City of Edmonds

# Comprehensive Water System Plan

October 2017

murraysmith

**THIS PAGE INTENTIONALLY LEFT BLANK**

# COMPREHENSIVE WATER SYSTEM PLAN

# FOR

# CITY OF EDMONDS

## October 2017


Prepared by:

**MURRAYSMITH, INC.**

In association with:
**FCS Group, Inc.**

15-1662.409

**THIS PAGE INTENTIONALLY LEFT BLANK**

# City of Edmonds
# Comprehensive Water System Plan
# Table of Contents

**Chapters** **Page**



**Tables** **Page**

**Figures** **Page**



**Appendices**

# EXECUTIVE SUMMARY

## Overview and Purpose

This water system plan is an update to the City of Edmonds' (City's) December 2010 Water Comprehensive Plan, which received Washington State Department of Health (DOH) approval in February 2011. The City is required to update and submit a water system plan to DOH for review and approval every ten years in accordance with current drinking water regulations. Prior to January 2017, the plan update and approval period was six years.

The purpose of this updated plan is to meet the State's regulatory requirements and to provide the City with a useful working document to guide the planning, scheduling, and budgeting of water system improvements. This updated plan will also be used by City staff to help maintain the water system to ensure both existing and future customers are provided with a safe and reliable supply of drinking water and fire protection. The planning period for this water system plan is 20 years.

## Water System Overview

The City's municipal water system started in 1928 and has grown over the years as the City expanded and annexed more areas. The City's water system provides service to approximately 80 percent of the population within the City limits of roughly 10,177 metered water service connections. The other 20 percent of the City's population receive water service from the Olympic View Water & Sewer District, which is located within the southwest portion of the City limits.

All water supplied to City customers is currently purchased from Alderwood Water and Wastewater District (AWWD) and is conveyed through a single metered connection near the northeast corner of the water system. The City also has the capability to serve a portion of its system with water purchased from Seattle Public Utilities (SPU), but currently maintains this source of supply for emergencies only and the single metered connection on standby. Water purchased from AWWD originates from the City of Everett Sultan River source. Water supplied by SPU originates from SPUs Tolt River source.

The City's water system has seven pressure zones with two supply stations, 17 pressure reducing valve (PRV) stations, two pressure relief stations, one pump station, more than 139 miles of water main, and 11 emergency interties with adjacent water systems. Water storage is provided by four reservoirs that have a combined capacity of 7.5 million gallons (MG).

## Water Supply and Water Quality

The City's purchase of water from AWWD is on a wholesale basis and subject to the terms and conditions of the water supply agreement that has been in place since 1978. A new agreement was negotiated in 2010 extending the wholesale supply agreement through January 1, 2055. The City also negotiated a new agreement with SPU in 2011 for long-term standby supply for emergency purposes through December 31, 2061. The City signed an interlocal agreement with the City of Lynnwood in 2015 providing supplemental water supply for emergency purposes.

The City's primary supply of water is produced at the source by the City of Everett (Everett), then supplied to AWWD, and finally supplied to the City. Everett is the regional supplier of water to a majority of water systems in Snohomish County. Everett's source of water originates from the Sultan River and fills Lake Chaplain, where it is drawn and treated at the Everett Water Filtration Plant. The water also receives chlorine disinfection within the AWWD system prior to being supplied to the City. Water quality is routinely monitored within the City's system and has been good in the past with no water quality concerns.

## Past Water Usage and Future Water Demands

Total annual water usage within the City's service area peaked in 2003, at a time when the City was supplying an average of 3.65 million gallons per day (MGD). Since 2003, total annual water usage has decreased at the same time that the number of water customers has moderately increased. Total water supply to the system averaged 2.92 MGD in 2014. The average per capita water demand within the City's service area from 2009 through 2014 was 95 gallons per day per person. This represents a reduction of roughly 9 percent when compared to the average water demand of 104 gallons per day per person that was presented in the City's 2010 Comprehensive Water System Plan for the years 2003 through 2008. The reduction in water usage in terms of both total annual water supply and average day demand per person over the last several years is due to the success of the City's past conservation efforts, replacement of old water mains, and the detection and repair of water main leaks.

Additional reductions in per capita water demand are expected in future years, but not likely at the same rate seen in recent years. Future reductions from water use are expected from ongoing replacements of old water main and the continued implementation of water use efficiency measures (previously referred to as conservation measures), both at the local and regional levels. Growth of customers within the City's existing service area will have the largest impact on overall water demand during the next 20 years. At the end of the 20-year planning period, the estimated amount of additional water demand from planned growth will represent an increase between approximately 5.5 and 14 percent, depending on the amount of future water use reductions from the continued water use efficiency program efforts.

## Operations and Maintenance

The City's Water Division is staffed by several well-qualified personnel that are certified to operate and maintain the water system, as required by law. The City provides ongoing training opportunities for staff to comply with the State's certification requirements and to develop the skills necessary to ensure a dependable supply of high-quality drinking water is available to customers at all times.

The Water Division is currently staffed with seven full-time personnel consisting of four field technicians, one water quality technician, one meter reader, and one lead supervisor. The Water and Sewer Manager and Public Works Director both allocate a portion of their time to the Water Division as well. The Water Division has been able to operate the water system and meet past regulatory requirements for public water systems. However, the increasing needs of the water system, combined with the additional demands of now having a consistent waterline replacement program and additional needs due to regulatory requirements, has created more challenges in completing planned preventive maintenance activities. Therefore, the City's Water Maintenance and Operations Division is planning to add at least one additional staff member in the near future to ensure continued compliance with regulatory requirements and the increasing needs of the system.

## Water System Improvements Completed Since 2010

The City has completed several water system improvement projects since the last water system plan was completed in 2010. These include several projects that replaced old and undersized water main, improvements to the Five Corners Pump Station, and pressure reducing station replacements.

## Water System Analysis and Planned Improvements

The existing water system was analyzed to determine its ability to meet current water system regulations and the City's own policies and design criteria. Several analyses were performed to evaluate all components of the water system under both existing and future water demand conditions. The results of the analyses were used to identify and size improvements for the water system. Planned improvements include the following, which are detailed in **Chapter 9**:

- Water Main Improvements
  - Primarily replacement of existing water mains due to their age, pipe material, and need to provide more fire flow.

- PRV Station and Pressure Relief Improvements

  - Replacement of PRV Stations #13, #14, #15, #16 (CIP Nos. PRV 1 through PRV 4)
  - Annual PRV Station Improvements Program (CIP No. PRV 5)

- Facility Improvements
  - Five Corners Reservoir Improvements (CIP No. F1)
  - Yost Reservoir Piping Maintenance and Replacement (CIP No. F2)
  - Seaview Reservoir Piping Maintenance and Replacement (CIP No. F3)
  - SPU Intertie & Emergency Intertie Improvements (CIP No. F4)

- Other Improvements
  - Pressure Zone Conversion (325 to 486) (CIP No. M1)
  - Comprehensive Water System Plan Update (CIP No. M2)

## Financing for Planned Water System Improvements

The need for improvements to the water system is almost entirely due to aging infrastructure that has reached the end of its useful service life, is undersized and unable to meet current requirements, or has some other existing system deficiency. The improvements identified in this plan have been sized to meet both current needs and future growth within the system. Improvements identified for the next six years (2017-2022) are estimated to cost approximately $18.9 million, which results in an average expenditure of approximately $3.15 million per year (in 2016 dollars).

A financing plan has been developed for funding the planned improvements and ongoing operations and maintenance, while paying down debt. The financing plan is based on the City's preference to fund capital improvements from cash reserves without incurring new debt. The improvements will be funded through a combination of cash reserves from system reinvestment, rate revenues, and new water service connection general facility charges. Ongoing water rate adjustments are necessary to provide sufficient revenue to support water system operations, maintenance and replacements. The financing plan is based on the City's recently adopted water rate adjustments for 2017 through 2019 and projected adjustments for future years.

# CHAPTER 1 | INTRODUCTION

## Background and Purpose

The City of Edmonds' (City) existing Comprehensive Water System Plan, dated December 2010, was approved by DOH in February 2011. This plan must be updated and submitted to the Washington State Department of Health (DOH) every ten years in accordance with the regulatory requirements contained in WAC 246-290-100. The purpose of this updated plan is to meet the current regulatory requirements for water system planning and provide useful planning information that will guide the City in operating, maintaining, and improving its water system.

## Water System Ownership and Management

The City of Edmonds is a municipal corporation that owns and operates a public water system within its corporate boundaries. Water system data on file at the DOH for the City is shown in **Table 1-1**.

**Table 1-1**
**Water System Ownership and Management**

| Information Type | Description |
|---|---|
| System Name | City of Edmonds |
| System Type | Group A-Community-Public Water System |
| County | Snohomish County |
| System ID Number | 225004 |
| Owner Number | 1683 |
| Address | 7110 210th Street SW, Edmonds, WA 98026-7219 |
| Primary Contact | 425-771-0235 |
| Owner Contact | Jim Waite, Water/Sewer Manager |

## Overview of Existing Water System

The City's municipal water system started in 1928 with the construction of new water facilities and the acquisition of a private water company that was serving central Edmonds for many years. The City's water service area has grown over the years as the City expanded and annexed more areas. In 2014, the City provided water service to more than 10,177 customer accounts within an area of approximately 7.1 square miles.

All water supplied by the City is purchased from Alderwood Water and Wastewater District

(AWWD) and is conveyed through a single metered connection near the northeast corner of the City's system. The City also has the capability to serve a portion of its system with water purchased from Seattle Public Utilities (SPU) and conveyed through a single metered connection near the southeast corner of the City's system, but currently maintains this supply facility on standby. Water purchased from AWWD originates from the City of Everett Sultan River source and is sold to AWWD on a wholesale basis. Water supplied by SPU originates from SPUs Tolt River source.

The City's water system has seven pressure zones with two supply stations, 17 pressure reducing stations, two pressure relief stations, one pump station, more than 139 miles of water main, and 11 emergency interties with adjacent water systems. Water storage is provided by four reservoirs that have a combined capacity of approximately 7.5 million gallons (MG).

## Summary of Plan Contents

A summary of the plan and organization of content is provided below:

- Executive Summary: Summarizes the key elements of this plan.
- Chapter 1 - Introduction: Provides an overview of the City's water system, the objectives of the plan, and the plan organization.
- Chapter 2 - Water System Description: Presents the water service area, describes the existing water system, and identifies the adjacent water purveyors.
- Chapter 3 - Land Use and Population: Presents related plans, land use, and population characteristics.
- Chapter 4 - Water Demands: Presents historical water use patterns, existing water demands, and projected future demands.
- Chapter 5 - Policies and Design Criteria: Presents the City's water service policies, water system operation policies, and water system design criteria.
- Chapter 6 - Water Source and Quality: Describes the City's water source and the results of past water quality monitoring.
- Chapter 7 - Operations and Maintenance: Describes the City's water system operations and maintenance program.
- Chapter 8 - Water System Analyses: Presents the results of the water system analyses and summarizes existing system deficiencies.

- Chapter 9 - Water System Improvements: Describes the water system improvements that resolve existing system deficiencies, estimated costs of improvements, and a schedule for implementation of the improvements.

- Chapter 10 - Financial Plan: Summarizes the financial status of the City's water utility and presents a program for funding the water system improvements.

- Appendices: Additional information and plans that supplement the chapters listed above.

    - Appendix A - Agreements
    - Appendix B - DOH Water Facilities Inventory (WFI) Form
    - Appendix C - Water System Facility Data
    - Appendix D - Consistency Statement Checklist
    - Appendix E - State Environmental Policy Act (SEPA) Checklist
    - Appendix F - Water Use Efficiency Program
    - Appendix G - Construction Standards
    - Appendix H - Cross-Connection Control (CCC) Program
    - Appendix I - Fire Code
    - Appendix J - Annual Water Quality Report
    - Appendix K - Coliform Monitoring Plan
    - Appendix L – Ordinances

## Definition of Terms

Definitions for terms used in this plan are provided below.

Consumption: The volume of water used by the water system's customers, based on customer meter records. The volume is measured at each customer's connection to the distribution system.

Cross-Connection: A physical arrangement that connects a drinking water system with anything other than another drinking water system with the potential for a contamination of the drinking water.

Demand: The quantity of water required from a water supply source over a period of time necessary to meet the needs of domestic, commercial, industrial, and public uses, and to provide enough water to supply fire fighting, system losses, and miscellaneous water uses. Demands are normally discussed in terms of flow rate, such as million gallons per day (mgd) or gallons per minute (gpm), and are described in terms of a volume of water delivered during a certain time period. Types of demands discussed in this plan include:

- Average Day Demand (ADD): The total amount of water delivered to the system in a year divided by the number of days in the year.

- Peak Day Demand (PDD): The maximum amount of water delivered to the system during a 24-hour time period of a given year.

- Peak Hour Demand (PHD): The maximum amount of water delivered to the system, excluding fire flow, during a one hour time period of a given year. Peak hour demand usually occurs during the same day as the peak day demand.

Distribution System Leakage (DSL): The annual amount of water calculated from the difference between the measured amount of water supplied into the system and the measured amount of water taken out of the system for consumption and other authorized uses. Authorized uses include both metered and unmetered water uses. Water use that is unmetered must be estimated to be classified as an authorized use. Examples of common unmetered water uses include the use of hydrants for flushing, fire fighting, and construction. The calculated DSL volume consists primarily of water loss through leaks in the water system, but may also include meter inaccuracies, meter reading errors, water theft, and reservoir overflows.

Equivalent Residential Units (ERU's): One ERU represents the amount of water used by one single family residence for a specific water system. The demand of other customer classes can be expressed in terms of ERU's by dividing the demand of each of the other customer classes by the demand represented by one ERU.

Fire Flow: The rate of flow of water required during fire fighting, which is usually expressed in terms of gallons per minute (gpm).

Head: A measure of pressure or force by water. Head is measured in feet and can be converted to pounds per square inch (psi) by dividing feet by 2.31.

Head Loss or Pressure Loss: A reduction in pressure caused by pipeline wall friction, bends, physical restrictions, or obstructions as water moves through a pipeline.

Hydraulic Elevation: The height of a free water surface above a defined datum; the height above the ground to which water in a pressure pipeline would rise in a vertical open-end pipe.

Maximum Contaminant Level (MCL): The maximum permissible level of contaminant in the water that the purveyor delivers to any public water system user, measured at the locations identified under WAC 246-290-310.

Potable: Water suitable for human consumption.

Pressure Zone: A portion of a water system that operates at a common hydraulic elevation.

Purveyor: An agency, subdivision of the State, municipal corporation, firm, company, mutual or cooperative association, institution, partnership, persons, or other entity owning or

operating a public water system. Purveyor also means the authorized agents of such entities.

Supply: Water that is delivered to a water system by one or more supply facilities, which may consist of supply stations, booster pump stations, and wells.

Storage: Water that is "stored" in a reservoir to supplement the supply facilities of a system and provide water supply for emergency conditions. Storage is broken down into the following five components that are defined and discussed in more detail in the plan: operational storage, equalizing storage, standby storage, fire flow storage, and dead storage.

Water Service Connection Fee: A one-time fee paid by a property owner when initially connecting to the City's water system. This fee pays for the new customer's equitable share of the cost of the existing system. This fee offsets the costs of providing water to new customers and recognizes that the existing water system was largely built and paid for by the existing customers.

## Abbreviations

The following abbreviations are used in this plan:

| | |
|---|---|
| ADD: | Average Day Demand |
| AWWA: | American Water Works Association |
| AWWD: | Alderwood Water and Wastewater District |
| CCR: | Consumer Confidence Report |
| CIP: | Capital Improvement Program |
| City: | City of Edmonds |
| DOH: | Department of Health |
| DSL: | Distribution System Leakage |
| EPA: | Environmental Protection Agency |
| ERU: | Equivalent Residential Unit |
| fps: | feet per second |
| GMA: | Growth Management Act |
| gpm: | gallons per minute |
| MCL: | Maximum Contaminant Level |
| MG: | Million Gallons |
| MGD: | Million Gallons per Day |
| mg/l: | milligrams per liter |
| PDD: | Peak Day Demand |
| PHD: | Peak Hour Demand |
| psi: | pounds per square inch |
| SDWA: | Safe Drinking Water Act |
| SPU: | Seattle Public Utilities |
| WAC: | Washington Administrative Code |

**THIS PAGE INTENTIONALLY LEFT BLANK**

# CHAPTER 2 | WATER SYSTEM DESCRIPTION

## Introduction

This chapter describes the City of Edmonds' (City) existing water system and provides a brief discussion of adjacent water systems. Included is a discussion of the water service area, water service agreements, and all existing water system facilities. The evaluation of the existing water system is presented in **Chapter 8**.

## Water Service Area

### City History

The City was incorporated in 1890 with the original town site encompassing approximately 550 acres. The original town site is now occupied primarily by the downtown and adjacent residential areas. The City has expanded in area through annexations to approximately 8.9 square miles. Continued growth during the 1940's and 50's resulted in a more active role of the municipality in providing water, sewer and streets for the residential and commercial expansion. The Port District was formed in 1948 and began waterfront improvements. Commercial and retail businesses within the downtown area provided a wide range of services to the community. Completion of Interstate 5 and increased growth in the Puget Sound region led to a gradual change in the character of Edmonds, with more emphasis on residential development and a decline in the retail importance of the downtown. The City is now primarily a residential community.

The rate of population growth has been relatively stable over the years with a major increase between 1950 and 1970 from 8,016 to 23,700 due to annexations. Between 1990 and 2000, the population expanded to 39,515 due to annexations in the southern portion of the City. Since then, the City's population has grown to approximately 39,950 in 2014. Approximately 80 percent of the City's population receives water service from the City. The remaining 20 percent receive water service from the Olympic View Water & Sewer District (OVWSD), which is located within the southwest portion of the City limits.

