feet of 16-inch DI, 10,000 feet of 14-inch DI and 2,800 feet of 18-inch HDPE pipe. The 18-inch ductile iron pipe was installed in 1975 or after. The 16-inch ductile iron was installed in 1979 along with the Siletz Intake screening improvements. The 14-

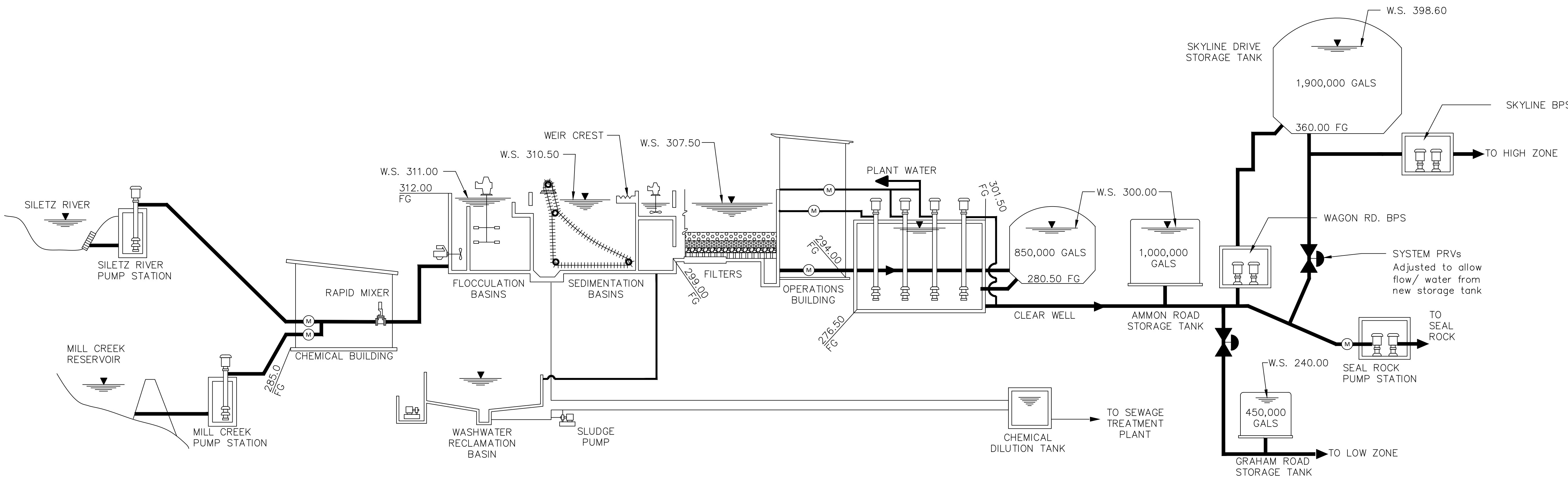
inch ductile and cast iron pipe was installed sometime prior to 1978. The 18-inch HDPE was installed in 2015 and replaced a 12-inch AC pipe.

6.2 Water Treatment

6.2.1 General

The Toledo Water Treatment Plant is a conventional surface water treatment plant constructed in 1976. The adjacent concrete clearwell at the plant was constructed in 1938. Upgrades to the instrumentation and controls system, individual filter effluent turbidimeters, new filter media, and other minor improvements were constructed in 1999. Primary plant control is now through PLC programming with a Wonderware interface and SCADA system. Original design capacity of the plant was 3.0 mgd or 2,080 gpm. Today, typical flows through the plant range from 850 to 1,200 gpm.

The plant consists of two side-by-side identical treatment trains in exterior concrete basins with a chemical feed and storage room, a lower equipment/pipe gallery room, an upper control room overlooking the treatment basins, and a concrete backwash waste basin. The plant pumps including a backwash pump, surface wash pump, and plant water supply pump are located outside over a wetwell type basin adjacent to the clearwell. At times the Ammon Road Tank fills more slowly than desired due to hydraulic restrictions and demand in the distribution system however use of the booster pump to increase flows (also boosts pressure 10 psi) to the tank results in pipeline failures, especially in some of the older piping along Sturdevant Road. A simple hydraulic schematic of the plant and other parts of the system are shown on the following page.



Civil West Engineering Services, Inc.

City of Toledo
Lincoln County, Oregon

Water System Schematic

Water System Master Plan

NTS

Drawn By: MKC
Date: September 2016

The 40-year old plant is located on the top of a hill with little extra room available for expansion. Evidence of ground movement is apparent on the northerly slope and some cracking of the concrete backwash waste basin can be seen. Horizontal cracking and minor leakage is evident at the 78-year old concrete clearwell.

In general, finished water quality is good and the plant functions properly. Typical finished water turbidity is around 0.03 NTU. The State of Oregon credits the plant filtration process with 2.5-log removal credit for *Giardia* and 2.0-log removal credit for *Cryptosporidium*. Several components of the plant are past their design life and will eventually require replacement. Even though flows today are lower than the 2,080 gpm original design flow, treatment standards today are much more stringent than existed in 1976 during plant design and construction. Various major components of the plant are discussed in following sections.

6.2.2 Chemical Addition and Rapid Mix

Original plant provisions included injection points for activated carbon for taste and odor control, potassium permanganate for iron and manganese precipitation, alum for primary coagulation, lime for pH and alkalinity adjustment, and polymer for a coagulant aid. Coagulant addition occurs in the chemical room where an in-line mechanical flash mixer is situated in the 18-inch raw water feed line. Provisions for feed points also exist after flocculation. Activated carbon and permanganate are not being used at this time.

Alum dosage at the Toledo plant averages 17 mg/L. During periodic storm events dosage is increased as high as 40 mg/L. Liquid alum is stored in a 7,600-gallon fiberglass reinforced plastic tank. A cationic polymer (573C) used as coagulant aid at a dose of 0.1 mg/L.

As with many surface waters in Oregon, the Siletz River and Mill Creek are relatively low in natural alkalinity and supplemental alkalinity is required to allow proper alum coagulation. Approximately 45 pounds per day of lime is used during the summer and 20 pounds per day during the winter to adjust the raw water alkalinity to allow proper alum coagulation. Lime is dosed with adjustable dry hopper and the solution is fed downstream of the rapid mix and alum feed point.

Soda Ash is added to the final filtered water for pH adjustment and corrosion control. An average of 30 to 70 pounds per day of Soda Ash is required with dosages ranging from 4 to 8 mg/L and averaging about 5 mg/L.

Sodium hypochlorite is added for final disinfection as discussed in section 6.2.7. Prechlorination provisions are not currently used but may be used in the future as needed.

6.2.3 Flocculation

Following chemical addition and rapid mix, raw water enters the flocculation section through an open channel flume located along the northern side of the concrete basins. Two flocculator basins, each measuring 20 feet by 20 feet by 14 feet deep provide a volume of 5,600 ft^3 or 41,890 gallons each. The water surface elevation in the flocculators is 311.00 feet per the 1976 plans. The total flocculation volume provides a theoretical hydraulic detention time of 40 minutes at 3.0 mgd.

Each basin has a vertically-mounted mechanical flocculator with 40-inch diameter propellers and 2.0 hp AC Baldor motors. Both motors are on VFDs and housed new enclosures as part of the 2015-16 improvements. The two basins can be operated either in series or in parallel. Current normal operation is in series to provide dual-stage flocculation. The first stage flocculator is operated around 40 rpm while the second stage is operated around 35 rpm. Maximum speed is 100 rpm. Shafts and propellers for each unit were replaced about 17 years ago. The flocculation equipment is currently in good condition.

The EPA suggests that 30 minutes of detention time be provided when water temperatures drop below 5°C. The often cited “10-State Recommended Standards for Waterworks” also requires at least 30 minutes for flocculation. The existing flocculation volume is sufficient to adequately treat the original design flow of 2,080 gpm.

6.2.4 Sedimentation

Two sedimentation basin sections, each measuring 20 feet by 85 feet by 13.5 feet deep provide a volume of 22,950 ft^3 or 171,680 gallons each. The basins can be independently shut-off and dewatered. The water surface elevation in the sedimentation basins is 310.50 feet per the 1976 plans. The total sedimentation volume provides a theoretical hydraulic detention time of 165 minutes or 2.75 hours at 3.0 mgd. Surface area is 1700 ft^2 each (3400 ft^2 total) which results in a gross surface overflow rate of 882 gpd/ft^2 or 0.61 gpm/ft^2 at 3.0 mgd. Each basin has a weir length of 100 feet for a total weir loading rate of 15,000 gpd/ft.

Sedimentation basin design criteria according to the EPA (Optimizing Water Treatment Plant Performance Using the Composite Correction Program, 1998, EPA/625/6-91/027) suggests a surface overflow rate (SOR) of 0.6 gpm/ft^2 for turbidity removal and 0.4 gpm/ft^2 for color removal for conventional rectangular basins with depth between 12 and 14 feet. With vertical tube settlers (>45°), the SOR can be increased to 2.0 gpm/ft^2 for turbidity removal and 0.75 gpm/ft^2 for color removal (based on area over tubes only). AWWA/ASCE recommends (Water Treatment Plant Design, Third Edition) a SOR of 0.55 to 0.83 for turbidity removal with reduction to 0.35 to 0.55 gpm/ft^2 for water with high algae content. The AWWA/ASCE text also recommends SOR of 1.0 to 3.0 gpm/ft^2 over tube settlers with the normal design based on 2.0 gpm/ft^2. The 10-State Recommended Standards for Waterworks, requires 4 hours of detention time as well as a maximum horizontal through velocity of 0.5 fpm. Detention time may be reduced when the SOR is less than 0.5 gpm/ft^2.

The AWWA/ASCE text and most other references recommend weir loading rates of 20,000 gpd/ft or less. When turbidity can exceed 50 NTU, rates of 15,000 gpd/ft are commonly used. Typically, the sedimentation basin has a length to width ratio of 3:1 to 5:1 and the weirs extend into the basin 1/3 of the length or less. The existing sedimentation basins each have a length to width ratio of 4.25:1 with weirs extending 1/5 of the length. The existing horizontal through velocity at the original design rate of 2,080 gpm is a proper 0.5 fpm.

At the 20-year projected MDD of 1,530 gpm, the SOR will be 0.44 gpm/ft^2, the detention time 3.8 hours, and the weir loading rate 10,950 gpd/ft. These values are sufficiently conservative and would indicate that good sedimentation basin performance will occur at this flow.

The existing sludge collection equipment consists of a mechanical sludge scraper system with plastic chains, sprockets, and scrapers called a chain-and-scraper or chain-and-flight system. The scrapers run along the bottom and move the settled sludge to hoppers at one end. Manual telescoping sludge valves are opened and adjusted to blow-off sludge without completely dewatering the basin.

Currently, the collected sludge (~60,000 gallons) is held for approximately 3 months prior to being sent to the wastewater treatment plant. Storage of the sludge in this manner presents problems at the water treatment plant such as; loss of settling space, taste and odor issues, and the possibility of septic sludge conditions. Processing and dewatering sludge onsite would be cost prohibitive. The City is currently looking to replace alum as a flocculant with ACH or PAC to achieve lower sludge volumes.

6.2.5 Filtration

Each of the two dual-media filters measures 16 feet by 33 feet providing 528 ft^2 each or 1,056 ft^2 of total filter surface area. At the design flow of 3.0 mgd the filter loading rate is 1.97 gpm/ft^2. At the current peak flows of 1,250 gpm through one filter at a time, the filter loading rate is 2.37 gpm/ft^2. The water surface elevation at the filters is 307.5 feet per the 1976 plans.

At the 20-year projected MDD of 1,530 gpm, the filter loading rate will be 1.4 gpm/ft^2 with both filters operated simultaneously and 2.8 gpm/ft^2 when one filter is off line. A maximum filter loading rate of 4.0 gpm/ft^2 is recommended by EPA and AWWA for mixed media filters in good condition and no signs of air binding.

The filter underdrain consists of clay tiles manufactured by Leopold as originally installed. A 12-inch thick layer of graded support gravel lies on top of the clay tile underdrain. The actual filter media consists of a 12-inch layer of silica sand (specific gravity of 2.6, effective size of 0.45-0.55 mm, uniformity coefficient 1.40 or less) under an 18-inch thick layer of anthracite (specific gravity of 1.6, effective size of 0.95-1.05 mm, uniformity coefficient 1.40 or less). The filter media and support gravel were replaced in 2000. It is assumed that the tile underdrains were inspected and found to be in satisfactory condition at that time. The interior of the concrete filter basin was also refurbished in 2000.

Backwashing of the filters is accomplished with hydraulic upflow and surface washers as described in the following section.

6.2.6 Backwash

The filters at the Toledo WTP are backwashed between 8 and 16 times per month (total for both filters). Filter runs typically range from 20 to 50 hours in the winter and 40 to 75 hours in the summer.

Filter backwash is accomplished with hydraulic upflow and surface washers. No auxiliary air scour is provided. The original backwash pump from the 1976 plant remains in use today. The 60 hp vertical turbine pump conveys treated water from the clearwell and forces the water upwards through the filter media to expand the bed and to remove sediment. Filter backwash occurs at a rate of 8,000 gpm with a total of 85,000 gallons of water required to backwash one filter. The total backwash volume used equates to 161 gal/ft^2. With a filter area of 528 ft^2 each, the resulting backwash rate is 15 gpm/ft^2. Based on the size and type of filter media, this backwash rate should achieve approximately 10 to 20% expansion of the filter bed.

The goal for ideal hydraulic backwash is to achieve a 25-50% expansion of the media. To achieve this expansion, backwash rates required will vary between 17 and 23 gpm/ft^2 depending on the media configuration and the water temperature. For each 1°C increase in water temperature, an increase in the backwash rate of approximately 2% is required to prevent a reduction in bed expansion. A 25% expansion of the existing filter media during a backwash equates to 7.5-inches of rise in the existing filters. The backwash pump output (15 gpm/ft^2 maximum) is slightly less than optimal and mudball formation deep in the media is possible over time. This may be partially offset under current operations due to the lengthy backwash cycle and high total volume of water being used.

Rotary surface washers are installed in each filter to agitate the surface of the media. Fixed nozzle washers are also installed in the corners to reach areas where the rotary washers are ineffective. The washers should be approximately 2 inches above the surface of the anthracite and become submerged in the media during backwashing. A flowrate of at least 265 gpm (0.5 gpm/ft^2) to each filter at a minimum pressure of 50 psi is required for proper surface wash function. A 40 hp vertical turbine pump conveys water from the clearwell to the surface wash system.

Backwash waste water is dumped into the 100,000-gallon backwash waste basin prior to being discharged into the municipal sanitary sewer system. The use of filter backwash recycling provisions originally designed into the plant has been discontinued.

It is recommended that both the backwash and surface wash pumps be fully inspected and calibrated as soon as possible.