### Water System History

The original water system was established by the Edmonds Water Company in the late 1890's. Water was supplied from local springs and wells. The Edmonds Spring Water Company acquired the Edmonds Water Company shortly thereafter. The first large reservoir, a 300,000 gallon concrete tank, was constructed in 1921 near Ninth Avenue and Main Street. The City began acquiring and building its own municipal water system in 1928, beginning with a 500,000 gallon steel water tank and two wells. The City struggled with

water shortages and poor water quality from their groundwater sources through the 1950's and 60's. In 1966, the City contracted with the City of Seattle for a new water supply. A transmission main was extended from a new supply meter at the King County – Snohomish County boundary line through the Ballinger area, north of the City storage tank near Five Corners. The City also signed a water supply agreement with Alderwood Water & Wastewater District (AWWD) in 1966 to supply water to the City through a metered connection at the intersection of 168th Street SW and 62nd Avenue West. The City abandoned the wells and springs after completion of the new supply sources. Since 2000, the City has supplied the entire water system exclusively with water from AWWD, while maintaining the Seattle metered supply connection as a standby source of water for emergency use only.

## Topography

The City's water service area is located in a relatively hilly portion of southwest Snohomish County. The highest elevation in the City is in the southeast corner at over 450 feet above Mean Sea Level (MSL). The topography of the City's service area generally slopes downward, from east to west, toward Puget Sound, with the exception of the southeast corner of the service area that slopes down towards Lake Ballinger.

## Retail Water Service Area

The City's retail water service area boundary is within the City limits and defined by the City limits, except for the southwest portion of the City that is served by OVWSD, as shown in **Figure 2-1**, Existing Water System. These limits are generally defined as the area extending north to Meadowdale Beach Park, south to 244th Street SW along the Snohomish/King County boundary, and west to the Puget Sound. The eastern boundary of the City limits generally follows Olympic View Drive, 76th Ave West, and Highway 99, except for a small portion of the City bounded on the west by Highway 99 and Lake Ballinger to the east between 220th Street SW and 244th Street SW.

## Satellite System Management

A Satellite Management Agency (SMA) is defined as a person or entity that is certified by the Department of Health to own and/or operate more than one public water system without the necessity for a physical connection between such systems. The City provides water service to all customers in its water service area. Currently, no small water systems exist within the City's water service area. The areas adjacent to the City's water service area boundary are currently served by relatively large, public water systems that are unlikely to become future satellite water systems.

## Water Service Agreements

The City has entered into a long-term agreement with the AWWD for the purchase of water on a wholesale basis. The City also has an agreement with OVWSD for OVWSD's supply of water to customers within the City limits. The City has emergency intertie agreements with Seattle Public Utilities and the City of Lynwood for the supply of water during emergency events. A summary of these agreements is presented below and copies are contained in **Appendix A**.

### Water Supply Agreement with Alderwood Water & Wastewater District

This 2010 agreement provides for the wholesale supply of water from AWWD to the City of Edmonds until January 1, 2055, at which time it can be renewed by mutual agreement of both parties. The agreement consists of several sections that address water supply, master metering, area of use, water quality, wholesale rate calculation, future facility acquisitions, and several other elements. A copy of the agreement is contained in **Appendix A**.

### Emergency Intertie Agreement with Seattle Public Utilities

The December 31, 2011 agreement between the Seattle Public Utilities (SPU) and the City of Edmonds allows the City to use water through the metered connection to the SPU transmission system for emergency purposes, including fire flow. The agreement is for a fifty-year term, expiring on December 31, 2061. A copy of the agreement is in **Appendix A**.

### Interlocal Agreement with City of Lynnwood for Emergency Interties

The March 2015 agreement provides for supplemental water supply for emergency purposes through five emergency intertie connections between the two water systems. The agreement addresses obligations, billing for water used, ownership, administration, and other elements. It also provides the locations of interties along with infrastructure information.

### 1985 Agreement with Olympic View Water District

This agreement provides for water supply from the OVWSD to customers located within the Edmonds' city limits and the boundaries of OVWSD, subject to the terms and conditions as outlined in the agreement. A copy of this agreement is contained in **Appendix A**. Also included in **Appendix A** is a copy of the OVWSD franchise agreement and an interlocal operating agreement between the City and OVWSD.

## Existing Water System Facilities

A description of the City's existing water system facilities is provided in this section. The analysis of these facilities is presented in **Chapter 8**. General water system facility data is summarized on the Department of Health Water Facilities Inventory (WFI) form, which is included in **Appendix B**. More detailed water system facility information is contained in **Appendix C**.

## Pressure Zones

The City's topography varies from sea level along the west side bordering the Puget Sound, to approximately 455 feet along the eastern City limit. The terrain generally slopes from east to west, toward Puget Sound. This wide range of elevation requires the City to either reduce or increase pressures in certain areas such that sufficient water pressure and fire flow are available throughout the system. This has been accomplished by dividing the water system into seven different pressure zones, as shown in **Figure 2-1**. The pressure in each zone is regulated by reservoir levels, pressure reducing station settings, pump station settings, or a combination of these, as illustrated in the hydraulic profile, **Figure 2-2**.

### *Overview*

All water supply to the system is from the Alderwood Supply Station, which supplies water directly to the City's highest pressure zone, the 596 Zone. All other pressure zones receive water from the 596 Zone through a control valve at the Five Corners Reservoir site or through pressure reducing valve (PRV) stations. A more detailed description of the City's pressure zones follows.

### *596 Zone*

The 596 Zone is the City's largest zone, which includes customers in the central and eastern portion of the City. The 596 Zone is a closed zone, which is a pressure zone without gravity storage. Primary supply to the zone is from the Alderwood Supply Station, which functions as a pressure regulating facility to maintain pressures in the 596 Zone. Pumped water storage is provided for the 596 Zone, utilizing the Five Corners 3.0 MG and 1.5 MG Reservoirs and the Five Corners Pump Station. The 596 Zone can also receive water on an emergency basis from five manually operated emergency interties with the City of Lynnwood, which are located along the eastern boundary of the service area. Ground elevations vary throughout the 596 Zone from approximately 270 to 455 feet.

### *505 Zone*

The 505 Zone supplies water to customers in the central and northern portion of the City. Water to this zone is supplied from the 596 Zone through five PRV stations, including PRV

Stations 10, 13, 14, 15, and 24. These stations reduce the pressure of the water to maintain adequate pressures throughout the 505 Zone. Ground elevations vary throughout the 505 Zone from approximately 195 to 365 feet.

### *500 Zone*

The 500 Zone supplies water to customers near the northern portion of the City. Water to this zone is supplied from the 596 Zone through two PRV stations (2 and 5). Ground elevations vary throughout the 500 Zone from approximately 180 to 400 feet.

### *486 Zone*

The 486 Zone supplies water to customers in the central and southern portion of the City. The primary supply of water to this zone is from the Five Corners 1.5 MG Reservoir, which floats on the zone and establishes pressures throughout the zone. The Five Corners 1.5 MG Reservoir is filled with water from the 596 Zone through a control valve on the inlet piping system of the reservoir. Supplemental water supply to the 486 Zone is provided by two PRV stations, which receive water from the 596 Zone. These PRV stations, 16 and 17, are normally not open and are set to supply water during fire flow events and other high demand situations when pressures drop in the 486 Zone. The 486 Zone can also receive water on an emergency basis through three manually operated emergency interties with OVWSD. Ground elevations vary throughout the 486 Zone from approximately 170 to 375 feet.

### *425 Zone*

The 425 Zone is the smallest zone with customers near the north portion of the City. Water to this zone is supplied from the 596 Zone through two PRV stations. These PRV Stations include 8 and 9. Ground elevations vary throughout the 425 Zone from approximately 175 to 285 feet.

### *420 Zone*

The 420 Zone supplies water to customers in the central portion of the City. Water to this zone is supplied from two PRV stations, one receiving water from the 596 Zone (PRV Station 23) and the other receiving water from the 486 Zone (PRV Station 18). Ground elevations vary throughout the 420 Zone from approximately 155 to 250 feet.

### *325 Zone*

The 325 Zone is the second largest pressure zone and supplies water to customers in the western portion of the City and adjacent to Puget Sound. The primary supply of water to this zone is from the 1.5 MG Seaview Reservoir and 1.5 MG Yost Reservoir. Both reservoirs float on the zone and establish pressures throughout the zone. The Seaview Reservoir is

supplied with water from the 505 Zone through a control valve at the reservoir site. The Yost Reservoir is supplied with water from the Five Corners 1.5 MG Reservoir in the 486 Zone through a control valve at the reservoir site. Supplemental water supply to the 325 Zone is provided by four PRV stations, which are supplied by three different pressure zones, including two from the 500 Pressure Zone (PRV Stations 3 and 6), one from the 486 Pressure Zone (PRV Station 20), and one from the 425 Pressure Zone (PRV Station 7). These PRV Stations are shown in **Figure 2-2**. These PRV stations are normally not open, but are set to supply water during fire flow events and other high demand situations when pressures drop in the 325 Zone. The 325 Zone can also receive water on an emergency basis through a single, manually operated emergency intertie with OVWSD. Ground elevations vary throughout the 325 Zone from approximately 10 to 245 feet.

## Supply Facilities

The City is supplied with water through the Alderwood Supply Station and maintains a standby emergency intertie with SPU for supply during emergency events.

### *Alderwood Supply Station*

The City currently supplies the entire system with water purchased from AWWD, which in turn purchases the water from the City of Everett. The original source of the water is the Spada Reservoir, in the headwaters of the Sultan River (roughly 30 miles east of Everett).

The Alderwood Supply Station is located in the City's 596 Zone at the intersection of 168th Street SW and Olympic View Drive. The supply station is a below-grade concrete vault, which receives water from AWWD's 635 Zone through a 24-inch transmission main. The station contains a 12-inch mainline meter and control valve and an 8-inch supplemental meter and control valve. The station includes a remote telemetry unit and is connected to the City's telemetry system through leased telephone lines. Modifications to the station were completed in 2010 to increase capacity of the supply facility, as planned in the City's 2010 Comprehensive Water System Plan.

### *Seattle Public Utilities Emergency Intertie*

The emergency intertie with SPU is a below-grade concrete vault with a single 20-inch inlet pipe, 20-inch outlet piping, a 12-inch flow meter, and a 12-inch control valve that connects SPU's 592 Zone with the City's 596 Zone. The facility was originally used for primary supply to the south portion of the City's water system, prior to the City supplying the entire system with water purchased from AWWD. The facility is currently used by the City as an emergency intertie, in accordance with the terms and conditions of the 2011 agreement with SPU.

### *Water Treatment*

All water purchased by the City is treated before entering the City's distribution system. The City does not provide additional water treatment. Water purchased from AWWD is treated by the City of Everett's water filtration plant, located adjacent to Lake Chaplain. This plant provides filtration, chlorination and fluoridation. Additional chlorination is provided by AWWD at AWWD reservoir sites.

Water treatment of the SPU supply is provided by the Tolt Treatment Facility, located near the South Fork Tolt River. Seattle provides filtration, ozonation, chlorination, and fluoridation at this facility.

## Pumping Facilities

### *Five Corners Pump Station*

The Five Corners Pump Station is located at the same site as the Five Corners 1.5 MG and 3.0 MG Reservoirs on the north side of Bowdoin Way, west of the Five Corners intersection at 212$^{th}$ Street SW and 84$^{th}$ Avenue West. The Five Corners Pump Station was constructed along with the Five Corners 3.0 MG Reservoir in 1978 on the same site. The primary purpose of the station is to pump stored water from the Five Corners reservoirs to the 596 Zone for fire flow and during peak demand periods to maintain a relatively steady supply through the Alderwood Supply Station, thereby minimizing large fluctuations in supply being demanded from AWWD.

Improvements to the pump station were completed in 2010 and included replacement of pumps, valves, piping and variable frequency drives (VFDs). Control modifications were completed in 2016 that allow the station to operate in either pressure or flow control modes.

The pump station contains two end-suction centrifugal pumps with 60 horsepower motors, each designed to pump 1,195 gpm at 130 feet total dynamic head. The station was designed with space for a third pump in the future. A standby engine generator at the site provides backup power supply to ensure the pump station is operational at all times (i.e., in the event of a power failure).

## Storage Facilities

The City's water system has four reservoirs with a total combined storage capacity of approximately 7.5 million gallons. Two reservoirs (325 Zone 1.5 MG Seaview Reservoir, 325 Zone 1.5 MG Yost Reservoir) provide storage to the 325 Zone and the two other reservoirs (Five Corners 1.5 MG Reservoir, Five Corners 3.0 MG Reservoir) provide storage to the other pressure zones. A more detailed description of each reservoir is provided below.

### *325 Zone 1.5 MG Seaview Reservoir*

The 325 Zone 1.5 MG Seaview Reservoir is located at Seaview Park, which is south of 184th Street SW at approximately 90th Ave West. The 119-foot square buried concrete reservoir was constructed in 1975 and provides approximately 15.0 vertical feet of water storage with an overflow elevation of 325 feet. The reservoir is filled with water from the 505 Zone through 8-inch inlet piping with an 8-inch flow meter and 8-inch control valve. The reservoir provides supply to the 325 Zone through its 12-inch outlet piping.

### *325 Zone 1.5 MG Yost Reservoir*

The 325 Zone 1.5 MG Yost Reservoir is located at 9537 Bowdoin Way, near the southern end of the distribution system. Similar to the Seaview Reservoir, the Yost Reservoir is a 119-foot square buried concrete reservoir. The reservoir is located beneath tennis courts at Yost Park. The reservoir was constructed in 1973 and provides approximately 15.0 vertical feet of water storage for the 325 Zone with an overflow elevation of 325 feet. The reservoir is filled with water from the 486 Zone Five Corners 1.5 MG Reservoir through 8-inch inlet piping with an 8-inch flow meter and 8-inch control valve. The reservoir provides supply to the 325 Zone through its 18-inch outlet piping.

### *Five Corners 1.5 MG Reservoir*

The Five Corners 1.5 MG Reservoir is located just west of Five Corners at 8519 Bowdoin Way. The welded steel, 80-foot diameter reservoir was constructed in 1960 and provides water storage for the 486 Zone. The reservoir has separate 10-inch inlet piping that is elevated to the roof of the tank and 10-inch outlet piping. The reservoir is filled with water from the 596 Zone through 10-inch inlet piping with a 10-inch flow meter and 10-inch control valve.

### *Five Corners 3.0 MG Reservoir*

The Five Corners 3.0 MG Reservoir is located on the same site as the 1.5 MG Reservoir at Five Corners. The welded steel, 104-foot diameter reservoir was constructed in 1979 and provides pumped water storage for the 596 Zone via the Five Corners Pump Station and gravity storage to the 486 Zone. The reservoir has separate 10-inch inlet piping and 10-inch outlet piping. The reservoir is filled with water from the 596 Zone through 12-inch inlet piping with a 12-inch flow meter and 8-inch control valve.

## Distribution System

The City's water distribution system consists of approximately 136 miles of water main ranging in size from 4-inches to 24-inches in diameter. Most of the distribution piping is comprised of ductile iron water mains (61 percent), followed by cast iron water mains (38

percent). The City does not maintain records of water service materials. **Table 2-1** summarizes the water mains throughout the City's distribution system by diameter and total length of each size. **Table 2-2** provides a summary of the City's water mains by material type and total length of each.

**Table 2-1**
**Water Main Summary by Diameter**

| Pipe Diameter (Inches) | Total Length (miles) | Percent of Total (%) |
|---|---|---|
| < 4 | 1.80 | 1.33% |
| 4 | 12.0 | 8.88% |
| 6 | 37.3 | 27.5% |
| 8 | 64.4 | 47.5% |
| 10 | 2.03 | 1.50% |
| 12 | 13.8 | 10.1% |
| 14 | 0.18 | 0.13% |
| 16 | 1.02 | 0.75% |
| 18 | 0.31 | 0.23% |
| 20 | 0.99 | 0.73% |
| 24 | 1.82 | 1.34% |
| **Totals** | **135.7** | **100%** |

**Table 2-2**
**Water Main Summary by Material**

| Pipe Material | Total Length (miles) | Percent of Total (%) |
|---|---|---|
| Cast Iron | 51.7 | 38.1% |
| Ductile Iron | 82.3 | 60.6% |
| HDPE | 1.19 | 0.90% |
| PVC | 0.19 | 0.10% |
| Other | 0.32 | 0.20% |
| **Totals** | **135.7** | **100%** |

The City has an ongoing comprehensive leak detection program, established in 2002, to identify and eliminate water system leaks. The program has included the use of private leak detection services and City staff for locating and identifying leaks. All leaks discovered have been repaired. This system-wide leak detection program is ongoing to ensure that leaks are detected early and promptly repaired.

The City does not maintain records of water service materials. In light of unknown water service materials and the Directive of the Governor 16-06, Assisting Community and Agency Response to Lead in Water Systems, the City reviewed system maps between 2016 and 2017

to identify the portions of the water system most likely to have lead services. After reviewing maps, the City identified several old service lines throughout the City to pothole and inspect for water service materials. Potholing investigations revealed no lead materials. Additionally, the City has not found any lead services in any of their water main replacement projects or repairs. Based on this, the City has determined that it does not have lead services within its water system.

The City's annual water main replacement program has targeted replacement of older water mains, which are typically responsible for most of the leaks. Water main improvements planned by the City are identified in **Chapter 9**.

## PRV Stations

Pressure reducing valve (PRV) stations are connections between adjacent pressure zones that allow water to flow from the higher pressure zone to the lower pressure zone by reducing the pressure of the water as it flows through the station. PRV stations maintain a desired range of pressures in the lower zone. A PRV station is typically a below-grade concrete vault containing two pressure reducing control valves, piping, and other appurtenances. The control valve hydraulically varies the flow of water through the station to maintain a constant pressure on the downstream side of the valve as water flows into the lower pressure zone.