6.2.7 Disinfection

An OSEC unit produces sodium hypochlorite on-site. The chlorinator runs at approximately an 8% concentration and is adjusted based on the residual concentration measured in the finished water.

Immediately following post-filtration chlorination, the treated water enters the 850,000-gallon clearwell where chlorine contact time is provided. The clearwell is an 85-foot diameter circular concrete storage tank constructed in 1938. An aluminum dome roof was added in 1979. A separate outlet pipe from the clearwell feeds the pump well where the treatment plant pumps are located and from which water flows by gravity to the distribution system. Water surface elevation in the clearwell is 300.0 feet when full at 19 feet depth.

The clearwell overflow occurs at a depth of 20 feet and the level is allowed to drop normally to ~17 feet deep before the filters are started again. Recently, the overflow was tested and was found to be blocked. Clearing the blockage of the overflow should be an immediate priority.

During extreme drought years, the clearwell water level has been dropped to as low as 8 feet deep. Per the 1979 operation and maintenance manual, the tank holds 51,900 gallons per foot of depth between elevations 290.5 and 300.0. The tank has separate inlet and outlet pipes but contains no baffling to prevent short-circuiting.

At the EPA recommended efficiency value of 10% for non-baffled chlorine contact basins, the effective volume of the clearwell would be 85,000 gallons. A tracer study was recently conducted to verify actual efficiency and contact time, the contact time was estimated at 111 minutes. Based on the tracer study, there is no need for baffling at this time.

The 78-year-old clearwell exhibits horizontal cracking, potentially due to delays between concrete pours in the original construction. Water seepage is evident from several locations at these cracks and it is very likely that corrosion of the internal reinforcing steel has been occurring for decades. In a December 2009 report divers found gaps up to 2-inches wide at the interior cold joints in the floor and reported the seal to be in fair to poor condition in numerous locations. To prevent additional deterioration and potential spalling of the concrete as the corrosion progresses, it is recommended that refurbishment of the concrete be conducted.

6.2.8 Plant Domestic Water Supply System

Plant water is supplied by the plant water pump located at the plant pump station near the other pumps (backwash, surface wash, booster). The Precision Pumping System uses two submersible pumps that are 2 hp and rated for 45 gpm each. The pumps have a PLC and are driven by VFDs. The pumps pump to a new 10-gallon pressure tank.

6.2.9 Electrical System

The 41-year old motor control center (MCC) in the chemical room and is still in use today and repair and replacement parts are hard to find as the equipment is antiquated. The MCC should be updated to allow for continued reliability and safety. New HOA switches and other minor modifications were done in 2000 to update the plant automation control system.

A 100 kW (125 kVA) diesel generator provides standby backup power for the plant's primary functions. The gen-set has a newer above ground fuel tank. With proper maintenance and exercising the generator should function for the planning period.

6.3 Treated Water Storage

6.3.1 Skyline Drive Storage Tank

The Skyline Drive Storage Tank is a 1.90 MG steel tank located on high ground on the north end of town, just north of Skyline Drive. The tank was built in 2014 and is approximately 90 feet in diameter and approximately 55 feet tall. The Skyline Drive Storage Tank has a normal maximum water surface elevation of 398 feet (38 foot water depth).

6.3.2 Ammon Road Storage Tank

The Ammon Road Storage Tank is a 1.00 MG painted steel tank located in the southeast hills of town along Ammon Road. The tank was constructed in the 1970s and is approximately 75 feet in diameter and 30 feet tall. The Ammon Road Tank has a normal maximum water surface elevation of 300 feet (29 feet water depth) matching that in the clearwell tank at the plant.

The tank interior received spot repair painting in 1983. The tank exterior was repainted in 1984. Radio telemetry was installed in 2007. Since it has been 32 years since the last coating refurbishment, the tank is now due for recoating once again.

6.3.3 Graham Street Storage Tank

The Graham Street Storage Tank is a 0.45 MG steel tank constructed in 1968 at an elevation 60 feet lower than the Ammon Road Tank. The tank is 60 feet in diameter by 20 feet tall and has a water surface elevation when full of 240 feet. The Graham Street Tank and its service area is fed through pressure reducing valves (PRVs) from the higher Ammon Road Tank/WTP service area. Adjustment of at least four PRVs is necessary to maintain a proper hydraulic grade for the tank.

The tank interior received spot repair painting in 1983. The tank exterior was repainted in 1984 and again in 2008. The interior is due for refurbishment and lead removal should be anticipated.

6.4 Distribution System

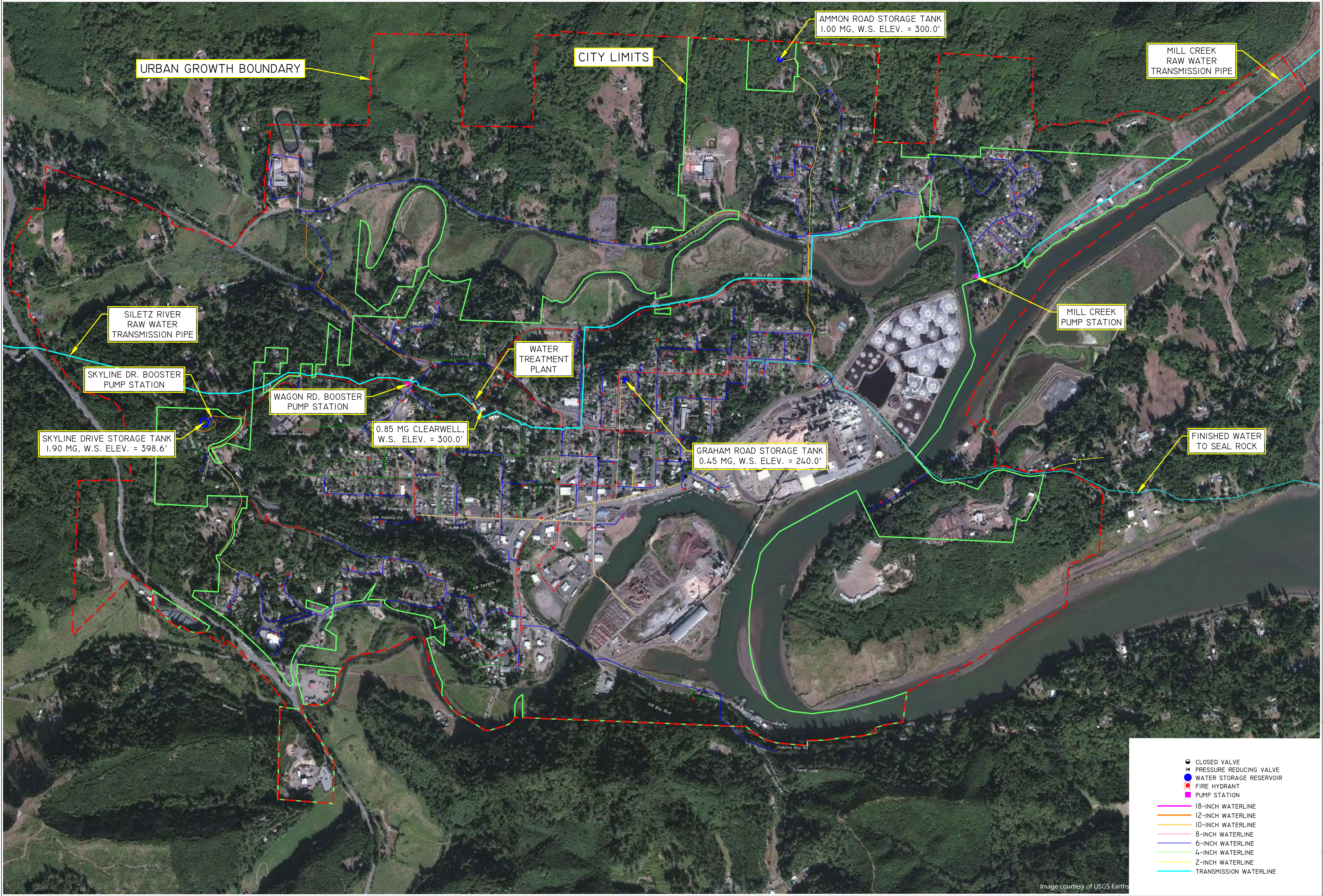
6.4.1 Pressure Zones

The Toledo water system is currently separated into three pressure zones. The main pressure zone in town (intermediate pressure zone) has a hydraulic grade of 300 feet provided by the water surface elevation in the WTP clearwell tank and the Ammon Road Storage Tank. For an ideal minimum pressure of 40 psi in the intermediate pressure zone, elevations above 208 feet need pressure boosting. To avoid pressures over 80 psi in the intermediate pressure zone, elevations below 115 feet need pressure reducing valves or need to be served by the low-level pressure zone.

Lower elevations in town are served by the low-level pressure zone which has a hydraulic grade of 240 feet provided by the Graham Road Storage Tank and the various PRVs feeding this level. For an ideal minimum pressure of 40 psi in the low-level pressure zone, elevations above 148 feet need pressure boosting or should be served by the intermediate pressure zone. To avoid pressures over 80 psi in the low-level pressure zone, elevations below 55 feet need pressure reducing valves.

High elevations at the north end of town are served by the high-level pressure zone which has a hydraulic grade of ~400 feet provided by the Skyline Drive tank. The highest ground elevations in the high-pressure zone area reach ~380 feet based on the USGS quadrangle map. To provide the minimum required pressure of 20 psi at the high point, an effective hydraulic grade of 426 feet is required in the high-level zone. It appears that the elevations of the public property are about 20 feet lower than the actual high point thus a slightly lower hydraulic grade may provide for the minimum 20 psi at the service connection.

Please see the map on the following page for more detail.



Civil West Engineering Services, Inc.

CITY OF TOLEDO
LINCOLN COUNTY, OREGON

EXISTING WATER SYSTEM

WATER SYSTEM MASTER PLAN

0 1" 1" = 1200 ft

DRAWN BY: DCV
DATE: SEPT. 2016

N

6.4.2 Piping System Summary

The City of Toledo water system includes over 186,000 feet (over 35 miles) of piping over 2-inches in diameter. Due to the great distance of both raw water sources from town, one-third of the total pipe length in the system is raw water piping.

Table 6.4.3-1 – Water System Piping Inventory

Nominal Diameter (inch)	Approximate Length (feet)	Percent of Total Length
18"	2,630	1.41%
12"	7,820	4.18%
10"	14,080	7.53%
8"	21,650	11.58%
6"	65,500	35.05%
4"	13,000	6.96%
18" Raw Water	19,075	10.21%
16" Raw Water	2,100	1.12%
14" Raw Water	10,250	5.48%
12" Raw Water	29,580	15.83%
8" Raw Water	1,200	0.64%
	186,885	100.00%

7 Improvement Needs

7.1 Water Supply Needs and Alternatives

7.1.1 Water Supply Needs

Fortunately, the City of Toledo has plentiful water rights which are sufficient for many years beyond the planning period. The 5.75 cfs water rights on the Siletz River with priority dates in 1937 and 1929 are alone sufficient to satisfy a projected 40-year demand. There are no significant water rights with earlier priority dates on the Siletz River owned by others which would impact Toledo's rights, and minimum streamflows also appear large enough to not restrict these Toledo water rights. In addition, the City holds another 4.0 cfs right on the Siletz and another 15.0+ cfs rights on Mill Creek (though Mill Creek flows in summer are low enough such that only an estimated 1.7 to 2.0 cfs is available – see section 6.1.3).

Those water rights, however, must be delivered to the system through reliable and maintainable infrastructure. Replacement and or repair of the aging raw water supply infrastructure is the City's most challenging water system need. The 5-mile-long Mill Creek Raw Water Transmission Piping is 67 years old and is undersized, deteriorating, and extremely difficult to access in many areas.

7.1.2 Mill Creek Supply Alternatives

Alternatives for the Mill Creek Raw Water Supply include:

1) Do Nothing – Would require eventual abandonment of source as piping deteriorates further
2) Continue with upkeep and pipeline spot repairs as necessary
3) Replace piping along new routes and construct new Mill Creek Raw Water Pump Station

The do nothing alternative essentially results in the Mill Creek raw water source eventually being completely unavailable to the city which is an unacceptable consequence. The 67-year old asbestos cement (AC) Mill Creek transmission piping is currently so deteriorated in certain areas that even short periods of use result in further line failures in difficult to access areas. It appears that varying thicknesses or pressure classes of pipe were used during installation in the 1950s. It is the thinner-wall sections, typically in the difficult to access wetland areas, which result in the greatest number of failures and maintenance issues today. Various options for replacing the transmission piping were investigated in detail in the 2002 Raw Water Transmission System Replacement and Rehabilitation Preliminary Design Report by Lee Engineering. Included as part of the 2002 Report (due to the significant amount of wetlands, waterways, and forest land along the pipe routes) an Environmental Review Report was prepared by Adolfson Associates, Inc. to investigate potential environmental impacts and hurdles to various alignment alternatives. The recommended option in the 2002 Report was based on accessibility, minimizing environmental impacts, and costs. The 2002 estimated cost for the project was approximately $7.2 million and appears reasonable and accurate. Updating this cost to current dollars results in a project cost to replace the Mill Creek Raw Water Transmission Piping and Pump Station of $11.3 million.

The Mill Creek Source can meet the average winter water demands of the system for more than 50 years due to rainfall recharge of the basin during the wet season. Due to the low flows entering the basin during dry periods, the Mill Creek Source cannot meet even current summer peak water demands, even though sufficient water rights exist.

If the 52-year old dam were to be increased in height by 10 feet, apparently as the original design intended for later expansion, the storage volume would be effectively doubled from the current 250 acre-feet to approximately 500 acre-feet (average depth increase from 16.6 feet to 26.6 feet and surface area increased from 15 to 19 acres), or 163 million gallons. In this case, the Mill Creek Source could supply the system’s year-round needs, including summer peaks, for around 50 years. A more detailed hydrologic study would be required to verify. Based on costs presented in the “Regional Water Projection: Polk and Lincoln Counties” done in March 2009 by WH Pacific for expansion (40-foot height increase) of the Barney Reservoir Dam ($46.4 million in 2016) and the McGuire Reservoir Dam ($18.0 million in 2016), a 10-foot increase in the height of the Mill Creek Dam would likely exceed $8.5 million in project costs.

The only other option for the City is to continue with spot repairs of the pipeline as needed and continue upkeep and maintenance of the pump station. This option may not allow reliable long-term use of the source since a pipe failure could occur in an inaccessible wetland area however it would be available for occasional, backup and emergency use. The Mill Creek source is important as a redundant supply of water and the City has ample water rights on the source.