PRV stations are placed in water systems to function in one of two ways. First, they can serve as an active supply facility by maintaining a continuous flow of water into a lower zone that has no other source of supply. The PRV stations serving the 505 Zone, 500 Zone, 425 Zone, and 420 Zone are this type. Second, a PRV station can serve as a standby supply facility by providing fire flow or emergency water supply. In this scenario, the main supply to the zone is from another source (e.g., supply facility or reservoir). This type of PRV station does not typically open to provide flow until the lower, or downstream, zone experiences a significant drop in pressure. Only then will the PRV station become active and allow flow into the lower zone. The PRV stations that supply the City's 486 Zone and 325 Zone are this type.

The City's water system has a total of 17 active PRV stations, as shown in both plan view (**Figure 2-1**) and profile view (**Figure 2-2**). Since 2010, eleven new PRV stations have been constructed, where most of these are replacements of existing, older PRV stations. All the City's PRV stations are in below-grade concrete vaults. A listing of all PRV stations and related data is contained in **Appendix C**.

## Pressure Relief Facilities

Pressure relief stations are installed in pressure zones supplied with water from a higher pressure zone or a high-pressure source. A pressure relief station typically consists of a below-grade vault housing a pressure relief valve, piping, and other appurtenances. Pressure relief

stations protect the zone that it is installed in by discharging water out of the system when pressures in the zone increase beyond the set point of the pressure relief valve, thereby maintaining safe pressures in the zone. The pressure relief valve is normally closed and opens when the pressure in the zone increases beyond the set point of the valve. The valve opens and hydraulically varies the flow rate through the valve to limit the maximum pressure on the upstream side of the valve. A common application for a pressure relief station is to protect a pressure zone from high pressures when a pressure reducing valve in a PRV station fails in the open position and allows high pressure water to enter the lower pressure zone. As an alternative to installing standalone pressure relief stations, pressure relief valves can be installed within PRV stations on the lower pressure zone side of the pressure reducing valve.

The City has two standalone pressure relief stations in the 325 Zone. One is located in the northern portion of the zone and the other in the southern portion. The pressure relief facilities protect the 325 Zone from high pressures in the event of a "stuck open" valve failure of any of the 325 Zone PRV stations, since the originally installed PRV stations in the 325 Zone were not equipped with pressure relief valves. To further improve pressure relief in the 325 Zone and other pressure zones, the City has installed pressure relief valves within most of the recently constructed PRV Stations (#2, #3, #5, #6, #7, #8, #17, #18, #23, and #24). A pressure relief valve is also located within the Five Corners Pump Station to provide pressure relief for the 596 Zone.

## Water System Interties

Water system interties are physical connections between two adjacent water systems that are normally separated by a closed isolation valve or control valve. Interties function as either a normal supply facility or an emergency supply facility. The City's Alderwood Supply Station is considered a normal supply intertie and the SPU Supply Station is considered a standby supply intertie. These interties are operated and maintained according to the previously discussed interlocal agreements.

Emergency supply interties provide water from one system to another during emergency situations only. The City's five interties with the City of Lynnwood and six interties with OVWSD are considered emergency interties. These emergency interties are all normally closed and manually opened in the event supply from Alderwood Water District is disrupted or a portion of the system is affected from one or more water mains that are out of service.

## Telemetry and Supervisory Control System

The City's telemetry and supervisory control system records water system data and provides automatic control of all supply, storage, and pumping facilities. The City's telemetry and supervisory control system also provides instant alarm notification to operations personnel in the event of equipment failure, operation problems, or other emergency events in the system.

A summary of the City's telemetry and supervisory control system at each water system facility is provided below. All facilities are linked to the City's master telemetry unit at the operations facility via leased telephone lines.

- **Alderwood Supply Station**: Monitors and records flow rate and pressure. Remote control of the control valve settings.
- **Seattle Supply Station**: Monitors and records flow rate and pressure. Remote control of the control valve settings.
- **Reservoirs**: Monitors and records water level, chlorine residual, and reservoir fill rates.
- **Five Corners Pump Station**: Monitors and records suction pressure, discharge pressure (596 Zone), and flow rate.

## Adjacent Water Systems

The area outside and immediately adjacent to the City's existing water service area is served by several public water systems, as shown in **Figure 2-3**. The following provides a brief description of each adjacent water system.

### Alderwood Water & Wastewater District

The AWWD provides direct retail water service to the cities of Brier and Mill Creek, portions of the cities of Bothell and Mukilteo, and unincorporated areas of southwest Snohomish County. The AWWD also provides wholesale water service to the cities of Mountlake Terrace and Lynnwood, similar to Edmonds. The AWWD purchases all water supply from the City of Everett. There are no current plans for changes in water service area boundaries between the City and the AWWD.

### City of Seattle/Seattle Public Utilities

The SPU direct water service area is located to the south of the City. SPU receives its water supply from the Cedar River and Tolt River watersheds. There are no current plans for changes in water service area boundaries between the City and SPU's direct service area.

### Olympic View Water & Sewer District

The OVWSD is located to the south of the City and provides water service to a population of approximately 14,500 people as of 2014. The OVWSD service area includes the Town of Woodway, part of the City of Edmonds, and a portion of unincorporated Snohomish County. Most of OVWSD's water supply is purchased from SPU, though it also maintains its own

sources. The OVWSD has six emergency interties with the City, as previously discussed. The emergency interties are located at:

- Intersection between Pine Street and Chinook Road, between OVWD 353 Zone and the City's 325 Zone.
- Intersection of Elm Place and 7th Avenue S, between OVWD 415 Zone and the City's 486 Zone.
- Intersection of Birch Place and 7th Avenue S, between OVWD 415 Zone and the City's 486 Zone.
- Intersection of 8th Avenue S and Elm Way, between OVWD 505 Zone and the City's 486 Zone.
- 220th Street SW, at approximately 7th Avenue S and 9th Avenue S, between OVWD 505 Zone and the City's 486 Zone.
- Intersection of 76th Avenue W and 224th Street, between OVWD 540 Zone and the City's 596 Zone.

No future interties were identified in the District's most recent Comprehensive Water System Plan, as of January 2015. However, a potential future emergency intertie could be installed near the intersection of 236th Street SW and Highway 99 where the City extended a 12-inch water main stub to the west side of the highway approximately 10 years ago when the highway was re-paved. There are no current plans for changes in water service area boundaries between the City and the District.

### City of Lynnwood

Lynnwood is located to the east of the City and provides water service to a population of more than 36,650 people as of 2014. Lynnwood purchases all of its water from the AWWD. There are five manually operated emergency interties between Lynnwood's 573 Zone and Edmonds 596 Zone. The emergency interties are located at:

- Intersection of 208th Street and 76th Avenue W.
- 20910 Highway 99.
- Intersection of Olympic View Drive and 180th Street SW.
- Intersection of Olympic View Drive and 73rd Avenue W.
- Intersection of 68th and North Meadowdale Beach Road.

There are no current plans for additional interties between Lynnwood and Edmonds and there are no current plans for changes in water service area boundaries between the two systems.

## City of Mountlake Terrace

The City of Mountlake Terrace (Mountlake Terrace) is located to the east of Edmonds and provides water service to a population of approximately 21,090 people. Mountlake Terrace purchases all of its water from the AWWD. Mountlake Terrace's 2009 Comprehensive Water System Plan identified one future emergency intertie with the City. The emergency intertie would be located near the intersection of 226th Place SW and 73rd Place West, providing an emergency supply of water from the Edmonds's 596 Zone to the Mountlake Terrace 494 Zone. At the time of this writing, the planned emergency intertie has not been constructed. There are no current plans for changes in water service area boundaries between the two systems.

FIGURE 2-1

# Comprehensive Water System Plan

## Existing Water System

murraysmith

October 2017

N

0 2,000

Scale in Feet

## Legend

- Emergency Intertie
- Pressure Reducing Station
- Pump Station
- Reservoir
- Supply Station
- Pressure Relief Facility
- Zone Valve (Closed)
- City of Edmonds Retail Water Service Area
- Other Water Service Areas
- City Limits
- Snohomish/King County Boundary

**Existing Water Mains:**

- 325 Zone Water Main
- 420 Zone Water Main
- 425 Zone Water Main
- 486 Zone Water Main
- 500 Zone Water Main
- 505 Zone Water Main
- 596 Zone Water Main

**Pressure Zones:**

- 325 Zone
- 420 Zone
- 425 Zone
- 486 Zone
- 500 Zone
- 505 Zone
- 596 Zone

Note: Water main labels indicate the pipe diameter and material.

ALDERWOOD WATER & WASTEWATER DISTRICT

PRV #3

Pressure Relief #4

Emergency Intertie with City of Lynnwood 573 Zone

PRV #2

Supply from Alderwood Water District (635 Zone)

PRV #6

PRV #5

PRV #7

PRV #8

PRV #10

PRV #13

Seaview Reservoir (1.5 MG)

PRV #14

PRV #24

PRV #9

PRV #15

CITY OF EDMONDS

Puget Sound

PRV #23

PRV #16

Pressure Relief #19

PRV #18

PRV #17

Yost Reservoir (1.5 MG)

Five Corners Reservoirs and Pump Station (3.0 MG & 1.5 MG)

Emergency Interties with City of Lynnwood 573 Zone

CITY OF LYNNWOOD

Emergency Intertie with Olympic View Water District Woodway 353 Zone

PRV #20

Emergency Interties with Olympic View Water District 415 Zone

Emergency Interties with Olympic View Water District 505 Zone

Chase Lake

Emergency Intertie with Olympic View Water District 540 Low Zone

UNINCORPORATED SNOHOMISH COUNTY

CITY OF MOUNTLAKE TERRACE

TOWN OF WOODWAY

OLYMPIC VIEW WATER & SEWER DISTRICT

Lake Ballinger

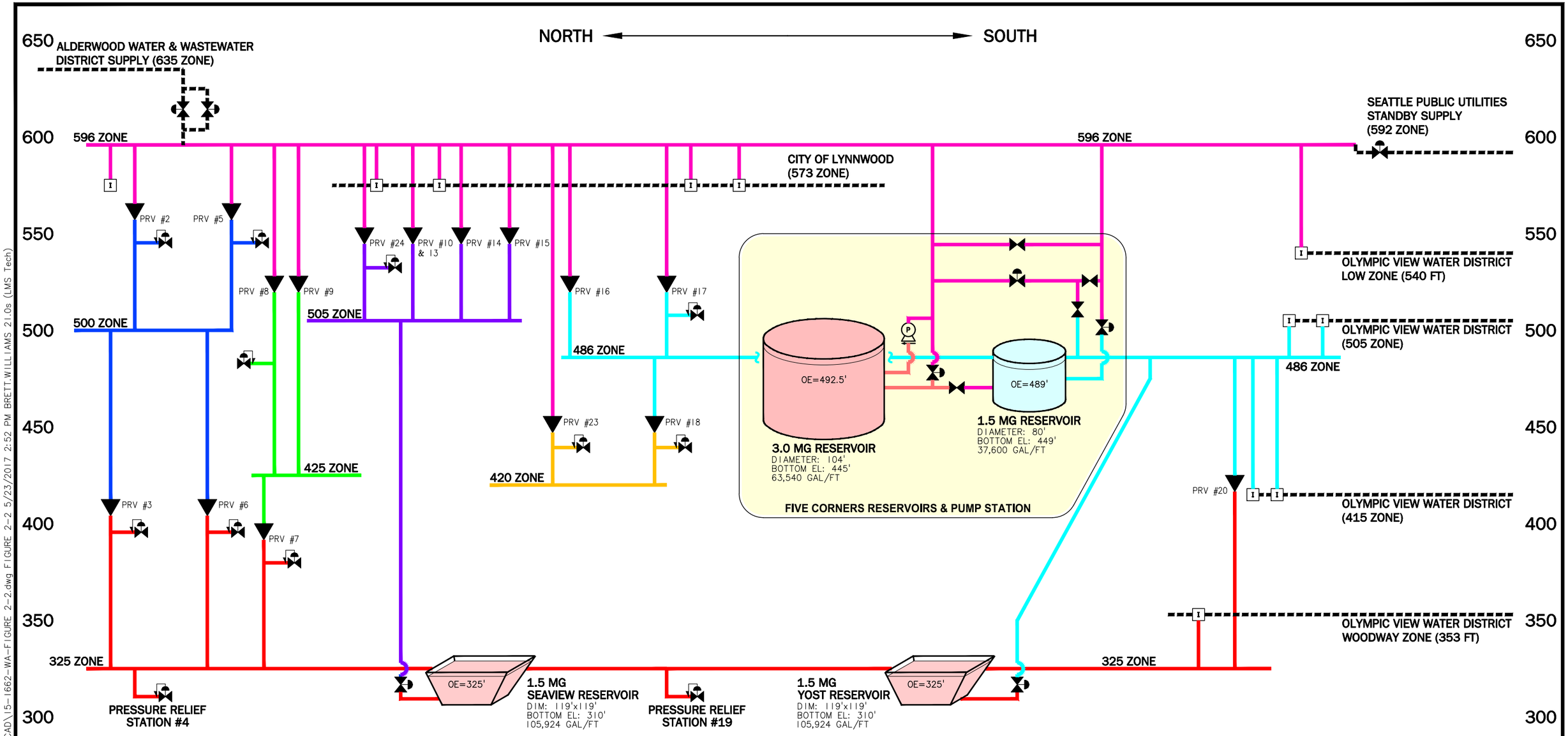
Standby Supply from Seattle Public Utilities (592 Zone)

SNOHOMISH COUNTY

KING COUNTY

SEATTLE PUBLIC UTILITIES

NORTH CITY WATER DISTRICT




## LEGEND

- 596 ZONE
- 505 ZONE
- 500 ZONE
- 486 ZONE
- 425 ZONE
- 420 ZONE
- 325 ZONE
- ADJACENT SYSTEM
- PRESSURE REDUCING STATION/VALVE
- ISOLATION VALVE
- CONTROL VALVE
- PRESSURE RELIEF VALVE
- INTERTIE
- PUMP STATION
- FACILITIES AT SAME SITE

## ABBREVIATIONS

| | |
|---|---|
| EL | ELEVATION |
| FT | FEET |
| MG | MILLION GALLONS |
| OE | OVERFLOW ELEVATION |

FIGURE 2-2

Comprehensive Water System Plan

**Existing Water System Hydraulic Profile**

June 2017

H:\EVT_Projects\15\1662 Edm WSP\GIS\MXD\15-1662-WA-FIGURE 2-3.mxd 9/30/2016 4:25:14 PM Thomas.Walsh

FIGURE 2-3

Comprehensive Water System Plan

**Service Area and Adjacent Water Systems**

June 2017

## Legend

- City of Edmonds Retail Water Service Area
- Alderwood Water District
- City of Lynnwood
- City of Mountlake Terrace
- Olympic View Water & Sewer District
- Seattle Public Utilities
- North City Water District
- City Limits
- Snohomish/King County Boundary

N

0 2,000

Scale in Feet

ALDERWOOD WATER & WASTEWATER DISTRICT

CITY OF EDMONDS

CITY OF LYNNWOOD

CITY OF MOUNTLAKE TERRACE

TOWN OF WOODWAY

OLYMPIC VIEW WATER & SEWER DISTRICT

UNINCORPORATED SNOHOMISH COUNTY

SNOHOMISH COUNTY

KING COUNTY

SEATTLE PUBLIC UTILITIES

NORTH CITY WATER DISTRICT

Puget Sound

Chase Lake

Lake Ballinger

524

99

104

5

The City of Edmonds makes no representations, express or implied, as to the accuracy, completeness and timeliness of the information displayed. This map is not suitable for legal, engineering, or surveying purposes. Notification of any errors is appreciated.
Source: City of Edmonds GIS, Washington State Dept. of Health and Snohomish County GIS (March 2016).

# CHAPTER 3 | LAND USE AND POPULATION

## Introduction

This chapter demonstrates the compatibility of the City of Edmonds' (City) Comprehensive Water System Plan (Plan) with the City's Comprehensive Plan, identifies designated land uses within the City limits, and presents population data. The City's Comprehensive Plan was originally completed in 1995 to meet the requirements of the State of Washington Growth Management Act (GMA) and was updated most recently in July 2015.

## Compatibility with Other Plans

The City's Comprehensive Plan and GMA were reviewed to ensure that the Plan is consistent with the City's land use policies.

### Growth Management Act

The State of Washington GMA, which was passed in 1990 and amended in following years, defined four goals relevant to water system planning:

1. Focus growth in urban areas and reduce sprawl;
2. Maintain consistency between land use and utility plans;
3. Ensure adequate public facilities and services, concurrent with growth; and,
4. Designate and protect critical areas.

#### *Urban Growth Area*

The City is considered an urban growth area in accordance with the GMA, per RCW 36.70A.110. The City has coordinated with Snohomish County in designating its approximately 5,700-acre urban growth area (UGA). The City UGA is bounded on the south by the City of Shoreline, on the southwest by the City of Woodway and unincorporated Snohomish County areas, on the west by the Puget Sound, and on the east by the cities of Lynnwood (northeast) and Mountlake Terrace (southeast).

#### *Consistency*

The plans and policies of the City and Snohomish County must be consistent in accordance with GMA, per RCW 36.70A.100. The GMA also requires consistency with the implementation of water system plans and comprehensive plans, per RCW 36.70A.120.

The Municipal Water Law, which became effective in 2003, also requires consistency of water system plans with local plans and regulations. Confirmation of consistency under this law is achieved by means of completing the Consistency Statement Checklist, which must be included with all water system plans. A signed copy of this checklist is included in **Appendix D**.

### *Concurrency*

The GMA requires concurrency, so that adequate public facilities and services are available when growth occurs to ensure health, safety, and a high quality of life. The GMA requires that growth be located in areas already served or readily served by public facilities and services, per RCW 36.70A.110.

### *Critical Areas*

The GMA requires that critical areas be designated and protected. Critical areas include wetlands, steep slopes, and aquifer recharge areas. **Appendix E** contains a State Environmental Policy Act (SEPA) checklist that was prepared for this Plan addressing environmental issues.