7.1.3 Recommended Supply Alternatives

The recommended plan for Mill Creek is to continue to maintain and repair the existing infrastructure as necessary while beginning to budget for a 10-year phased approach to replacement of both the Mill Creek Transmission line and the Mill Creek Booster Pump Station. The recommended alternative in the 2002 report remains as the most viable option today. This recommended option includes reroute of the pipeline along improved roadways to avoid wetlands and environmental issues and to build a new pump station near the dam site as required due to the new hydraulic grade. Updating the 2002 costs to today results in an estimated project cost of $11.3 million for the Mill Creek supply improvements. Due to the high cost of the Mill Creek project it is recommended that the project be split into phases and for the work to be done over a ten-year period.

7.2 Water Treatment Needs and Alternatives

7.2.1 Water Treatment Plant Needs Summary

In general, the Toledo Water Treatment Plant is well maintained, well operated, and produces high quality treated water. Fortunately the plant was originally overdesigned and still has sufficient capacity to meet the City’s current needs as well as the projected needs over the next 20 years. To continue to produce safe drinking water over the next 20 years, only two relatively minor improvements will be required.

The current needs at the treatment plant include:

1) Rehabilitate clearwell

2) Update motor controls and related electrical systems in chemical building

Certain improvements at the plant are needed regardless of capacity or growth, these improvements are required due to deterioration and age of the existing components.

The existing 77-year old concrete clearwell exhibits minor leakage which causes corrosion of the interior reinforcing steel and will eventually lead to concrete spalling and significant damage. Divers (Liquivision Technology) inspected the interior of the clearwell in December 2009 and found portions of the interior in poor condition with gaps of up to 2-inches at the old cold joints in the floor. Rehabilitation of the concrete is recommended to eliminate the water weeping and protect the structure from further damage. The condition of the rebar inside the concrete is unknown however no structural failure or cracking was evident at the time of the 2009 inspection. Since rebar corrosion has been occurring for many years, no easy location for a new clearwell exists, and failure of the concrete structure at the top of the hill would be catastrophic, strength improvements are recommended. Strength improvements can be made by wrapping the tank with FRP/carbon fiber bands at a construction cost of approximately $20-$25 per square foot. Since chlorine contact time is insufficient with the clearwell out of service, the repairs need to be made while the tank is full or need to be made very quickly (the new storage tank on Skyline Drive could provide several days of water supply and may allow clearwell improvements to be made with the clearwell drained for a few days).

With the tank in service, injection of a water-activated, NSF approved, urethane-grout can be used to repair small cracks from the exterior. The cost of crack injection is highly site specific with typical construction costs around $50-$70 per lineal foot. Unfortunately, this repair method cannot repair cracks which may be in underground portions of the tank.

If the tank can be drained, the large interior gaps of 2-inches can be filled with quick-cure non-shrink grout and then sealed with an NSF approved spray on lining material. These spray-on linings are typically applied around 80 to 100-mils thick and some can cure in 72 hours or less. Alternatively, a drop-in PVC liner can be installed.

A coating on the tank exterior will further protect and enhance the tanks longevity. If composite wrapping (for strength) is not done, an elastomeric coating (±$15/s.f.) is recommended on the exterior. If composite wrapping is done to strengthen the tank, a less expensive paint coating (±$5/s.f.) can be used.

Estimated project costs for maintenance items are shown below assuming a rough cost of $20 per square foot to drain the clearwell, make minor spot repairs, install a full spray-on interior liner, and add some composite wrapping to the exterior.

7.3 Treated Water Storage Needs and Alternatives

7.3.1 Water Storage Needs Analysis

As discussed in section 4, the goal for treated water storage is to have 3 average days of emergency water (3 x ADD), a modest amount of equalization storage to provide for diurnal fluctuations in tank water levels (20% of the MDD), plus fire storage sufficient to supply 3,500 gpm for 3 hours. The total Existing storage is equal to 3.35 MG between the Skyline Drive, Ammon Road and the Graham Street storage tanks assuming the tanks are 100% full. The clearwell should not be included as storage volume since it is not designed to empty and in fact must stay full to provide chlorine contact time.

Based on the storage goals, the City needs 2.52 million gallons (MG) at the end of the planning period. There is no need to expand storage at this time.

The existing storage facilities must be maintained. The expected coating life of the epoxy-based coatings on the existing tanks is 20 to 25 years when properly applied. Since it has been 33 years since the last interior coating, the interior of both the Ammon Road and the Graham Street storage tanks should be recoated early in the planning period. The exterior of the Ammon Road storage tank should also be recoated early in the planning period since it has been 32 years since it was last refinished.

7.3.2 Water Storage Improvement Alternatives

It is now time to recoat the entire interior and exterior of the steel Ammon Road Storage Tank as well as the interior of Graham Street Storage Tank to protect the steel substrate from corrosion damage.

Ammon Road & Graham Street Storage Tank Recoating Probable Costs

Water CIP - Phase 3			***Potential Cost Share Distribution***	
Item	***Description***	***Opinion of Probable Project Cost***	***Toledo Share***	***Seal Rock Share***
S2	Ammon Rd. Storage Tank Refurbishment	$318,000	$318,000	$0
S3	Graham St. Storage Tank Refurbishment	$176,000	$176,000	$0
		$494,000	**$494,000**	**$0**

7.3.3 Recommended Water Storage Improvements

It is recommended that recoating of the interior and exterior of the existing Ammon Road Storage Tank and recoating the interior of the existing Graham Street Storage Tank be initiated within the next few years to protect those assets. The budget cost for repainting the two existing tanks is $494,000.

7.4 Distribution System Needs and Alternatives

7.4.1 Water Distribution System Hydraulic Analysis

As discussed in the 2010 Master Plan, the system contained some undersized piping which limited fire flows. The distribution system was modeled in WaterCAD and recommendations for “looping” and upsizing of mains to improve fire flows were made and added to the 2010 CIP. All of these distribution system improvements have since been completed. We recommend that the distribution system be modeled again to reflect the performance of the distribution system improvements and to ensure that no deficiencies exist.

8 Capital Improvement Plan

8.1 Capital Improvement Plan Purpose and Need

This section summarizes the water system capital improvements needed to properly serve the community's needs over the next 20 years as determined by the detailed analyses in this Water System Master Plan. The Capital Improvement Plan (CIP) consists of various projects to maintain and protect existing water system assets, projects to correct deficiencies, and projects necessary to increase water system capacity to serve the growing population.

The water system CIP is used to help establish funding needs, user rates, system development charges (SDCs), and to plan for and prioritize various project needs. The CIP can change over time as projects are completed and/or new unforeseen needs arise and an attempt should be made to annually update the CIP and keep the list of needs current.

8.2 Capital Improvement Plan Projects

8.2.1 CIP Summary

The raw water supply/transmission and water storage projects recommended in this Water System Master Plan for the 20-year planning period are summarized below. The table includes the replacement of the Mill Creek raw water supply system as recommended in the 2002 Raw Water Transmission System Replacement and Rehabilitation Report.

CIP Project Summary

Water System Capital Improvement Needs			***Potential Cost Share Distribution***	
Item	***Description***	***Opinion of Probable Project Cost***	***Toledo Share***	***Seal Rock Share***
WS3	Mill Creek Pump Station and Transmission Piping	$11,300,000	$5,650,000	$5,650,000
S2	Ammon Rd. Storage Tank Refurbishment	$318,000	$318,000	$0
S3	Graham St. Storage Tank Refurbishment	$176,000	$176,000	$0
		$11,794,000	**$6,144,000**	**$5,650,000**

An attempt was made to show the potential split in cost sharing of the various needs between the City and the Seal Rock Water District based on the historic 50/50 share. Items such as supply and treatment logically split based on water demand. Items such as the various distribution improvements within the City do not directly involve service to the Seal Rock Water District and are shown with 100% cost share belonging to the City. The 50/50 sharing agreement used in the past appears reasonable, as recent records show a total of 52% of all water sold going to the District and 49% being used within the City.

8.2.2 CIP Phases

The cost for the water system improvement needs is great and there may be reason to prioritize the improvements or take projects on in phases. The previous phases 1 and 2 have been completed, with phases 3 and 4 remaining outstanding.

The two projects in phase 3 are the refurbishment of both the Ammon Road and Graham Street water storage tanks. Both tanks need interior refurbishment, with the larger Ammon Road tank needing both interior and exterior work.

The Mill Creek Pump Station and Transmission Piping remains on the CIP as a phase 4 project and should be budgeted for. This project is high in cost, but must be addressed to avoid potential disruption of service should a catastrophic line break occur.

Phased CIP Projects

Water CIP - Phase 3			***Potential Cost Share Distribution***	
Item	***Description***	***Opinion of Probable Project Cost***	***Toledo Share***	***Seal Rock Share***
S2	Ammon Rd. Storage Tank Refurbishment	$318,000	$318,000	$0
S3	Graham St. Storage Tank Refurbishment	$176,000	$176,000	$0
		$494,000	**$494,000**	**$0**
Water CIP - Phase 4			***Potential Cost Share Distribution***	
Item	***Description***	***Opinion of Probable Project Cost***	***Toledo Share***	***Seal Rock Share***
WS3	Mill Creek Pump Station and Transmission Piping	$11,300,000	$5,650,000	$5,650,000
		$11,300,000	**$5,650,000**	**$5,650,000**

8.2.3 CIP Timeline

In an effort to minimize upfront costs associated the Mill Creek Transmission Line & Pump Station Project, we propose doing the project in multiple phases. Please see the CIP Timeline on the following page.

CAPTIAL IMPROVEMENT PLAN

		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Mill Creek Transmission Line & Pump Station Project																						
WS3	**Phase 1 Design**		$271,200																			
	Phase 1 Transmission Line & Pump Station			$1,988,800																		
	Phase 2 Design				$271,200																	
	Phase 2 Transmission Line & Pump Station					$1,988,800																
	Phase 3 Design						$271,200															
	Phase 3 Transmission Line & Pump Station							$1,988,800														
	Phase 4 Design								$271,200													
	Phase 4 Transmission Line & Pump Station									$1,988,800												
	Phase 5 Design										$271,200											
	Phase 5 Transmission Line & Pump Station											$1,988,800										
Water Storage Tank Projects																						
S2	**Predesign**		$12,720																			
	Design			$25,440																		
	Ammon Rd. Refurbishment				$279,840																	
S3	**Predesign**					$7,040																
	Design						$14,080															
	Graham Street Refurbishment							$154,880														
	Fiscal Year Totals:		**$283,920**	**$2,014,240**	**$551,040**	**$1,995,840**	**$285,280**	**$2,143,680**	**$271,200**	**$1,988,800**	**$271,200**	**$1,988,800**										

9 Financing

9.1 Existing Water Rates and Charges

9.1.1 Existing Rate Structure

In 2009 and 2010 the sewer rate was increased 12% each year and 11% in 2011. In 2012 the sewer rate was raised 22.5% and the water rate was raised 43%. Sewer rate increases impact water usage as they are based on water use. Each customer's sewer charge is a flat rate of $11.50 per month plus $15.20 per one thousand gallons of treated water based on the average amount of water use during the months of January through April. The City has noted an approximate drop in revenue of 4% for every 10% rate increase due to customer conservation. The current rate structure has an increasing facilities charge based on the size of water meter installed and has fixed service and use charges regardless of the amount of water used. The current rate structure is shown in the table below.

Current Water Rate Structure

Water Meter Size (in)	Capacity Factor	Facilities Charge	Service Charge	Use Charge (per 1000 gal)	Facilities + Service Charge	Outside City
5/8	1.0	$23.15	$5.25	$4.45	$28.40	$56.80
3/4	1.5	$34.73	$5.25	$4.45	$39.98	$79.95
1	2.6	$60.19	$5.25	$4.45	$65.44	$130.88
1-1/4	4.1	$94.92	$5.25	$4.45	$100.17	$200.33
1-1/2	5.9	$136.59	$5.25	$4.45	$141.84	$283.67
2	10.5	$243.08	$5.25	$4.45	$248.33	$496.65
3	23.6	$546.34	$5.25	$4.45	$551.59	$1,103.18
4	41.9	$969.99	$5.25	$4.45	$975.24	$1,950.47
6	94.3	$2,183.05	$5.25	$4.45	$2,188.30	$4,376.59
8	167.5	$3,877.63	$5.25	$4.45	$3,882.88	$7,765.75
10	261.0	$6,042.15	$5.25	$4.45	$6,047.40	$12,094.80
12	377.0	$8,727.55	$5.25	$4.45	$8,732.80	$17,465.60

The current rate structure results in an average monthly water bill of $46.07 with an average residential water use of 3,970 gallons per month (see section 3.2.6) per typical single-family dwelling. When using the statewide typical consumption of 7,500 gallons per month per household as often cited by funding agencies as the “average residential water bill”, the monthly charge is $61.78 ($0.008/gallon).

The City has an agreement with the Seal Rock Water District whereby the District pays the City for the treatment and delivery of water at a rate equivalent to the residential usage charge ($0.00335/gallon). The Seal Rock charge equates to $25.12 for 7,500 gallons.

Based on the audit report from fiscal year ending June 2015, water sales revenue within the City was $1,197,807 with an additional $387,905 in revenue from wholesale water sales to the Seal Rock Water District. Based on this data, the average monthly bill to Seal Rock is $32,325.

9.1.2 Connection Charges and System Development Charges

Like most communities, a connection fee is charged when a new water service is installed within the service boundary where no previous connection existed. The connection fee varies by meter size and is meant to match the actual cost of labor, equipment, and material furnished by the City as required to provide and install the service line and meter. Typical connection charges for small residential service connections are $300 to $400.

The City also has a water System Development Charge (SDC) in place established by ordinance and based upon the 2010 report, *"Public Infrastructure System Development Charge Methodology"* which presents engineering analysis and costs estimates together with an economic and financial analysis of the system. The current SDC for a new basic residential water connection is $4,955. The SDC charge increases with size of water meter in 5/8" equivalents. See *http://www.cityoftoledo.org/documents/Planning/Final%20SDC%20Report.pdf* for further details.

9.1.3 Water Fund Budget

See the following pages for the water fund budgets for the FYs of 2011 – 2015.