## City of Edmonds Comprehensive Plan

The City updated its Comprehensive Plan, adopted in July 2015, to extend the planning horizon through 2035 and to accommodate additional people, jobs, and community needs. The Comprehensive Plan was originally prepared in 1995 to comply with the requirements of the GMA and RCW 35A.63, which covers Planning and Zoning in Code Cities. It provides policy that is consistent with Snohomish County on land use, housing, capital facilities, transportation, and parks and recreation issues for a 20-year period. The Land Use Element of the Comprehensive Plan includes goals and policies for planning growth and development over a 20-year planning period. The Utilities Element of the Comprehensive Plan includes goals and policies to ensure that new development will be adequately served without impacting existing levels of service. The Community Culture & Urban Design Element is a new section that acknowledges the impact of community culture and design on development.

The Community Sustainability Element of the Comprehensive Plan includes goals and policies addressing climate change, community health, and environmental quality. This section addresses improved physical appearance, walkability, protection of natural environments, and residential characteristics. The City also developed a Climate Change Action Plan in 2010 to address accomplishments to date and identify additional efforts planned by the City to achieve a more sustainable community. Elements of this plan related to the City's water system include water conservation and rainwater capture from rooftops to reduce per capita water consumption, and implementation of capital improvements utilizing energy efficient equipment to reduce power consumption at water system facilities.

At the regional level, the City of Everett (Everett) and the Everett Water Utility Committee (EWUC) have conducted studies to evaluate the impacts of global climate change on its water supply to ensure that the long-term planning of the region's future water supply accounts for the effects of climate change. The City is a member of the EWUC, which is an advisor to the Water Supply Forum, consisting of representatives of public water systems and local governments in the Central Puget Sound region of Washington State. The Water Supply Forum addresses current and future water supply issues facing the region and has documented the projected effects of climate change on the region's water supply situation in the Regional Water Supply Outlook, which was published in 2009 and most recently updated in 2012.

## Land Use

The land area within the limits of the City is approximately 8.9 square miles (5,700 acres) and includes approximately five miles of marine shoreline along Puget Sound. The City is mostly built-out (approximately 96 percent developed), based on current zoning, with limited infill and redevelopment potential remaining. The City's water service area is approximately 7.1 square miles (4,532 acres) and is smaller than the city limits, due to a portion of the south area of the City being served by Olympic View Water and Sewer District (OVWSD).

The City's Comprehensive Plan Map, which is included as **Figure 3-1**, shows the various land uses throughout the City. As shown on the map, most of the City is single family residential and includes a smaller portion of multi-family residential, mixed use commercial, and other land uses. Approximately 61 percent of the land area within the City is currently designated for single-family residential use; 6 percent is designated for multi-family residential use; 7 percent is designated for mixed use commercial use; and the remaining 26 percent is designated for other uses such as public right of ways, parks, schools, and open space.

## Population

### Household Size Trends

The average household size in the City has declined over the past three decades, which is consistent with the decreasing household size trend of the nation. Average household size in Edmonds, including both single family and multi-family residences, has decreased from 2.41 persons per household in 1990 to 2.32 in 2000 and 2.26 in 2010. The average household size for all of Washington State was 2.51 persons per household in 2010.

## Existing & Future Population

Population density in the City remained constant between 2010 and 2014, at 6.9 persons per acre, and increased to 7.0 persons per acre in 2015, based on Washington State Office of Financial Management (OFM) data. In comparison, the City of Lynnwood had a density of 5.6 persons per acre in 2015 and the City of Mountlake Terrace had a density of 8.3 persons per acre in 2015.

**Table 3-1** shows past and projected populations within the entire City limits, and the City's water service area, which is smaller than the City limits. From 2009 to 2015, the City's water service area population remained relatively constant, from an estimated 31,350 people in 2009 to 31,716 people in 2015, as shown in **Table 3-1**. The population within the City's water service area is anticipated to increase during the 20-year planning period of this Plan to an estimated population of 35,127 people in the year 2035.

The population projections shown in **Table 3-1** are based on the City's planning target population of 45,550 people within the City limits in the year 2035, which was developed by the City as part of the cooperative planning process for the region. The population projections for 2021, 2025, and 2035 are based on an interpolation using the City's 2015 and 2035 population values.

**Table 3-1**
**Historical Population and Future Projections**

| Year | Population Within City Limits | Population Within Edmonds Water Service Area |
|---|---|---|
| **Historical** | | |
| 2009 | 40,900 | 31,350 |
| 2010 | 39,709 | 31,209 |
| 2011 | 39,800 | 31,286 |
| 2012 | 39,800 | 31,271 |
| 2013 | 39,950 | 31,299 |
| 2014 | 39,950 | 31,290 |
| 2015 | 40,490 | 31,716 |
| **Projected** | | |
| 2021 (+6 years) | 42,407 | 32,703 |
| 2025 | 43,282 | 33,378 |
| 2035 (+20 years) | 45,550 | 35,127 |

FIGURE 3-1

# City of Edmonds

## Comprehensive Plan Map

### Plan Designations

- Retail Core
- Arts Center Corridor
- Downtown Mixed Commercial
- Downtown Convenience
- Downtown Mixed Residential
- Downtown Master Plan
- Shoreline Commercial
- Downtown Residence-Office
- Single Family - Urban 1
- Single Family - Urban 2
- Single Family - Urban 3
- Single Family - Resource
- Single Family Master Plan
- Multi Family - Medium Density
- Multi Family - High Density
- Neighborhood Commercial
- Community Commercial
- Planned Business / Neighborhood Business
- Mixed Use Commercial
- Highway 99 Corridor
- Edmonds Way Corridor
- Hospital / Medical
- Master Plan Development
- Public
- Park / Open Space

### Plan Overlays

- Activity Center
- Corridor Development
- Park
- School
- Hi-Rise Overlay
- Edmonds City Limits

This map is a representation of the official Comprehensive Plan Map of the City of Edmonds. Please check with the City of Edmonds Planning Division before relying on the information described on this map.

Map revision date: December 30, 2011

1,000 500 0 1,000 Feet

N W E S

Note:
This is a reduction of the official Comprehensive Plan Map on file at the City of Edmonds. A full size 36" x 60" map can be obtained from the Edmonds Planning Division.

Downtown / Waterfront Activity Center

Medical / Highway 99 Activity Center

Westgate Corridor

Edmonds Way Corridor

Highway 99 Corridor

Perrinville

Puget Drive

Five Corners

Westgate

Firdale Village

Meadowdale Beach County Park

Meadowdale Play Fields

Southwest County Park

Hutt Park

Seaview Park

Lynndale Park / Skatepark

Seaview Elementary

Sierra Park

Edmonds Elementary

Maplewood Hill Park

Maplewood K-8 Co-op School

Edmonds Community College

College Place Elementary

College Place Middle School

Pine Ridge Park

Holy Rosary Private School

Yost Park

Edmonds Marsh

Port of Edmonds

Point Edwards

City Park

Pine St Park

Chase Lake Elementary

Swedish / Edmonds Campus

Edmonds Woodway High School

Westgate Elementary

Sherwood Elementary

Former Edmonds Woodway High School

Old Woodway Elementary

Woodway Elementary

Madrona K-8 School

Lake Ballinger

# CHAPTER 4 | WATER DEMANDS

## Introduction

This chapter summarizes past water demands and future projected water demands for the City of Edmonds' (City) system. These are used in **Chapter 8** to analyze the existing water system facilities and form the basis for sizing future water system improvements described in **Chapter 9**. The different types of demands that were analyzed include: average day demand, peak day demand, peak hour demand, fire flow demand, and future projected demands, both with and without estimated reductions from water conservation efforts. This chapter also summarizes the City's water demand data collection and reporting procedures.

## Current Population & Service Connections

The City provided water service to a population of approximately 31,290 in 2014, as shown in **Chapter 3**. The City has categorized all water customers into four different classes for billing purposes: Single Family Residential, Multi-Family Residential, Commercial or Industrial, and Government or Education. Water was provided to 10,177 metered water service connections in 2014. Of these, approximately 8,757 (86 percent) were single family residential accounts, 639 (6 percent) were multi-family residential accounts, 530 (5 percent) were commercial or industrial accounts, and 251 (2 percent) were government or education accounts. The demand analysis in the following section summarizes the past water use of the four water customer classes.

## Existing Water Demands

### Seasonal and Other Factors Affecting Water Demands

The total demand of all customers will vary both throughout the day and over the course of the year for any public water system. The following factors have the greatest impact on water demands in a public water system: 1) population, 2) weather, and 3) type of customer. As population increases, the overall, long-term demand is expected to increase. Weather primarily influences short-term demands, where the higher outdoor temperatures during the summer months results in increased water usage, which is mostly due to outdoor landscape irrigation. Water usage patterns vary among different types of customers. For example, single family residential customers typically use more water than multi-family residential customers, primarily due to the outdoor lawn watering and irrigation practices of single family residences. Similarly, demands can be affected by conservation efforts targeting water reduction through smarter and more sustainable practices.

## Water Consumption

Water consumption is the amount of water that customers use as measured by their water meters. **Table 4-1** shows past water consumption data from 2009 through 2014. While population data was known for the year 2015, there was incomplete production data and, therefore, the year 2014 served as the baseline for projections. As shown in the table, the majority of the City's overall water consumption is attributed to single family residential customers. Although more than 86 percent of the City's customers are single family residential, they only use approximately 60 percent of the total water consumed. This is due to the lower amount of usage per single family resident as compared to other types of customers.

**Table 4-1**
**Average Annual Metered Consumption and Service Connections**

| Year | Customer Class | | | | Totals |
|---|---|---|---|---|---|
| | Single Family | Multi-Family | Commercial/ Industrial | Government/ Education | |
| **Average Number of Connections** | | | | | |
| 2009 | 8,683 | 631 | 519 | 233 | 10,066 |
| 2010 | 8,699 | 638 | 521 | 237 | 10,095 |
| 2011 | 8,701 | 639 | 525 | 244 | 10,109 |
| 2012 | 8,709 | 639 | 528 | 247 | 10,123 |
| 2013 | 8,733 | 639 | 531 | 248 | 10,151 |
| 2014 | 8,757 | 639 | 530 | 251 | 10,177 |
| **Average Annual Consumption (1000 gallons)** | | | | | |
| 2009 | 661,637 | 203,992 | 169,676 | 20,789 | 1,056,095 |
| 2010 | 571,488 | 192,516 | 156,982 | 15,515 | 936,500 |
| 2011 | 556,556 | 196,711 | 159,685 | 23,083 | 936,035 |
| 2012 | 559,094 | 196,844 | 163,580 | 14,461 | 933,979 |
| 2013 | 582,047 | 192,648 | 173,946 | 24,599 | 973,240 |
| 2014 | 579,428 | 196,055 | 171,989 | 27,133 | 974,605 |
| **Average Daily Consumption Per Connection (gal/day/conn)** | | | | | |
| 2009 | 209 | 886 | 896 | 244 | |
| 2010 | 180 | 827 | 826 | 179 | |
| 2011 | 175 | 843 | 833 | 259 | |
| 2012 | 176 | 844 | 849 | 160 | |
| 2013 | 183 | 826 | 897 | 272 | |
| 2014 | 181 | 841 | 889 | 296 | |
| Average | 184 | 844 | 865 | 235 | |

As shown in **Table 4-1**, single family residential customers used an average of 184 gallons per day per connection. This is less than the average of 208 gallons per day per connection

presented in the City's 2010 Comprehensive Water System Plan for years 2003 through 2008 and less than the average consumption of the other customer types. Other customer classes are anticipated to have greater consumption per connection, since several multi-family units are often served from a single connection and commercial/ industrial customers are often the highest users of water in a public water system.

**Table 4-2** shows the top 20 water customers with the highest consumption in 2014. The total water consumption of these customers represents approximately 12 percent of the total consumption for 2014. **Table 4-2** consists mostly of multi-family complexes, municipal facilities, and commercial properties.

**Table 4-2**
**2014 Largest Water Users**

| Name | Address | Water Use Type | Annual Consumption (gal) |
|---|---|---|---|
| City of Lynnwood | 17000 76th Ave W | Domestic | 33,660,096 |
| Swedish Edmonds Hospital | 21601 76th Ave W | Domestic | 15,439,045 |
| 99 Ranch Market | 22511 Highway 99 #104 | Domestic | 10,074,764 |
| Sterling Crest Condominiums | 19515 86th Ave W | Domestic | 8,137,310 |
| Extendicare | 21400 72nd Ave W | Domestic | 4,400,790 |
| Swedish Medical Center | 21632 Highway 99 | Domestic | 4,106,805 |
| Edmonds School District #15 | 7600 212th Ave W | Irrigation | 3,947,470 |
| Park Ballinger Apartments | 22924 76th Ave W | Domestic | 3,677,424 |
| BCD Tofu House | 22511 Highway 99 | Domestic | 3,564,468 |
| Ballinger Court Apartments | 22707 76th Ave W | Domestic | 3,316,863 |
| Edmonds Landing Retirement | 180 2nd Ave S | Domestic | 3,236,073 |
| Harbor Square Athletic Club | 160 W Dayton St | Domestic | 3,169,496 |
| Highland Park Condominiums | 500 Elm Way | Domestic | 2,813,424 |
| Point Edwards HOA | 45 Pine St | Domestic | 2,685,507 |
| Maplewood Manor | 8516 196th St SW | Domestic | 2,315,969 |
| Point Edwards HOA | 75 Pine St | Domestic | 2,307,740 |
| Andy's Motel | 22201 Highway 99 | Domestic | 2,259,117 |
| Anthony's Home Port | 456 Admiral Way | Domestic | 2,256,873 |
| Plum Tree Plaza | 22315 Highway 99 | Domestic | 2,237,424 |
| Kimm & Associates | 23515 Highway 99 | Domestic | 2,109,507 |
| Largest Water Users Total | | | 115,716,164 |
| Water System Total | | | 974,604,717 |
| Percent of Total | | | 12% |

## Water Supply

Water supply refers to water that is delivered to a water system. Water supply differs from water consumption in that water supply is the amount of water delivered into a water system and water consumption is the amount of water taken out of the system. For any given year, the amount of water supply will be greater than the amount of water consumption, due to water system leaks that exist in all water systems and other factors discussed below. For the City, water supply represents water that is purchased from the Alderwood Water & Wastewater District (AWWD) and delivered through the City's Alderwood Supply Station. **Table 4-3** summarizes the total amount of water that was supplied to the City's system from 2009 through 2014, the average population within the City's retail water service area, the average day demand of the system, and the per capita demand for each year.

As shown in **Table 4-3**, per capita demand varied from year to year, with an overall trend of decreasing per capita water demand. This decreasing trend is most likely the result of water conservation efforts and reflects a similar trend among other public water systems throughout the Puget Sound. The City's average per capita demand from years 2009 through 2014 is 95 gallons per day, which is less than the per capita demand of 104 gallons per day presented in the City's 2010 Comprehensive Water System Plan for years 2003 through 2008. This average per capita demand value is used later in this chapter to forecast water demands in future years, based on the population projections presented in **Chapter 3**.

**Table 4-3**
**Historical Supply and Per Capita Demands**

| Year | Average Population | Annual Supply (1000 gallons) | Average Day Demand (gpm) | Average Day Demand (MGD) | Average Demand Per Capita (gal/day/capita) |
|---|---|---|---|---|---|
| 2009 | 31,350 | 1,178,070 | 2,241 | 3.23 | 103 |
| 2010 | 31,209 | 1,067,511 | 2,031 | 2.92 | 94 |
| 2011 | 31,286 | 1,085,479 | 2,065 | 2.97 | 95 |
| 2012 | 31,271 | 1,054,815 | 2,007 | 2.89 | 92 |
| 2013 | 31,299 | 1,072,086 | 2,040 | 2.94 | 94 |
| 2014 | 31,290 | 1,065,003 | 2,026 | 2.92 | 93 |
| 2015 | 31,716 | 872,131 | 1,659 | 2.39 | 75 |
| Average (2009-2014) | | | | | 95 |

**Table 4-4** shows the average demand of each of the City's pressure zones, based on 2014 water demand data. Almost half of the overall water system demand is within the 596 Zone and almost one-third of the demand is within the 325 Zone.

**Table 4-4**
**2014 Demands by Pressure Zone**

| Pressure Zone | 2014 Annual Supply (1000 gallons) | Average Day Demand (gpm) | Average Day Demand (MGD) | Percent of Total Demand (%) |
|---|---|---|---|---|
| 596 | 539,957 | 1,026 | 1.48 | 50.7% |
| 505 | 44,730 | 86 | 0.12 | 4.2% |
| 500 | 20,235 | 38 | 0.05 | 1.9% |
| 486 | 80,940 | 154 | 0.22 | 7.6% |
| 425 | 11,715 | 23 | 0.03 | 1.1% |
| 420 | 25,560 | 48 | 0.07 | 2.4% |
| 325 | 341,866 | 652 | 0.94 | 32.1% |
| Total | 1,065,003 | 2,026 | 2.92 | 100% |

### *Authorized Consumption & Distribution System Leakage*

Authorized consumption is the amount of water authorized for use. This includes water customers' usage and other authorized uses such as water main flushing, street cleaning, and permitted hydrant use. All unauthorized uses and any water that cannot be accounted for is considered distribution system leakage. In other words, distribution system leakage is an unrecorded volume of water that may include water system leaks, inaccurate supply metering, inaccurate customer metering, unknown fire hydrant usage, illegal water service connections, and unknown reservoir overflows.

The Water Use Efficiency Rule, which became effective in January 2007, requires all public water systems to calculate and report annually distribution system leakage on a 3-year rolling average and as a percentage of total supply. If the amount of distribution system leakage exceeds the 10 percent threshold established by the Water Use Efficiency Rule, a water loss control action plan must be prepared and implemented by the water system. This plan will need to identify steps and timelines for reducing leakage.

The difference between the amount of water supplied to the City from AWWD and the amount of metered water consumption from 2009 through 2014 is shown in **Table 4-5**. The table also includes the amount of other authorized water uses, annual distribution system leakage, and the 3-year rolling average of distribution system leakage as a percentage of total supply. The estimated amount of authorized uses shown in the table is from City maintenance records. The table illustrates a trend of decreasing distribution system leakage as a percentage of total supply, which likely reflects the City's implementation of a more aggressive annual water main replacement program that started in 2010.

**Table 4-5**
**Metered Supply and Consumption Comparison**

| Year | Total Supply (1000 gallons) | Total Consumption (1000 gallons) | Net Difference (1000 gallons) | Net Difference as % of Total Supply | Other Authorized Uses (1000 gallons) | Distribution System Leakage | |
|---|---|---|---|---|---|---|---|
| | | | | | | (1000 gallons) | % of Total Supply (3-yr Avg) |
| 2009 | 1,178,070 | 1,056,095 | 121,976 | 10.35% | 31,879 | 90,096 | - |
| 2010 | 1,067,511 | 936,500 | 131,010 | 12.27% | 12,709 | 118,302 | - |
| 2011 | 1,085,479 | 936,035 | 149,444 | 13.77% | 28,720 | 120,724 | 9.9% |
| 2012 | 1,054,815 | 933,979 | 120,837 | 11.46% | 19,716 | 101,120 | 10.6% |
| 2013 | 1,072,086 | 973,240 | 98,845 | 9.22% | 8,569 | 90,277 | 9.7% |
| 2014 | 1,065,003 | 974,605 | 90,398 | 8.49% | 3,379 | 87,019 | 8.7% |

**Table 4-6** presents 2014 water supply and consumption data and the methodology used to calculate distribution system leakage on an annual basis, prior to the calculation of a 3-year rolling average.

**Table 4-6**
**2014 Estimated Distribution System Leakage**

| Description | Total Amount (1000 gallons) |
|---|---|
| A. Total Purchased Supply | 1,065,003 |
| B. Total Metered Consumption | 974,605 |
| C. Estimated Authorized Uses (flushing, street cleaning, permitted hydrant use) | 1,456 |
| Distribution System Leakage (A-(B+C)) | 88,942 |
| Distribution System Leakage as % of Total Purchased Supply | 8.4% |

*Amount shown for distribution system leakage may be from water main and water service leaks, meter inaccuracies, meter reading & recording errors, illegal water use, and other uses not identified above.*

## *Equivalent Residential Units*

The demand of each customer class can be expressed in terms of equivalent residential units (ERU's) for demand forecasting and planning purposes. One ERU is equivalent to the amount of water used by a single family residence. The number of ERU's represented by the demand of the other customer classes is determined from the total demand of the customer class and the demand per ERU from the single family residential demand data. **Table 4-7** shows the number of ERU's calculated for each customer class from 2009 through 2014.

## Table 4-7
## Equivalent Residential Units (ERUs)

| Year | Average Number of Connections | Average Annual Demand (1000 gallons) | Average Day Demand per ERU (gal/day/ERU) | Total ERU's |
|---|---|---|---|---|
| **Single Family Residential** | | | | |
| 2009 | 8,683 | 738,054 | 233 | 8,683 |
| 2010 | 8,699 | 651,436 | 205 | 8,699 |
| 2011 | 8,701 | 645,413 | 203 | 8,701 |
| 2012 | 8,709 | 631,429 | 199 | 8,709 |
| 2013 | 8,733 | 641,162 | 201 | 8,733 |
| 2014 | 8,757 | 633,173 | 198 | 8,757 |
| Average (2010-2014) | | | 201 | |
| **Multi-Family Residential** | | | | |
| 2009 | 631 | 227,553 | 233 | 2,677 |
| 2010 | 638 | 219,447 | 205 | 2,930 |
| 2011 | 639 | 228,117 | 203 | 3,075 |
| 2012 | 639 | 222,311 | 199 | 3,066 |
| 2013 | 639 | 212,214 | 201 | 2,890 |
| 2014 | 639 | 214,240 | 198 | 2,963 |
| **Commercial/Industrial** | | | | |
| 2009 | 519 | 189,273 | 233 | 2,227 |
| 2010 | 521 | 178,942 | 205 | 2,390 |
| 2011 | 525 | 185,180 | 203 | 2,496 |
| 2012 | 528 | 184,744 | 199 | 2,548 |
| 2013 | 531 | 191,613 | 201 | 2,610 |
| 2014 | 530 | 187,942 | 198 | 2,599 |
| **Government/Education** | | | | |
| 2009 | 233 | 23,190 | 233 | 273 |
| 2010 | 237 | 17,685 | 205 | 236 |
| 2011 | 244 | 26,769 | 203 | 361 |
| 2012 | 247 | 16,331 | 199 | 225 |
| 2013 | 248 | 27,097 | 201 | 369 |
| 2014 | 251 | 29,649 | 198 | 410 |
| **System-Wide Totals** | | | | |
| 2009 | 10,066 | 1,178,070 | 233 | 13,860 |
| 2010 | 10,095 | 1,067,511 | 205 | 14,255 |
| 2011 | 10,109 | 1,085,479 | 203 | 14,634 |
| 2012 | 10,123 | 1,054,815 | 199 | 14,549 |
| 2013 | 10,151 | 1,072,086 | 201 | 14,602 |
| 2014 | 10,177 | 1,065,003 | 198 | 14,729 |

The demands shown in **Table 4-7** are based on supply data that was computed from the consumption of each customer class and the difference between total metered supply and consumption from each year.

The system-wide average demand per ERU from 2010 through 2014 was 201 gallons per day, which is less than the average demand per ERU of 236 gallons per day presented in the City's 2010 Comprehensive Water System Plan for years 2003 through 2008. The 2009 demand data was not used in the average computation as it was outside the range of demands for the other years and significantly different than the following five years. The City's average demand per ERU of 201 gallons per day is used later in this chapter to forecast ERU's in future years, based on estimated future demands.

### *Average Day Demand*

Average Day Demand (ADD) is the total annual amount of water delivered to a system divided by the number of days in the year. ADD is determined from the water system's historical water supply data and is used to project future system demands. ADD data is also used to determine standby storage requirements for water systems. Standby storage is the volume of a reservoir used to provide water supply under emergency conditions when supply facilities are out of service. Water supply records were used to determine the system's average day demand, which is shown in **Table 4-3**.

### *Peak Day Demand*

Peak Day Demand (PDD) is the maximum amount of water used throughout the system during a 24-hour time period of a given year. PDD typically occurs on a hot summer day when a large amount of outdoor lawn watering occurs simultaneously with other water uses. In accordance with *WAC 246-290-230 - Distribution Systems*, the distribution system must provide fire flow at a minimum pressure of 20 psi during PDD conditions. Supply facilities (i.e., supply stations, pump stations, interties) are typically designed to supply water at a rate that is equal to or greater than the system's PDD.

Water supply records and reservoir telemetry reports are typically used to determine a system's PDD; however, complete telemetry records of supply and reservoir data were not available to compute the PDD of the system. Therefore, the PDD was estimated by applying a typical peak day demand to average day demand ratio of 2.00 to the system's actual average day demand amount. This results in an estimated PDD of 4,052 gpm for 2014, as shown in **Table 4-8.**

### *Peak Hour Demand*

Peak Hour Demand (PHD) is the maximum amount of water use, excluding fire flow, during a one hour time period of a given year. In accordance with *WAC 246-290-230 - Distribution Systems,* new public water systems or additions to existing systems shall be designed to provide

domestic water at a minimum pressure of 30 psi during PHD conditions. Water main sizing and analysis and equalizing storage are typically based on PHD data.

The PHD, like the PDD, is typically determined from the combined flow of water into the system from all supply sources and reservoirs. Similar to the PDD, sufficient information was not available to calculate the City's PHD based on actual system data. Therefore, the PHD was estimated based on a typical PHD/PDD ratio of 1.80, resulting in a PHD of 7,294 gpm for 2014.

The peaking factors shown in **Table 4-8** are based on the demand data shown in the table. These peaking factors are used later in the chapter in conjunction with projected ADD to project future PDD and PHD for the system.

**Table 4-8**
**Peak Day Demands and Peaking Factors**

| Peak Day Demand Data | | |
|---|---|---|
| **Demand Type** | **Date** | **Demand (gpm)** |
| Average Day Demand (ADD) | 2014 | 2,026 |
| Peak Day Demand (PDD) | Data unavailable<br>Assumed PDD/ADD = 2.0 | 4,052 |
| Peak Hour Demand (PHD) | Data unavailable<br>Assumed PHD/PDD = 1.8 | 7,294 |
| **Peaking Factors** | | |
| **Description** | | **Peaking Factor** |
| Peak Day Demand/Average Day Demand (PDD/ADD) | | 2.00 |
| Peak Hour Demand/Peak Day Demand (PHD/PDD) | | 1.80 |
| Peak Hour Demand/Average Day Demand (PHD/ADD) | | 3.60 |

### *Fire Flow Demand*

Fire Flow Demand is the amount of water required during firefighting as defined by applicable codes. Fire flow requirements are established for individual buildings and expressed in terms of flow rate (gpm) and flow duration (hours). Fighting fires imposes the greatest demand on a water system due to the high rate at which water must be supplied over a short period of time. This requires that each component of the system be properly sized and configured to meet the most stringent demand placed on it.

General fire flow requirements were established for the different land use categories to provide a target level of service for planning and sizing future water facilities. The general fire flow requirement for each land use category within the City's service area is shown in **Table 4-9**. The water system analyses presented in **Chapter 8** are based on an evaluation of the water system providing sufficient fire flow in accordance with these general fire flow requirements.

**Table 4-9**
**General Fire Flow Requirements**

| Land Use Category | Fire Flow Requirement (gpm) | Flow Duration (hours) |
|---|---|---|
| Single Family Residential | 1,000 | 2 |
| Multi-Family Residential | 3,000 | 3 |
| Commercial/Business/Mixed Use | 3,000 | 3 |
| Schools | 3,000 | 3 |
| Hospital | 5,000 | 4 |

## Future Water Demands

### Method of Projecting Demands

Future demands were calculated from the projected population data from **Chapter 3** and the per capita demand data from **Table 4-3**. The demand projections were computed with and without a further reduction in water use from conservation. The per capita demand of existing customers (95 gallons per day) was used for all demand projections without water conservation. The future water demand projections with conservation were based on a reduced per capita demand that reflects the City's water use reduction goals, as shown in the City's Water Use Efficiency Program in **Appendix F**.

### Future Water Demand Projections

**Table 4-10** presents the estimated water demands of the system each year for the next ten years and at the end of the 20-year planning period. The actual demand data from 2013 and 2014 is also shown in the table for comparison purposes. The future ADD values were projected based on population estimates for the given years and the estimated per capita demand values. The future PDD values and PHD values were computed from the projected ADD values for that year and the existing system peaking factors shown in **Table 4-8**. The future demand projections are shown both with and without estimated reductions in water use from achieving the City's conservation goals.

The 20-year projected demand data without conservation reductions was used for the evaluation of the planned improvements presented in **Chapter 9** to ensure that the future system will be sized properly to meet all requirements, whether or not additional water use reductions from conservation are achieved.

**Table 4-10**
**Future Water Demand Projections**

| Description | Historical | | Projected | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 (+6 yrs) | 2021 | 2022 | 2023 | 2024 (+10 yrs) | 2025 | 2034 (+20 yrs) | 2035 |
| **Population Data** | | | | | | | | | | | | | | | |
| Population in Water Service Area | 31,299 | 31,290 | 31,716 | 31,878 | 32,042 | 32,206 | 32,371 | 32,536 | 32,703 | 32,870 | 33,039 | 33,208 | 33,378 | 34,948 | 35,127 |
| **Demand Basis Data (gal/day/capita)** | | | | | | | | | | | | | | | |
| Average Day Demand without Conservation | 94 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 |
| Average Day Demand with Conservation | | | 92 | 92 | 91 | 90 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 88 | 88 |
| **Average Day Demand (gpm)** | | | | | | | | | | | | | | | |
| Demand without Conservation | 2,040 | 2,026 | 2,092 | 2,103 | 2,114 | 2,125 | 2,136 | 2,146 | 2,157 | 2,169 | 2,180 | 2,191 | 2,202 | 2,306 | 2,317 |
| Demand with Conservation | | | 2,026 | 2,037 | 2,025 | 2,013 | 2,001 | 2,011 | 2,021 | 2,032 | 2,042 | 2,052 | 2,063 | 2,136 | 2,147 |
| **Average Day Demand (MGD)** | | | | | | | | | | | | | | | |
| Demand without Conservation | 2.94 | 2.92 | 3.01 | 3.03 | 3.04 | 3.06 | 3.08 | 3.09 | 3.11 | 3.12 | 3.14 | 3.15 | 3.17 | 3.32 | 3.34 |
| Demand with Conservation | | | 2.92 | 2.93 | 2.92 | 2.90 | 2.88 | 2.90 | 2.91 | 2.93 | 2.94 | 2.96 | 2.97 | 3.08 | 3.09 |
| **Peak Day Demand (gpm)** | | | | | | | | | | | | | | | |
| Demand without Conservation | 4,079 | 4,053 | 4,185 | 4,206 | 4,228 | 4,249 | 4,271 | 4,293 | 4,315 | 4,337 | 4,359 | 4,382 | 4,404 | 4,611 | 4,635 |
| Demand with Conservation | | | 4,053 | 4,073 | 4,050 | 4,026 | 4,001 | 4,022 | 4,042 | 4,063 | 4,084 | 4,105 | 4,126 | 4,271 | 4,293 |
| **Peak Day Demand (MGD)** | | | | | | | | | | | | | | | |
| Demand without Conservation | 5.87 | 5.84 | 6.03 | 6.06 | 6.09 | 6.12 | 6.15 | 6.18 | 6.21 | 6.25 | 6.28 | 6.31 | 6.34 | 6.64 | 6.67 |
| Demand with Conservation | | | 5.84 | 5.87 | 5.83 | 5.80 | 5.76 | 5.79 | 5.82 | 5.85 | 5.88 | 5.91 | 5.94 | 6.15 | 6.18 |
| **Peak Hour Demand (gpm)** | | | | | | | | | | | | | | | |
| Demand without Conservation | 7,343 | 7,295 | 7,533 | 7,571 | 7,610 | 7,649 | 7,688 | 7,727 | 7,767 | 7,807 | 7,847 | 7,887 | 7,927 | 8,300 | 8,343 |
| Demand with Conservation | | | 7,295 | 7,332 | 7,289 | 7,246 | 7,202 | 7,239 | 7,276 | 7,314 | 7,351 | 7,389 | 7,427 | 7,689 | 7,728 |

*2013 and 2014 Peak Day Demand and Peak Hour Demand values are based on actual average day demand amounts for the given year and the City's peaking factors, and may not represent actual peak demands for these years.*
*Water reductions are based on the Everett Water Utility Conservation Program, with a target reduction of 5.9% by 2019.*

## Future ERU Projections

**Table 4-11** presents the projected number of ERU's of the system for years 2020, 2024, and 2034 relative to the baseline year of 2014. The 6-year, 10-year, and 20-year ERU forecasts are based on the projected water demands from **Table 4-10** and the system-wide average demand per ERU that was computed from recent demand data, as shown in **Table 4-7**. The projections for 2021, 2025, and 2035 are also provided for reference.

**Table 4-11**
**Future ERU Projections**

| Description | 2020 Projected (+6 yrs) | 2021 Projected | 2024 Projected (+10 yrs) | 2025 Projected | 2034 Projected (+20 yrs) | 2035 Projected |
|---|---|---|---|---|---|---|
| **Demand Data (gpm)** | | | | | | |
| ADD, without Conservation | 2,146 | 2,157 | 2,191 | 2,202 | 2,306 | 2,317 |
| **ERU Basis Data (gal/day/ERU)** | | | | | | |
| Demand per ERU, without Conservation | 201 | 201 | 201 | 201 | 201 | 201 |
| **Equivalent Residential Units (ERU's)** | | | | | | |
| Total System ERU's | 15,400 | 15,500 | 15,700 | 15,800 | 16,500 | 16,600 |

## Water Demand Data Collection and Reporting

## Demand Data Collection

The demand data presented in this chapter includes both the supply and use (i.e., consumption) sides of water demands, which the City has collected and recorded for many years. The supply side data is recorded by a water meter in the Alderwood Supply Station that is connected to the City's SCADA system. This provides a continuous recording of the volume and rate of water supply into the City's system. The City's other supply station, which provides a standby source of supply from Seattle Public Utilities regional system, is also metered and connected to the City's SCADA system. On the water use side, customer demand data is recorded by meters at all water service connections and collected every other month. Also included on the water use side and recorded with portable meters is permitted water use from fire hydrants for construction, street cleaning, and water main flushing.

## Demand Data Reporting

A summary of past water use is reported each year in the City's Water Use Efficiency Annual Performance Report, which is one of the requirements of the Water Use Efficiency Rule. In addition to this annual report, the City will continue to report demand data when updating its water system plan in the future.

# CHAPTER 5 | POLICIES AND DESIGN CRITERIA

## Introduction

The City of Edmonds (City) strives to provide high quality water service at a reasonable cost to its customers. This is achieved through the guidance of the following laws, policies, and design criteria that are applied to operating, maintaining, and planning improvements for the water system.

Federal Regulations

- U.S. Department of Health & Human Services
- U.S. Environmental Protection Agency

State Regulations

- Washington State Department of Health
- Washington State Department of Ecology

County Regulations

- Snohomish County Council

City Regulations and Policies

- Edmonds City Council

Design Criteria

- American Water Works Association
- Washington State Department of Health

The Edmonds City Council must adopt policies that meet or exceed those established by governments above them. The governmental entities above the City Council include the U.S. Government, Washington State, and the Snohomish County Council. The City's policies are documented and implemented through ordinances, operation procedures, engineering and construction standards, and design criteria.