CITY OF TOLEDO
Lincoln County, Oregon

SCHEDULE OF REVENUES, EXPENSES, AND CHANGES IN FUND NET ASSETS - BUDGET AND ACTUAL

WATER FUND

For the Year Ended June 30, 2011

	Original and Final Budget	Variance with Final Budget Over (Under)	Actual: Budget Basis	Actual: Adjustments	Actual: GAAP Basis
REVENUES					
Water sales	$ 585,000	$ 32,982	$ 617,982	$ -	$ 617,982
Water sales - Seal Rock	293,000	(2,266)	290,734	-	290,734
Fees and charges	20,000	(1,920)	18,080	-	18,080
Rents and leases	7,775	1	7,776	-	7,776
Investment earnings	600	(283)	317	-	317
Other income	1,000	1,452	2,452	-	2,452
Total revenues	907,375	29,966	937,341	-	937,341
EXPENSES					
Water plant	434,776	(11,545)	423,231	(120,579)	302,652
Water distribution	476,299	(32,074)	444,225	(124,269)	319,956
Depreciation	-	-	-	133,784	133,784
Contingency	70,000	(70,000)	-	-	-
Total expenses	981,075	(113,619)	867,456	(111,064)	756,392
Excess (deficiency) of revenues over (under) expenses	(73,700)	143,585	69,885	111,064	180,949
OTHER FINANCING SOURCES (USES)					
Capital contributions	-	-	-	73,266	73,266
Transfers out	-	-	-	(244,848)	(244,848)
Total other financing sources (uses)	-	-	-	(171,582)	(171,582)
Change in net assets	(73,700)	143,585	69,885	(60,518)	9,367
Net assets - beginning	73,700	60,958	134,658	1,490,014	1,624,672
Net assets - ending	$ -	$ 204,543	$ 204,543	$ 1,429,496	$ 1,634,039

CITY OF TOLEDO
Lincoln County, Oregon

SCHEDULE OF REVENUES, EXPENSES, AND CHANGES IN FUND NET ASSETS - BUDGET AND ACTUAL

WATER FUND

For the Year Ended June 30, 2012

	Original and Final Budget	Variance with Final Budget Over (Under)	Actual Budget Basis	Actual Adjustments	Actual GAAP Basis
REVENUES					
Water sales	$ 770,000	$ 103,000	$ 873,000	$ -	$ 873,000
Water sales - Seal Rock	318,000	34,584	352,584	-	352,584
Fees and charges	17,000	8,836	25,836	-	25,836
Rents and leases	7,775	1	7,776	-	7,776
Investment earnings	500	197	697	-	697
Other income	3,000	1,525	4,525	-	4,525
Total revenues	1,116,275	148,143	1,264,418	-	1,264,418
EXPENSES					
Water plant	519,870	(20,635)	499,235	(253,269)	245,966
Water distribution	628,834	(43,746)	585,088	(518,402)	66,686
Depreciation	-	-	-	139,676	139,676
Contingency	70,000	(70,000)	-	-	-
Total expenses	1,218,704	(134,381)	1,084,323	(631,995)	452,328
Excess (deficiency) of revenues over (under) expenses	(102,429)	282,524	180,095	631,995	812,090
OTHER FINANCING SOURCES (USES)					
Capital contributions	-	-	-	476,075	476,075
Transfers out	-	-	-	(7,284,446)	(7,284,446)
Total other financing sources (uses)	-	-	-	(6,808,371)	(6,808,371)
Change in net assets	(102,429)	282,524	180,095	(6,176,376)	(5,996,281)
Net assets - beginning	102,429	102,114	204,543	1,429,496	1,634,039
Net assets (deficit) - ending	$ -	$ 384,638	$ 384,638	$ (4,746,880)	$ (4,362,242)

CITY OF TOLEDO
Lincoln County, Oregon

SCHEDULE OF REVENUES, EXPENSES, AND CHANGES IN FUND NET POSITION - BUDGET AND ACTUAL

WATER FUND

For the Year Ended June 30, 2013

	Original and Final Budget	Variance with Final Budget Over (Under)	Actual: Budget Basis	Actual: Adjustments	Actual: GAAP Basis
REVENUES					
Water sales	$ 1,300,000	$ (148,928)	$ 1,151,072	$ -	$ 1,151,072
Water sales - Seal Rock	335,000	48,568	383,568	-	383,568
Fees and charges	18,000	1,791	19,791	-	19,791
Grants and contributions	-	1,114	1,114	-	1,114
Rents and leases	9,066	-	9,066	-	9,066
Investment earnings	700	1,812	2,512	-	2,512
Other income	3,000	5,980	8,980	-	8,980
Total revenues	1,665,766	(89,663)	1,576,103	-	1,576,103
EXPENSES					
Current					
Water plant	800,823	(22,067)	778,756	(295,136)	483,620
Water distribution	1,501,963	(607,912)	894,051	(749,621)	144,430
Depreciation	-	-	-	143,618	143,618
Contingency	135,000	(135,000)	-	-	-
Total expenses	2,437,786	(764,979)	1,672,807	(901,139)	771,668
Excess (deficiency) of revenues over (under) expenses	(772,020)	675,316	(96,704)	901,139	804,435
OTHER FINANCING SOURCES (USES)					
Capital contributions	-	-	-	571,426	571,426
Transfers in	-	423,475	423,475	-	423,475
Transfers out	-	-	-	(885,665)	(885,665)
Total other financing sources (uses)	-	423,475	423,475	(314,239)	109,236
Change in net position	(772,020)	1,098,791	326,771	586,900	913,671
Net position - beginning	242,001	142,636	384,637	(4,746,879)	(4,362,242)
Net position - ending	$ (530,019)	$ 1,241,427	$ 711,408	$ (4,159,979)	$ (3,448,571)

CITY OF TOLEDO
Lincoln County, Oregon

SCHEDULE OF REVENUES, EXPENSES, AND CHANGES IN FUND NET POSITION - BUDGET AND ACTUAL

WATER FUND

For the Year Ended June 30, 2014

	Original and Final Budget	Variance with Final Budget Over (Under)	Actual Budget Basis	Actual Adjustments	Actual GAAP Basis
REVENUES					
Water sales	$ 1,215,000	$ (18,141)	$ 1,196,859	$ -	$ 1,196,859
Water sales - Seal Rock	260,000	64,673	324,673	-	324,673
Fees and charges	18,500	6,818	25,318	-	25,318
Grants and contributions	1,200	(651)	549	-	549
Rents and leases	9,324	-	9,324	-	9,324
Investment earnings	2,000	1,526	3,526	-	3,526
Other income	4,000	(403)	3,597	-	3,597
Total revenues	1,510,024	53,822	1,563,846	-	1,563,846
EXPENSES					
Current					
Water plant	1,039,609	(215,235)	824,374	(429,454)	394,920
Water distribution	1,070,728	(301,184)	769,544	(553,171)	216,373
Depreciation	-	-	-	120,665	120,665
Contingency	135,000	(135,000)	-	-	-
Total expenses	2,245,337	(651,419)	1,593,918	(861,960)	731,958
Excess (deficiency) of revenues over (under) expenses	(735,313)	705,241	(30,072)	861,960	831,888
OTHER FINANCING SOURCES (USES)					
Capital contributions	-	-	-	2,520,984	2,520,984
Transfers in	3,393	(3,393)	-	108,702	108,702
Transfers out	-	-	-	(812,994)	(812,994)
Total other financing sources (uses)	3,393	(3,393)	-	1,816,692	1,816,692
Change in net position	(731,920)	701,848	(30,072)	2,678,652	2,648,580
Net position - beginning	731,920	(20,511)	711,409	(4,159,980)	(3,448,571)
Net position - ending	$ -	$ 681,337	$ 681,337	$ (1,481,328)	$ (799,991)

CITY OF TOLEDO
Lincoln County, Oregon

SCHEDULE OF REVENUES, EXPENSES, AND CHANGES IN FUND NET POSITION - BUDGET AND ACTUAL

WATER FUND

For the Year Ended June 30, 2015

	Original and Final Budget	Variance with Final Budget Over (Under)	Actual Budget Basis	Actual Adjustments	Actual GAAP Basis
REVENUES					
Water sales	$ 1,225,000	$ (27,193)	$ 1,197,807	$ -	$ 1,197,807
Water sales - Seal Rock	350,000	37,905	387,905	-	387,905
Fees and charges	18,700	2,088	20,788	-	20,788
Grants and contributions	1,000	(638)	362	-	362
Rents and leases	9,324	(777)	8,547	-	8,547
Investment earnings	2,500	396	2,896	-	2,896
Other income	4,000	1,061	5,061	-	5,061
Pension credit	-	-	-	54,258	54,258
Total revenues	1,610,524	12,842	1,623,366	54,258	1,677,624
EXPENSES					
Current					
Water plant	1,065,062	(214,950)	850,112	(360,878)	489,234
Water distribution	1,102,761	(322,176)	780,585	(648,719)	131,866
Depreciation	-	-	-	108,359	108,359
Contingency	140,000	(140,000)	-	-	-
Total expenses	2,307,823	(677,126)	1,630,697	(901,238)	729,459
Excess (deficiency) of revenues over (under) expenses	(697,299)	689,968	(7,331)	955,496	948,165
OTHER FINANCING SOURCES (USES)					
Capital contributions	-	-	-	4,151,501	4,151,501
Transfers in	-	-	-	23,493	23,493
Transfers out	-	-	-	(809,816)	(809,816)
Total other financing sources (uses)	-	-	-	3,365,178	3,365,178
Change in net position	(697,299)	689,968	(7,331)	4,320,674	4,313,343
Net position - beginning, as restated	697,299	50,039	747,338	(1,701,259)	(953,921)
Net position - ending	$ -	$ 740,007	$ 740,007	$ 2,619,415	$ 3,359,422

Approximately 76% of sales revenue comes from within the City while 24% comes from wholesale water sales to the Seal Rock Water District. For 2015 a total of $1,585,712 ($1,197,807 + $387,905) was generated from sales of 224.1 million gallons of water with an average cost per gallon of $0.0071. The $387,905 from Seal Rock resulted from sales of 115.8 million gallons for at an average cost per gallon of $0.0033. The $1,197,807 from customers within the City resulted from sales of 108.3 million gallons for a cost per gallon of $0.0111.

9.2 Revenue Increase Needed

9.2.1 Capital Improvement Costs

The Capital Improvement Plan (CIP) listed in section 8 has a total estimated cost of $11.8 million. Approximately $6.1 million of the cost is considered the City's portion while $5.7 million is the Seal Rock Water District's share based on a 50/50 split of the cost for necessary raw water improvements.

9.3 Potential Grant and Loan Sources

9.3.1 Background Data for Funding

Funding for municipal water system capital improvements occurs with loans, grants, principal forgiveness, bonds, or a combination thereof. Parameters such as the local and State median household income (MHI), existing debt service, water use rates, low/moderate income level percentages, financial stability, and project need are used by funding agencies to evaluate the types and levels of funding assistance that can be received by a community.

According to the 2000 US Census, the MHI in Toledo is $34,503 (1999 dollars). The State MHI is $40,916 and the Toledo MHI is 84.3% of the State MHI. According to the Proposed 2010 Method of Distribution document for Community Development Block Grant (CDBG) program, Toledo has 41.0% low/moderate income persons.

Based on 7,500 gallons use per month, the average residential water bill in Toledo is currently $61.78 per month or $741.36 annually which equals 2.15% of the local MHI. Many funding sources require user rates to be high enough to meet a certain “threshold rate” or “affordability rate” which is expressed at a percentage of the local MHI. For example, in 2009 for the CDBG program, water rates had to be at least 1.48% of the local MHI to qualify for grant assistance. In Toledo, this threshold rate would be $42.55 per month. Since the threshold rate is met, grants and principal forgiveness may be available.

The calculation for the water user rate can incorporate, when applicable, fee-equivalents derived from other local funding sources that are or will be used to pay for the water system, including any special levy on taxable property within the system’s territory.

9.3.2 Infrastructure Finance Authority (IFA)

IFA administers resources aimed at community development activities primarily in the water and wastewater infrastructure areas. The IFA Regional Coordinator for Lincoln County is Melissa Murphy (503-983-8857) and any application process should begin by contacting her. The funding programs through IFA include:

- Community Development Block Grants (CDBG)
- Safe Drinking Water Revolving Loan Fund (SDWRLF)
- Special Public Works Funds
- Water/Wastewater Financing

Block Grant assistance for Toledo may be possible due to the existing water rates and possible ability to meet the national objectives for low and moderate income persons.

The SDWRLF generally must be used to address a health or compliance issue and could potentially provide a loan up to $6 million per project. To receive a loan the project must be ranked high enough on the Project Priority List in the Intended Use Plan developed by the State. A Letter of Interest (LOI) must be submitted before a project can be listed in the Intended Use Plan. The LOIs are accepted annually. Loan terms are typically 3-4% interest for 20 years however “Disadvantaged Communities” can potentially qualify for 1% loans for 30 years as well as some principal forgiveness. To be considered a Disadvantaged Community the average residential water rate must be at or above the threshold rate (~$42.55 per month in Toledo) and the area MHI must be less that the State MHI.

All recipients of SDWRLF awards need to complete an environmental review on every project in accordance with the State Environmental Review Process (SERP), pursuant to federal and state environmental laws. The Environmental Report typically required can cost $25,000 to $75,000 depending on the specific biological, cultural, waterway, and wetland issues that arise.

Loans and grants are available through the Special Public Works Funds and Water/Wastewater Financing depending on need and financial reviews by IFA.

9.3.3 Rural Development / Rural Utilities Service (RUS)

The United States Department of Agriculture (USDA) Rural Utilities Service (RUS) has a Water Programs Division which provides loans, guaranteed loans, and grants for water infrastructure projects for towns of less than 10,000 persons. Grants are only available when necessary to keep user costs to reasonable levels (very similar to IFA threshold rate). Loans can be made with repayment periods up to 40 years. Interest rates vary but often are around 4% for design/construction loans. Environmental reporting is required similar to that for the SDWRLF but with slightly different criteria.

9.4 Potential Water Rate Increases

Because of the various options in funding programs and requirements for contact and communication with the Regional Coordinators prior to applications, the recommended first step in exploring funding options is to attend a “One-Stop” financing meeting. The One-Stop meeting is held in Salem once a month with the goal of gathering the State and federal funding agencies together at one time and one place to discuss all potential funding possibilities and issues. No funding commitments are made at the meeting, but probable funding sources and details are provided to enable the City to choose the best alternatives possible at that time and to initiate funding application steps.

To complete Phase 3 requires no additional revenue from Seal Rock since the Phase 3 projects are for the City alone. To complete Phase 4 requires $565,000 per year from Seal Rock and $565,000 per year from Toledo.

Based on this scenario, if the Phase 3 and 4 projects were undertaken within the next few years, an additional $177,000 in annual revenue would be needed from Seal Rock and no additional annual revenue would be needed from within the City. To generate the additional Seal Rock revenue would require an adjustment in the wholesale rate for 1000 gallons from $3.35 to approximately $4.88 based on current average volumes of water sold. For each of the approximate 2400 metered connections in the Seal Rock Water District, this increase would equal an additional $6.15 per month.

9.5 Rate Impact Summary

The current rate structure for the City generates approximately $132,000 per month in water sales revenue metered through around 1345 meters. With the Mill Creek Transmission Line and Booster Pump Station phased out over a ten-year period, the current rate structure will be able to pay for the improvements.