The City's water system policies and design criteria are organized and presented in this chapter under the following sections: water service, water supply, and facility policies and design criteria. The City's financial policies are described in **Chapter 10**.

# Water Service Policies

## New Water Services

- The City will provide potable water service to all people within its water service area, provided all policies related to service can be met.

- Requests for new water service will be processed by the City's Building Division as part of a Building Division permit. Applications are reviewed to ensure the proposed service is located within the City's retail water service area and will be evaluated by the Engineering department using the City's water model to determine fire flow availability, meter size, line size and improvements necessary for adequate water pressure, fire flow, looping or extensions. New water service applications will be processed within the following timeframes:

    - New single family residence: approximately 60 days
    - New commercial building: approximately 90 days
    - New fire connection: approximately 20 days

- Water system improvements and extensions required to provide water service to proposed developments will be reviewed and approved by the City, and must conform to the City's current design criteria, construction standards and specifications, as shown in the City's Water System Construction Standards contained in **Appendix G**. All costs of the improvements and extensions will be paid by the applicant.

- Delays affecting the City's ability to provide new water service are the responsibility of the applicant. Delays resulting from non-technical conditions may include environmental assessments, local ordinances, annexations, and various other issues.

- Disputes received by the City are routed to the appropriate department and resolved. Disputes not resolved by City staff are resolved by the City Council with assistance from the City's legal counsel, as necessary.

- Water service requests for areas outside of the City limits without annexation will be reviewed by the City Council after coordinating with the appropriate adjacent water system and the Department of Health. Water service to areas outside of the City limits shall be in compliance with Snohomish County's adopted land use plan, zoning and development regulations.

- Water system capacity is evaluated as part of the City's update of its water system plan to confirm the system's ability to provide adequate water service to both existing and future water customers.

### Annexations

- Areas annexed without existing municipal water service will be served by the City.
- Areas annexed with existing municipal water service must meet the City's water system standards.
- The City will follow state guidelines in the assumption of facilities in annexation areas.
- The City will comply with the existing water supply agreement with Alderwood Water & Wastewater District in assuming portions of adjacent water systems as a result of annexation.

## Water Supply Policies

### Water Quality

- The City will strive to provide high quality water while complying with all water quality regulatory requirements.
- The City will promptly respond to situations that may adversely affect water quality.

### Water Quantity

- The City will provide a sufficient quantity of water supply to existing customers and plan for at least 20 years into the future for meeting the needs of the water system.
- The City will size new water system facilities and improvements to existing facilities to have sufficient capacity to meet the needs of the water system.

### Water Use Efficiency

- The City will promote the efficient and responsible use of water and will participate in the Everett Water Utility Regional Conservation Program.
- The City has a water use efficiency program. Documentation from the City's water use efficiency program is contained in **Appendix F**.

## Cross-Connection Control

- The City strives to protect its water system from contamination due to cross-connections and has developed a cross-connection control program for eliminating cross-connections. Documentation from the City's cross-connection control program is contained in **Appendix H**.
- The City regularly reviews building permit applications for potential cross connections.

- The City will comply with the backflow prevention assembly installation and testing requirements as indicated in *WAC 246-290-490* and as published in the manual titled *Cross Connection Control Manual Accepted Procedures and Practice,* Pacific Northwest Section, American Water Works Association (AWWA).

- The City has staff that is certified for backflow prevention and testing.

## Facility Policies & Design Criteria

This section describes the policies and design criteria used in planning for water system replacements, extensions, and future improvements.

## Water Pressure

- The City will supply water to all customers at a minimum pressure of 30 psi at the water meter during all demand conditions, except under fire flow or emergency situations.

- During fire flow situations, the City will maintain a minimum pressure of at least 20 psi at the water meter for all customers throughout the system.

- The City will provide pressure reducing stations to control pressures in the distribution system and avoid high pressures. It is the customer's responsibility to install an approved pressure regulator on the customer side of the water meter to maintain pressures at 80 psi or less.

## Pipeline Velocities

- All new distribution system water mains will be designed to deliver the required amount of flow at a velocity of 10 feet per second (fps) or less. Velocities exceeding 10 fps are acceptable within short lengths of pipe and within water system facilities.

- All new transmission mains will be designed to deliver the required amount of flow at a velocity of 10 fps or less and will be evaluated for hydraulic surges (transient conditions) using a hydraulic model capable of surge analyses.

## Storage Facilities

- A sufficient amount of storage will be provided within the distribution system to facilitate the operation of the water system by maintaining adequate distribution system pressure and to provide supplemental supply during peak demand periods and emergency events.

- Storage facilities will be sized to provide stored water for the following purposes:

    - Operational storage will be available to aid in the operation of supply and pump facilities.

    - Equalizing storage will be provided to supply the water system under peak demand conditions, when the system demand exceeds the total rate of supply of the supply facilities. Equalizing storage must be maintained above an elevation that provides a minimum pressure of 30 psi at all service connections under peak hour demand conditions.

    - Standby storage will be provided to supply the water system under emergency conditions when supply facilities are out of service. Standby storage must be stored above an elevation that provides a minimum pressure of 20 psi at all service connections under peak hour demand conditions.

    - Fire suppression storage will be provided to supply water to the system at the maximum rate and duration required to extinguish a fire at the building with the highest fire flow requirement. Fire suppression storage must be stored above an elevation that will provide a minimum pressure of 20 psi at all service connections under peak day demand conditions.

## Transmission & Distribution Mains

- All new transmission and distribution mains will be looped to increase reliability and fire flow capacity, unless the City determines that looping is not practical.

- All new water mains will be designed under the direction of a professional engineer licensed in the State of Washington and will comply with the water quality testing and construction completion requirements of the DOH.

- All water system improvements and installation of new water mains shall be in accordance with City standard specifications and details.

- The diameter of all new distribution water mains will be reviewed by the City and may include hydraulic analyses using the City's hydraulic model.

- Dead-end water mains with fire hydrants shall be at least 8-inch diameter pipe up to the fire hydrant. If approved by the City, short dead-end water mains without fire hydrants, generally less than 50 feet long, may be constructed with 6-inch diameter or smaller pipe.

- Distribution water mains providing fire flow shall be sized to provide the required fire flow at a minimum residual pressure of 20 psi and maximum pipeline velocity of 10 fps under peak day demand conditions.

- All new water mains will be ductile iron pipe (class 52 minimum) with cement mortar lining.

- The following valves shall be installed with the water main:

    - Isolation valves shall be installed at locations along the water main to allow sections to be shut down for repair or installing services. On average, the maximum distance between isolation valves shall be 350 feet. A minimum of three valves shall be provided per cross and two valves per tee.

    - Zone valves shall be located at all pressure zone boundaries when a water main crosses a pressure zone boundary and connects into each pressure zone.

    - Combination air and vacuum release valves shall be placed at all high points of water main installations.

## Water Services

- All residential water service lines shall be 1-inch diameter or larger. The meter shall be ¾-inch diameter or larger.

- All new customer service lines serving new structures, shall be installed with a pressure reducing valve on the customer's side of the water meter. The valve shall be placed within the structure being served.

## Supply Stations and Pump Stations

All supply station and pump station improvements shall comply with the following minimum standards:

- All structures shall be non-combustible, where practical.

- All buildings shall have adequate heating, cooling, ventilation, insulation, lighting, and interior work space.

- All sites shall be fenced and locked to prevent unauthorized personnel from entering the water system facilities. Below-grade facilities located in areas that cannot be fenced shall be secured and locked.

- Each station shall be equipped with a flow meter, pressure gauges, pressure transmitters and all necessary instrumentation to assist personnel in operating and troubleshooting the facility.

- Backup power shall be provided at all pump stations to maintain full operation during power outages.

- Pumps shall be operated automatically with the ability to operate manually.

- The monitoring of stations and adjustment of control settings shall be capable locally and remotely.

All supply and pump stations shall be monitored with alarms for the following conditions:

- Pump started automatically or manually.
- Low suction pressure.
- High discharge pressure.
- Flooding and fire.
- Power phase failure.
- Communication link failure.
- Intrusion by unauthorized personnel.

All supply and pump stations shall have the following data recorded:

- Flow rate and flow totalizing.
- Incoming and outgoing pressures.
- All alarm conditions.

## Pressure Reducing Stations

- All pressure reducing stations shall be constructed according to the City's standard plans.

- Below-grade concrete vaults shall drain to daylight, drain to a storm pipe system, or be equipped with a sump pump.

- A pressure relief valve shall be installed on the low-pressure side of the pressure reducing valve to prevent system over-pressurization in case of a pressure reducing valve failure. The pressure relief valve shall be sized by the City using the City's

hydraulic model. It may be necessary to place the pressure relief valve in a separate vault.

## Fire Hydrants

- The City has established policies for the installation, maintenance and ownership of fire hydrants within the City limits, which include the water service areas of both the City and Olympic View Water and Sewer District.

- Fire hydrants serving detached single family dwellings or duplex dwellings on individual lots shall be located not more than 600 feet on center such that all single family lots are within 300 feet from a fire hydrant, as measured along the path of vehicular access. If dead-end streets or driveways, singly or in combination, are over 300 feet long, additional public hydrants shall be installed such that hydrant spacing does not exceed 600 feet.

- Fire hydrants serving any use other than detached single family dwellings or duplex dwellings on individual lots shall be spaced an average of 300 feet apart on center and shall be located so that all structures are located within 150 feet of a hydrant. If dead-end streets or driveways, singly or in combination, are over 150 feet long, then additional fire hydrants shall be installed so that the hydrant spacing does not exceed 300 feet.

- All fire hydrants shall be installed at street intersections where possible. Fire hydrant spacing shall be measured along vehicle access routes.

- The City Fire Marshal will review all proposed fire hydrant installations to ensure the correct number, location and spacing of fire hydrants for each project.

- Additional requirements for fire hydrants are contained in the City Fire Code, Chapter 19.25 of the Edmonds Municipal Code. This code is provided in **Appendix I**.

# CHAPTER 6 | WATER SOURCE AND QUALITY

## Overview

This chapter describes the City of Edmonds' (City's) existing water source and current water quality regulations. Also discussed are the City's water quality monitoring program, monitoring requirements, and results of past water quality monitoring.

## Water Source

### Alderwood Water & Wastewater District Supply

The City currently supplies its entire system through the Alderwood Supply Station with water purchased from Alderwood Water & Wastewater District (AWWD). AWWD, in turn, purchases its water from the City of Everett (Everett). The supply of wholesale water from the AWWD to the City is provided under the terms of the 2010 Water Supply Agreement (see **Appendix A**). The agreement states "The water delivered by the District to the Master Meter shall comply with state and federal standards for drinking water and be of the same standard and quality normally delivered to the District's other customers". Therefore, the quality of water entering the City's system is the same quality as the water delivered to the District's retail customers.

The Everett raw water supply originates in the Spada Reservoir, created by the Culmback Dam on the Sultan River approximately 25 miles east of Everett. The basin is protected and patrolled. The raw water passes through the Snohomish County PUD No. 1 Power House prior to entering the Chaplain Reservoir. Water from Chaplain Reservoir is delivered to the Everett Water Filtration Plant before supply to Everett, AWWD, the City, and several other water systems in Snohomish County.

Prior to 1983, the supply of water from Everett was limited to treatment consisting of sedimentation, screening, and chlorination due to the good quality of its source. However, a higher level of treatment eventually became necessary due to more stringent water quality regulations. In 1983, the Everett Water Filtration Plant was constructed to meet these needs, including chlorination and fluoridation. Additional chlorination occurs at the reservoir sites within the AWWD service area. This ensures sufficient chlorine residuals throughout the distribution system. Source water quality has been good in the past and should continue to meet all of the mandated water quality requirements with the Everett Water Filtration Plant and the AWWD disinfection program.

### Seattle Public Utilities (SPU) Supply

The SPU Supply Station is operated in standby mode for short-term use as either an emergency supply or to provide additional supply for fire flows, since all water is now purchased from AWWD. The supply of wholesale water from SPU to the City is provided under the terms of the 2011 Water Purveyor Contract and its subsequent amendments (see **Appendix A**).

The primary source of water that the City receives from SPU is from the Tolt River at the South Fork Tolt Reservoir, about 15 miles east of Duvall. Water is diverted, first, from the reservoir into the Tolt Regulating Basin, then to the Tolt Treatment Facility and, finally, into the Tolt Pipeline No. 1. This pipeline transports the water to purveyors that are primarily located both north and south of Seattle. SPU's water is delivered to the City from SPU's Richmond Highlands Tank, which is supplied by direct pumping from the Tolt transmission line, the Lake Forest Park Reservoir, or the Bitter Lake Pump Station. A 20-inch diameter water main spanning Fremont Avenue to NE 205th Street, at the King County/Snohomish County border, transmits SPU water from the Richmond Highlands Tank to the City's SPU Supply Station.

## Drinking Water Regulations

### Overview

The Environmental Protection Agency (EPA) regulates the quality of drinking water in the United States. The EPA is allowed to delegate primary enforcement responsibility for water quality control to each state under provisions of the Safe Drinking Water Act (SDWA). The Department of Health (DOH) is responsible for implementing and enforcing the drinking water regulations in the State of Washington. For the State of Washington to maintain primacy (delegated authority to implement requirements) under the SDWA, the State must adopt drinking water regulations that are at least as stringent as the federal regulations. The State, in cooperation with DOH, has published drinking water regulations in Chapter 246-290 of the Washington Administrative Code (WAC) to meet these stipulations. The City's water system identification number is 225004, as issued by the State of Washington DOH.

### Safe Drinking Water Act

The SDWA was enacted in 1974 as a result of public concern about water quality. The SDWA sets standards for quality of drinking water and requires water treatment should these standards not be met. The SDWA also sets water testing schedules and methods that water systems must follow. In 1986, the SDWA was amended due to additional public concern and frequent contamination of groundwater from industrial solvents and pesticides. These amendments identified source water protection, operator training, funding for water system

improvements, and public improvements as pivotal components of safe drinking water. The 1986 Amendments also require water systems to monitor and treat for a continuously increasing number of contaminants identified in the new federal regulations. Since implementation of the new regulations was marginally successful and slow, the SDWA was amended again and re-authorized in August of 1996.

## Water Quality Monitoring

### Monitoring Requirements

Water quality monitoring requirements are contained in *WAC 246-290-300*. The City of Everett provides source water quality monitoring of its surface water source. The City of Edmonds provides water quality monitoring throughout its distribution system. In accordance with section (2)(b) of *WAC 246-290-300*, the City must comply with the following monitoring requirements since it receives completely treated water from another public water system:

1. Collect coliform samples in accordance with subsection (3) of *WAC 246-290-300*. In summary, this consists of:

    a) Collecting a minimum of 30 coliform samples per month based on the population served and submitting the samples to a certified laboratory for analysis.

        i) Collecting and submitting additional samples as required when a coliform sample is determined to be invalid.

    b) Preparing a Coliform Monitoring Plan and updating it as necessary.

2. Collect disinfection byproduct samples as required by subsection (6) of *WAC 246-290-300*. This includes sample collection during normal operating conditions within the distribution system either at the same time and location as routine or repeat coliform sampling takes place or at a daily recurrence (whichever is greater).

3. Perform disinfectant residual monitoring throughout the distribution system in accordance with subsection (6) of *WAC 246-290-300* and as required under *WAC 246-290-451*. As a minimum, the residual disinfectant concentration within the distribution system shall be measured at the same time and location that a routine or repeat coliform sample is collected or daily, whichever is greater.

4. Perform lead and copper monitoring in accordance with subsection (5) of *WAC 246-290-300* and as required under 40 C.F.R. 141.86 (a) – (f), 141.87, and 141.88.

If unsatisfactory samples from the above monitoring are detected, the City must follow the procedures in *WAC 246-290-320* for repeat sampling, DOH notification, and customer notification.

The City documents the results of water quality testing and summarizes the results in an annual report to customers in compliance with the Consumer Confidence Report requirements that have been in effect since 1998. A copy of the City's latest annual water quality report is included in **Appendix J**.

The City currently takes water samples twice per month and tests for chlorine residual. The City will expand its baseline water quality data by additionally testing these samples for pH, alkalinity, and conductivity. The City will consider adding additional testing parameters as well.

## Monitoring Status

The City is in compliance with all water quality monitoring requirements. A summary of the City's compliance status for the monitoring requirements identified above is presented below.

### *Coliform Monitoring*

The City collects a minimum of 30 samples each month from different locations throughout the distribution system and submits the samples to a certified laboratory for coliform testing, as shown in the Coliform Monitoring Plan in **Appendix K**.

All coliform monitoring results for the years 2002 through 2015 were satisfactory for the presence of coliforms except for two samples collected in 2010, one sample in 2011, and one sample in 2015. Subsequent repeat sampling for all of these had satisfactory results.

### *Disinfection Byproduct Monitoring*

Since the implementation of the Stage 2 Disinfection Byproducts Rule (DBPR) in 2006, the City has been required to perform additional monitoring and reporting of disinfectant byproducts in the distribution system. The Stage 2 DBPR focuses on monitoring and reducing concentrations of two classes of disinfection byproducts, consisting of Total Trihalomethanes (TTHM) and five Haloacetic Acids (HAA5). The Stage 2 DBPR requires water systems to determine locations within the distribution system with the highest averages of TTHM and HAA5.

The City prepared a Standard Monitoring Plan as part of the Initial Distribution System Evaluation (IDSE) that outlined the City's approach for collecting one year of TTHM and HAA5 data at a specified frequency and at locations to characterize these contaminants

levels in the system. The City has completed sampling under this plan and submitted its IDSE Report for Standard Monitoring on December 23, 2008. Monitoring under the Stage 2 DBPR has been conducted quarterly in accordance with the City's Standard Monitoring Plan. Compliance with the Stage 2 DBPR is achieved if the locational running annual average (LRAA) at each monitoring location for the four most recent quarters is less than or equal to 80 ppb (parts per billion) for TTHM and less than or equal to 60 ppb for HAA5.

The results of TTHM and HAA5 monitoring in 2015 indicated compliance for TTHM with quarterly averages ranging from 41.6 to 58.1 ppb and an annual running average of 46.9 ppb and for HAA5 with quarterly averages ranging from 24.1 to 36.2 ppb and an annual running average of 29.5 ppb.

### *Residual Disinfectant Concentration Monitoring*

In accordance with *WAC 246-290-662*, the minimum residual disinfectant concentration entering the distribution system shall be at least 0.2 mg/L. Samples taken within the distribution system are required to have a residual disinfectant concentration that is detectable in at least 95 percent of the samples taken each calendar month. The results of the residual disinfectant concentration monitoring must be reported to DOH using DOH approved forms within ten days after the end of each month, unless otherwise directed by DOH.

The samples collected from the City's distribution system for coliform monitoring are also analyzed for residual disinfectant concentration. Chlorine residual varies throughout the distribution system, but is typically between 0.4 and 0.9 mg/L.

### *Lead and Copper Monitoring*

The Lead and Copper Rule identifies "action levels" for both lead and copper. The action levels for lead and copper are greater than 0.015 mg/L and 1.3 mg/L, respectively. If the 90th percentile concentration of either lead or copper from the group of samples exceeds these action levels, a corrosion control study must be undertaken to evaluate strategies and make recommendations for reducing the lead or copper concentration to below the action levels. Both federal and state regulations require monitoring for lead and copper every three years.

The City participates in the City of Everett regional lead and copper monitoring program. This program involves the collection of samples by the City of Everett for all water systems that use Everett water. Most recently, the City of Everett obtained samples from locations throughout the Edmonds water service area in 2015. The results of past lead and copper monitoring within the City's water system indicated the following lead and copper concentration levels:

- Lead
    - 2000: 0.001 mg/L to 0.006 mg/L (all below action levels)
    - 2003: 0.001 mg/L to 0.044 mg/L (one sample exceeding action levels)
    - 2006: less than or equal to 0.002 mg/L (all below action levels)
    - 2009: 0.0005 mg/L to 0.0032 mg/L (all below action levels)
    - 2012: 0.0005 mg/L to 0.0023 mg/L (all below action levels)
    - 2015: 0.0005 mg/L to 0.0027 mg/L (all below action levels)

- Copper
    - 2000: 0.005 mg/L to 0.107 mg/L (all below action levels)
    - 2003: 0.004 mg/L to 0.152 mg/L (all below action levels)
    - 2006: 0.020 mg/L to 0.076 mg/L (all below action levels)
    - 2009: 0.015 mg/L to 0.173 mg/L (all below action levels)
    - 2012: 0.0195 mg/L to 0.132 mg/L (all below action levels)
    - 2015: 0.0120 mg/L to 0.2230 mg/L (all below action levels)

# CHAPTER 7 | OPERATIONS AND MAINTENANCE

## Introduction

This chapter summarizes the operations and maintenance activities of the City of Edmonds' (City's) Water Division, including a brief description of the personnel and their duties for operating and maintaining the water system.

## Water System Management and Personnel

### Management Structure

The City's Water Division functions under the direction of the Public Works Director. The Water and Sewer Manager is responsible for management of the water system and reports to the Public Works Director. The daily operation of the water system functions under the direction of the Water Division Lead. The Water Division Lead and the Water Quality Technician reports to the Water and Sewer Manager and the Water Maintenance Workers and Meter Reader report to the Water Division Lead, as shown in **Table 7-1**.

The Water Maintenance Staff are responsible for the daily operation and maintenance of the water system. Their tasks include routine operation and preventive maintenance, record keeping, inspection, testing, installation, and repair of system facilities, and maintenance required in response to emergencies.

The City's water system must be operated by one or more certified operators in accordance with Washington State Law (*WAC 246-292*). In addition, specialty certification is required for backflow device testing. **Table 7-2** shows the current certifications of the City's water operations and maintenance staff. Several certified crew members in the Sewer Division also assist the Water Division staff on an as-needed basis. The City maintains well qualified, technically trained staff and provides opportunities for ongoing training, certification, and membership in professional organizations.

### Personnel Responsibilities

The key responsibilities of the water operations and maintenance staff are summarized below:

- Public Works & Utilities Director: Manages administration, budget formulation, and utility rates.

- Water/Sewer Manager: Responsible for the operation of the water and sewer utility systems. Supervises the implementation of programs, and oversees the budgeting process for water system operations and maintenance.

- Water Lead Worker: Supervises all maintenance personnel in the Water Division. Supports the Water/Sewer Manager in the day-to-day operation of the water system. Coordinates preventative maintenance, daily operation, and repair.

- Water Quality Technician: Responsible for all tasks related to maintaining and testing water quality and cross connection control throughout the distribution system and responds to water quality complaints.

- Water Maintenance Workers: Directly involved in maintenance of the water system, monitoring of facilities, daily operations, inspection and repair, testing, response to complaints, and emergency response.

- Water Meter Reader: Responsible for reading all customer meters, recording the data, and performing water meter maintenance**.**

**Table 7-1**
**Water System Operations and Maintenance Organization Chart**

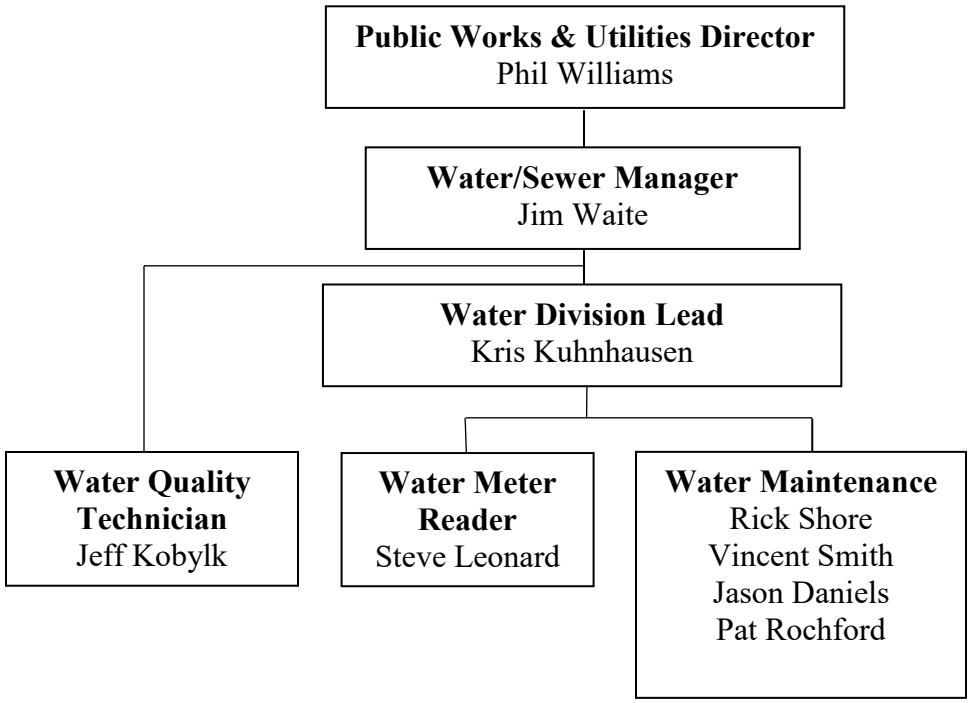


**Table 7-2**
**Personnel Certification**

| Name | Position | Certification No. | Certification Type |
|---|---|---|---|
| Jim Waite | Water/Sewer Manager | 3763 | WDM4, WDS, CCS, BAT, WTPOIT |
| Kris Kuhnhausen | Water Division Lead | 5199 | WDM3, WDS, CCS |
| Jeff Kobylk | Water Quality Technician | 11735 | CCS, BAT, WDS |
| Rick Shore | Senior Water Maintenance | 5441 | WDM1, WDS, CCS |
| Vincent Smith | Senior Water Maintenance | 6887 | WDS, CCS |
| Jason Daniels | Senior Water Maintenance | 8002 | WDS |
| Patrick Rochford | Senior Water Maintenance | 13326 | WDS |
| Steve Leonard | Meter Reader | | |

**Certification Definitions**
WDM - Water Distribution Manager
WDS - Water Distribution Specialist
CCS - Cross Connection Control Specialist
BAT - Backflow Assembly Tester
WTPOIT - Water Treatment Plant Operator in Training

## Normal Operations

### Available Equipment

The City owns and regularly uses a variety of equipment for daily routine operation and maintenance of the water system. The equipment and supplies needed for normal operation and maintenance of the water system is stored at the City's Public Works Facility. The City will also rent additional equipment, as needed, or contract with a local contractor for additional services. The following equipment and supplies are maintained by the City:

- Repair bands, couplings, and replacement pipe for all sizes and types of water mains found in the system to be used for the repair or replacement of leaking or broken water mains.

- Spare service saddles, corporation stops, service lines, meter setters, meters and boxes to be used for the repair of service connections from leaks or accidental damage.
- A complete hydrant assembly to be used for the repair or replacement of a leaking or damaged hydrant.
- Spare parts for facilities found in the distribution system, including gate valves, pressure reducing valves, air release valves, and fire hydrants.
- An adequate supply of dry chlorine is kept on hand. Chlorine is the only treatment chemical kept in stock.
- Vehicles that include three crew trucks, two dump trucks, one flatbed truck, one meter reading vehicle, one vactor truck, and one backhoe. All vehicles are equipped with communications equipment to ensure a reliable method of communication within the organization.

## Routine Operations

Routine operations involve the planning, coordination, and implementation of proper procedures to ensure that the water system is functioning properly and providing reliable, high-quality water to all customers at all times. Routine operations also involve planned maintenance activities and reading of customer meters.

## Routine Water Quality Sampling

The City routinely samples water throughout the distribution system to ensure the water is safe for its customers' use, as required by law. The Department of Health (DOH) has adopted federal regulations that specify minimum sampling requirements for water systems. The sampling requirements are contained in *WAC 246-290-300* and depend on the population served, source type, and treatment provided. Water quality monitoring is discussed further in **Chapter 6**, the City's latest Water Quality Report in **Appendix J**, and the City's Coliform Monitoring Plan in **Appendix K**.

## Cross-Connection Control

The City adopted a cross-connection control program that complies with *WAC 246-290-490* for the protection of its potable water from contamination due to cross connections. Backflow prevention devices are required at any service connection where a potential for contamination exists, as defined by City ordinance (Edmonds City Code, Chapter 7.20 Backflow Prevention). The premise where the backflow prevention device is installed is placed on a yearly inspection list that is maintained by the Water Division.

The City routinely reviews building permit applications for potential cross connection situations. Several Water Division staff have the Cross Connection Specialist certification as shown in **Table 7-2** and are capable of implementing the cross connection control program. Information from the City's cross connection control program is contained in **Appendix H**.

## Customer Complaint Response Program

The City maintains a log of complaints received from water customers. Depending on the nature of the complaint, a Water Division employee may be contacted by radio or mobile phone to respond immediately if a public health issue is apparent. If not of immediate urgency, a work order will be completed and staff will respond as soon as feasible.

The City dedicates one full-time employee to distribution system water quality. One of the responsibilities of this position is to address water quality complaints and inquiries. A computerized maintenance management system is used to document and track this activity.

## Recordkeeping & Reporting

Regulations for recordkeeping and reporting are contained in *WAC 246-290-480*. The City maintains all records in its Information and Management System (IMS). All water system operating records are kept for an indefinite period. The City will begin monitoring and maintaining both supply and tank level data from the City's SCADA system to aid in the identification of peak demands and overall water usage patterns. Records and reports maintained by the City include, but are not limited to, the following:

- Supply and Tank level data (SCADA)
- Water quality monitoring
- Water quality complaints
- Actions taken to correct Maximum Containment Level (MCL) violations
- Variances or exemptions
- Public notifications
- Flushing activities
- Backflow prevention devices and customer notices
- Maintenance and construction records
- System charts and drawings
- O&M manuals
- Personnel and legal records

The required retention periods of critical records required by DOH in accordance with *WAC 246-290-480* are as follows:

- Bacteriological analyses results: 5 years.
- Chemical analysis (IOC, VOC, SOC, etc.) results: For as long as the system is in operation.

- Copies of monitoring plans: As long as the corresponding monitoring occurs. Keep replaced plans 5 years for microbial and turbidity analysis and 10 years for chemical analyses.
- Records of action taken by the system to correct violations: 10 years after the last action taken for that violation.
- Records of sanitary surveys: 10 years.
- Records concerning a variance or exemption granted to the system: 5 years once the variance or exemption expires.
- Public notices: 3 years after issued.
- Consumer Confidence Reports: 3 years.
- Lead/Copper sampling data and analyses, reports, surveys, letters, evaluations, and schedules: 12 years.
- Daily source meter readings: 10 years.
- Other records of operation and analyses as may be required by DOH: 3 years.
- Project reports, construction documents and drawings, inspection reports, and approvals: life of the facility.

The notification and reporting requirements of DOH are as follows:

- The City must report the following to DOH:
    - Within one business day: a backflow incident per *WAC 246-290-490 (8)f*.
    - Within 48 hours: a failure to comply with the primary standards or treatment technique requirements specified in *WAC 246-290*.
    - Within 48 hours: a failure to comply with the monitoring requirements specified in *WAC 246-290*.
    - Within 48 hours: a violation of a primary maximum contaminant level (MCL).
- The City must submit to DOH all applicable reports required by *WAC 246-290*. Monthly reports are due by the 10th day of the following month, unless otherwise specified.
- Daily source meter readings and total annual source meter readings must be made available to DOH on request.

- Water facilities inventory form (WFI) must be submitted to DOH within 30 days of any change in name, category, ownership, or responsibility for management of the water system.

- The City must notify DOH of the presence of:

    - Coliform in a sample within 10 days of notification by the testing laboratory.

    - Fecal coliform or E. coli in a sample by the end of the business day that the City is notified by the testing laboratory.

- When a coliform MCL violation is determined, the City must:

    - Notify DOH within 24 hours of determining acute coliform MCL violations.

    - Notify DOH before the end of the next business day when a non-acute coliform MCL is determined.

    - Notify water customers in accordance with *WAC 246-290 Part 7, Subpart A*.

- Any reports or communications related to monitoring waivers must be submitted to DOH during each monitoring period or as required.

## Public Notification

In accordance with *WAC 246-290 Part 7, Subpart A*, the City must notify water system customers if any of the following conditions occur:

- Failure to comply with monitoring requirements under *WAC 246-290*.
- Failure to comply with a primary MCL described under *WAC 246-290-310*.
- Failure to comply with a surface water treatment technique.
- Failure to comply with testing requirements.
- Failure to comply with a DOH order.
- Failure to comply with a variance or exemption schedule from DOH.
- If the system is operating under a variance or exemption.
- If system is identified as a source of waterborne disease outbreak.
- If DOH issues the system a category red operating permit.
- If DOH issues an order.

The City will comply with public notification content requirements, notice distribution requirements, and time limit requirements specified in *WAC 246-290 Part 7, Subpart A*. More information on the City's public notification procedures is contained in the Coliform Monitoring Plan in **Appendix K**.

## Safety Procedures and Equipment

The City provides ongoing safety training for its staff to ensure a safe working environment. The American Water Works Association publishes a manual, entitled *Safety Practices for Water Utilities (M3),* describing safety programs and providing guidelines for safe work practices and techniques for a variety of water utility work situations. The City has implemented several safety rules related, but not limited to, the following:

- Climbing water reservoirs (tanks or standpipes).
- Traffic Control Flagger Certification
- Forklift Operation
- Confined Space Entry

All employees in the Water Division have basic first aid training. All Water Division vehicles are equipped with first aid kits. First aid kits are also maintained at the Public Works Facility.

A copy of Safety Data Sheets (SDS) for the chemicals used in the operations and maintenance of the water system are kept on file at the Public Works Department. The data sheets identify the chemical name, hazardous ingredients, physical data, fire and explosion hazard data, health hazards, spill and disposal procedures, user protection information, handling and storage precautions, as well as other information about the product.

## Emergency Operations

The Water Division staff are trained and equipped to respond to emergency events. The water system has been designed and constructed to operate under emergency conditions. A brief discussion of the capabilities of the water system infrastructure and its operation during emergency events follows.

### Multiple Supply Sources

The City has the capability to maintain water service to its customers if its primary supply facility, the Alderwood Supply Station, is out of service. The City's standby supply facility, the Seattle Public Utilities Supply Station, could be used to supply the system during an emergency event. The City also has multiple emergency interties with adjacent water systems that could be used during this type of event. The City has five emergency interties with the City of Lynnwood and six emergency interties with the Olympic View Water & Wastewater District.

### Multiple Reservoirs

The City has multiple reservoirs that provide redundancy to the operating areas they serve, should one of the reservoirs be out of service. The reservoirs include a 3.0 MG steel reservoir

and 1.5 MG steel reservoir at the Five Corners site, a 1.5 MG buried concrete reservoir at the Yost Park site, and a 1.5 MG buried concrete reservoir at the Seaview Park site.

## Distribution System

The City has installed water mains with multiple connections to other water mains and created looped water mains where possible. This looped configuration enables the City to maintain service to customers and minimize the number of customers taken out service during maintenance and repairs to the distribution system.

## Emergency Telephone Calls

Emergency calls during business hours are handled through the City switchboard. Calls during non-business hours are handled through the Snohomish County Emergency Communication System (Sno-Com). One Water Division employee is on-call 24-hours a day.

## On-Call Personnel

The City's "on-call" person is equipped with a phone, an iPad, and responds with a service vehicle. This allows a prompt response to any emergency calls. A list of emergency telephone numbers is provided to each "on-call" employee.

## Employee Cross-Training

The City's public works operations and maintenance employees are trained in all areas of the City-owned utilities. This enables the City to draw from a larger pool of workers that are qualified to deal with water related issues in the event of an emergency. This places the City in a position of readiness where they are able to effectively deal with almost any problem that arises.

## Emergency Response Program

The City of Edmonds Disaster Plan prepared by the City identifies procedures that would be carried out in the event of a serious emergency or disaster situation. The City has also prepared an Emergency Response Plan and a Vulnerability Assessment Plan of the water system, which includes contingency plans for responding to potential emergency conditions. Copies of these are kept on file at the Public Works Facility.

## Preventive Maintenance

The Water Division has developed a preventive maintenance program to ensure all critical components of the water system are properly functioning and regularly maintained for long-term performance and reliability. The schedule in **Table 8-2** is followed for preventive maintenance of the City's water system.

**Table 7-3**
**Preventive Maintenance Schedule**

| Infrastructure | Frequency | Maintenance Description |
|---|---|---|
| Pump Station | Daily | Inspect facility, site and security |
| | Annually | Inspect, clean, and maintain all equipment |
| | Every 5 Years | Rebuild control valves |
| Reservoirs | Daily | Inspect facility, site and security |
| | Annually | Inspect exterior coating |
| | Every 5 Years | Clean & inspect interiors |
| Supply Stations | Annually | Inspect, clean, and maintain all equipment |
| | Every 5 Years | Rebuild control valves |
| Fire Hydrants | Annually | Operate/flush, inspect, clean, & maintain |
| PRV Stations | Annually | Exercise, inspect, clean, & maintain all equipment |
| | Every 5 Years | Rebuild control valves |
| Valves | Annually | Operate, inspect, clean, & maintain |
| Water Mains | Semi-Annually | Flush water mains using fire hydrants & blow-off assemblies to discharge flushing water |

## Staffing

The Water Division is currently staffed with several full-time personnel consisting of water maintenance workers, a water quality technician, a meter reader, and a water maintenance lead worker. The Water and Sewer Manager allocates approximately 50 percent of their time to the Water Division. The Public Works Director oversees all Public Works activities, so a much smaller portion of their time is available to the water system.

The Water Division is currently staffed with seven full-time personnel consisting of four field technicians, one water quality technician, one meter reader, and one lead supervisor. The Water and Sewer Manager and Public Works Director both allocate a portion of their time to the Water Division as well. The Water Division has been able to operate the water system and meet past regulatory requirements for public water systems. However, the increasing needs of the water system, combined with the additional demands of now having a consistent waterline replacement program and additional needs due to regulatory requirements, has created more challenges in completing planned preventive maintenance activities. Therefore, the City's Water Maintenance and Operations Division is planning to add at least one additional staff member in the near future to ensure continued compliance with regulatory requirements and the increasing needs of the system.

**THIS PAGE INTENTIONALLY LEFT BLANK**

# CHAPTER 8 | WATER SYSTEM ANALYSIS

## Introduction

This chapter presents the analysis of the City of Edmonds' (City) existing water system. Individual water system components were analyzed under both existing and future water demand conditions to determine their ability to meet policies and design criteria. The City's water demands are presented in **Chapter 4** and the City's policies and design criteria are presented in **Chapter 5**. A description of the water system facilities and their current operation is presented in **Chapter 2**. The last section of this chapter presents the existing system capacity analysis that aided in the determination of the maximum number of equivalent residential units (ERUs) that can be served by the City's water system. Planned water system capital improvements that resolve the deficiencies identified in this chapter are presented in **Chapter 9**.

## Pressure Zones

**Table 8-1** lists each of the City's seven pressure zones, the highest and lowest elevation served in each zone, and the minimum and maximum distribution system pressures within each zone, based on maximum static water conditions (full reservoirs and no system demands). This table shows that the City is currently providing water at sufficient pressures throughout the system, with the highest pressures occurring at the lowest elevations of each pressure zone. All new water services with pressures exceeding 80 psi must have individual pressure reducing valves to reduce the pressure to 80 psi or less, in accordance with the plumbing code.

**Table 8-1**
**Minimum and Maximum Distribution System Pressures**

| Pressure Zone | Highest Elevation Served (ft) | Static Pressure at Highest Elevation (psi) | Lowest Elevation Served (ft) | Static Pressure at Lowest Elevation (psi) |
|---|---|---|---|---|
| 596 | 455 | 61 | 270 | 141 |
| 505 | 365 | 61 | 195 | 134 |
| 500 | 400 | 43 | 180 | 139 |
| 486 | 375 | 48 | 170 | 137 |
| 425 | 285 | 61 | 175 | 108 |
| 420 | 250 | 74 | 155 | 115 |
| 325 | 245 | 35 | 10 | 137 |
| Future 325 | 207 | 51 | 10 | 137 |

It is the City's policy to provide water service at a minimum pressure of 40 psi, which has generally been accomplished with the design of the system and location of pressure zone boundaries. Due to the challenging topography throughout the system, high pressures do occur in several areas of the service area. As shown in **Table 8-1**, the highest elevation served in the 325 Zone will change in the future through a pressure zone conversion project, described in **Chapter 9**, that converts an area of the 325 Zone to the 486 Zone.

## Alderwood Supply Station

This section evaluates the City's Alderwood Supply Station to determine if it has sufficient capacity to provide water supply to the system at a rate that meets the existing and future demands of the system. In the past, the City operated its water system as two independent service areas. This was based on the north service area being supplied with water from Alderwood Water & Wastewater District (AWWD) and the south service area being supplied with water from Seattle Public Utilities (SPU). The City now operates the system as one service area completely supplied with water from AWWD, due to the rising cost of water purchased from SPU. The City's SPU Supply Station remains in service but operates in a standby mode, providing additional supply to the system only when needed. All water is supplied through the City's Alderwood Supply Station.

## Analysis Criteria

Supply facilities must provide a reliable and sufficient quantity of water at pressures meeting the requirements of *WAC 246-290-230*. The capacity of supply facilities in a pressure zone with adequate storage must be sufficient to provide water at a rate that is equal to or greater than the peak day demand of the zone being served. This approach assumes that demands in excess of the peak day demand will be supplied from the equalizing storage portion of reservoirs. Since the City's Alderwood Supply Station provides supply to pressure zones that can also be supplied from storage for intraday peak demands, the supply requirement for the supply station is equal to the peak day demand of the system.

## Analysis Results

The Alderwood Supply Station delivers water to the City's entire water system and is supplied directly into the 596 Zone, meeting customer demands and filling the two reservoirs at the Five Corners site. Water is supplied to the remaining lower pressure zones from the 596 Zone through multiple pressure reducing valve (PRV) stations.

**Table 8-2** summarizes the evaluation of the City's Alderwood Supply Station to determine if it has sufficient capacity to meet the existing and future demands of the system. The existing system and future system evaluations are based on the existing facility, which has a maximum supply capacity of approximately 7,000 gpm. The capacity of the existing facility

was increased after completion of improvements in 2010, that enables flow through both the mainline and bypass portions of the station.

The results of the evaluation, as shown in **Table 8-2**, indicate the City's Alderwood Supply Station has sufficient capacity to meet the existing and future supply requirements of the system through the year 2034.

**Table 8-2**
**Alderwood Supply Station Capacity Evaluation**

| Description | Existing System Year 2014 (gpm) | Future System Year 2034 (gpm) |
|---|---|---|
| **Required Supply Capacity** | | |
| Peak Day Demand (PDD) | 4,052 | 4,611 |
| **Available Supply Capacity** | | |
| Alderwood Supply Station | 7,000 | 7,000 |
| **Surplus Supply Capacity** | | |
| Surplus Capacity | 2,948 | 2,389 |

## Five Corners Pump Station

This section evaluates the Five Corners Pump Station to determine if it has sufficient capacity to meet the existing and future demands of the system.

### Analysis Criteria

The primary purpose of the pump station is to pump stored water from the Five Corners 3.0 MG Reservoir to the 596 Zone to supplement the Alderwood Supply Station supply during peak demand periods, to provide supplemental fire flow, and to provide emergency supply. This is accomplished by using standby storage from the Five Corners 3.0 MG Reservoir should the Alderwood Supply Station be out of service.

The criteria for evaluating the capacity of the Five Corners Pump Station is based on the most stringent condition in which the system simultaneously experiences peak hour demands and a fire flow in the 596 Zone. This fire flow is based on the largest requirement of 5,000 gpm. Supply to the system during this condition is provided by the Alderwood Supply Station, Five Corners Pump Station, and SPU Supply Station, which is configured to automatically activate during this type of an event. The analysis is based on the pump station with improvements that were completed in 2010 and control improvements that were implemented in 2016.

## Analysis Results

The results of the evaluation, as shown in **Table 8-3**, indicate the Five Corners Pump Station has sufficient capacity to serve its purpose in providing supplemental supply to the system, based on both the existing and future supply requirements of the system. As shown in **Table 8-3**, the required supply from the Five Corners Pump Station increases to 800 gpm in the future (2034) due to increased demands.

**Table 8-3**
**Five Corners Pump Station Capacity Evaluation**

| Description | Existing System Year 2014 | Future System Year 2034 |
|---|---|---|
| **Required Supply (gpm)** | | |
| System Peak Hour Demand (PHD) | 7,294 | 8,300 |
| Maximum Fire Flow Requirement | 5,000 | 5,000 |
| Total Required Supply | 12,294 | 13,300 |
| **Available Supply (gpm)** | | |
| Alderwood Supply Station Capacity | 7,000 | 7,000 |
| SPU Supply Station Capacity | 5,500 | 5,500 |
| Total Supply Capacity | 12,500 | 12,500 |
| **Required Supply from Five Corners Pump Station (gpm)** | | |
| Required Supply from Pump Station | 0 | 800 |
| **Available Supply from Five Corners Pump Station (gpm)** | | |
| Five Corners Pump Station Capacity | 2,400 | 2,400 |
| **Surplus Pump Station Capacity (gpm)** | | |
| Surplus Pump Station Capacity | **2,400** | **1,600** |

## Storage Facilities

This section evaluates whether the City's four existing water storage facilities have sufficient capacity to meet the existing and future storage requirements of the system.

## Analysis Criteria

Water storage is provided in a public water system to achieve multiple purposes and can be represented by the following components: operational storage, equalizing storage, standby storage, fire flow storage, and dead storage. The following subsections provide a description of each storage component and the criteria used to evaluate the capacity of the City's storage facilities.

### Operational Storage

Operational storage is the upper portion of the reservoir that is used to supply the water system under normal demand conditions. Operational storage is the average amount of draw down in the reservoir during normal operating conditions, which represents a volume of storage that will most likely not be available for other purposes. The operational storage in all four of the City's reservoirs is the volume of storage between the average water level of the reservoirs and the maximum water level (i.e., overflow elevation) of the reservoirs.

### Equalizing Storage

Equalizing storage is the portion of the reservoir, below operational storage, that is used to supply the water system under peak demand conditions when the system demand exceeds the total rate of supply of the sources. The criteria for determining the equalizing storage requirements for the City's system, which is supplied continuously from the Alderwood Supply Station, is based on the Department of Health (DOH) formula that considers the difference between peak hour demand and supply capacity over the course of 150 minutes.

### Standby Storage

Standby storage is the portion of the reservoir used to supply the water system under emergency conditions when supply facilities are out of service. Considering the City's historically reliable supply from AWWD, standby supply from SPU, and 11 emergency interties with two adjacent water systems, the need for a large amount of standby storage is not warranted. Therefore, the standby storage requirement is based on a sufficient volume to provide all water supply to the system for one day during an average day demand condition when the Alderwood Supply Station is out of service and no other supply is provided by other facilities.

### Fire Flow Storage

Fire flow storage is the portion of the reservoir with sufficient volume to supply water to the system at the maximum rate and duration required to extinguish a fire at the building with the highest fire flow requirement. The magnitude of the fire flow storage is the product of the fire flow rate and duration of the system's maximum fire flow requirement. Fire flow requirements differ for the 325 Pressure Zone, versus the rest of the system. The required volume of fire flow storage for the 325 Zone is based on a 3,000 gpm fire flow for a 3-hour duration. The required volume of fire flow storage for the remaining pressure zones is based on a 5,000 gpm fire flow for a 4-hour duration.

Both standby storage and fire flow storage are considered emergency storage components and can be nested, as approved by local fire protection authorities. The City has elected to nest these two storage components, which results in the larger of the two individual components being used for both standby and fire flow purposes.

### *Dead Storage*

Dead storage is the bottom portion of the reservoir that cannot be used because water is stored at an elevation that is too low to either pump or flow by gravity to provide sufficient pressure. This unusable storage occupies the lower portion of most ground-level standpipe style reservoirs.

## Analysis Approach

The storage analysis is based on an evaluation of the existing reservoirs providing water to the two operating areas that they serve. The Five Corners 3.0 MG Reservoir and 1.5 MG Reservoir provide storage to an operating area that includes all pressure zones, except for the 325 Zone. The 1.5 MG Yost Reservoir and 1.5 MG Seaview Reservoir provide storage for the 325 Zone.

## Existing Storage Analysis Results

The results of the storage analysis for the existing system indicate that the existing storage facilities have sufficient capacity to meet existing demands, as shown in **Table 8-4**. The two Five Corners reservoirs have approximately 0.52 MG of excess storage for the pressure zones that they serve (all pressure zones except the 325 pressure zone). The Yost Reservoir and Seaview Reservoir have approximately 0.71 MG of excess storage for the 325 Zone. This results in a total, system-wide surplus storage of 1.22 MG for the existing capacity.

**Table 8-4**
**Existing Storage Capacity Evaluation**

| Description | All Zones except 325 Zone (MG) | 325 Zone (MG) | Total System (MG) |
|---|---|---|---|
| **Usable Storage (MG)** | | | |
| Maximum Storage Capacity | 3.90 | 3.00 | 6.90 |
| Dead (Non-usable) Storage | -0.36 | 0.00 | -0.36 |
| Total Usable Storage | 3.54 | 3.00 | 6.54 |
| **Required Storage (MG)** | | | |
| Operational Storage | 1.01 | 1.34 | 2.35 |
| Equalizing Storage | 0.03 | 0.01 | 0.04 |
| Standby & Fire Flow Storage* | 1.98 | 0.94 | 2.92 |
| Total Required Storage | 3.02 | 2.29 | 5.32 |
| **Surplus Storage** | **0.52** | **0.71** | **1.22** |

*General Note: Standby storage is larger than fire flow storage requirements, based on one day of storage for 201 gallons per day per ERU.*

## Future Storage Analysis Results

The future storage analysis was performed to determine the adequacy of the City's existing reservoirs to meet the future storage requirements, based on projected demands for the year 2034. The demands used in this analysis are projected demands without reductions from conservation efforts. The results of the future storage analysis indicate that the existing storage facilities have sufficient capacity to meet the future demands of the system in 2034, as shown in **Table 8-5**. Therefore, additional storage capacity is not required within the 20-year planning period. Under future conditions, a total, system-wide surplus storage of 0.67 MG is allotted. A number of improvements to the existing reservoirs, not related to capacity, are planned by the City and identified in **Chapter 9**.

**Table 8-5**
**Future Storage Capacity Evaluation**

| Description | All Zones except 325 Zone (MG) | 325 Zone (MG) | Total System (MG) |
|---|---|---|---|
| **Usable Storage (MG)** | | | |
| Maximum Storage Capacity | 3.90 | 3.00 | 6.90 |
| Dead (Non-usable) Storage | -0.36 | 0.00 | -0.36 |
| Total Usable Storage | 3.54 | 3.00 | 6.54 |
| **Required Storage (MG)** | | | |
| Operational Storage | 1.01 | 1.34 | 2.35 |
| Equalizing Storage | 0.13 | 0.06 | 0.20 |
| Standby & Fire Flow Storage* | 2.25 | 1.07 | 3.32 |
| Total Required Storage | 3.40 | 2.47 | 5.87 |
| **Surplus Storage** | **0.14** | **0.53** | **0.67** |

*General Note: Standby storage is larger than fire flow storage requirements, based on one day of storage for 201 gallons per day per ERU.*

## Distribution and Transmission System

This section evaluates the City's existing distribution and transmission water mains to determine if they are sized and looped adequately to provide the necessary flow rates and pressures to meet the existing and future requirements of the system.

## Analysis Criteria

The criteria used to evaluate the City's distribution and transmission system is contained in *WAC 246-290-230*. The pressure analysis criteria states that the distribution system "shall be designed with the capacity to deliver the design peak hour demand quantity of water at 30 psi

under peak hour demand flow conditions measured at all existing and proposed service water meters or along property lines adjacent to mains if no meter exists, and under the condition where all equalizing storage has been depleted." It also states that if fire flow is to be provided, then "the distribution system shall also provide maximum day demand (MDD) plus the required fire flow at a pressure of at least 20 psi at all points throughout the distribution system, and under the condition where the designed volume of fire suppression and equalizing storage has been depleted."

## Hydraulic Model

A hydraulic computer model of the City's water system was used to evaluate the existing system and identify proposed improvements to resolve deficiencies. The hydraulic model was also used to demonstrate that the proposed improvements will eliminate the identified deficiencies and meet the future demand requirements. A description of the hydraulic model and settings used for the analyses follows.

### *Description*

The City's existing water system was modeled with the Innovyze InfoWater™ software (version 12.3, Update #3). InfoWater™ is a GIS-based modeling program that uses the U.S. Environmental Protection Agency (EPA) software, EPANET, as its analysis engine. EPANET is a widely accepted program for the purposes of analyzing water distribution piping systems. All existing facilities and water mains in the City's water system were modeled, including recent improvements.

### *Demand Data*

The hydraulic model contains average day demands of the existing system, based on 2014 demand data. A global demand factor was used to adjust the demands to reflect future 2034 demand levels. Demand peaking factors from **Chapter 4** were used to adjust demand levels to peak day demand for the fire flow analyses and peak hour demand for the pressure analysis.

### *Facility Data*

The hydraulic model of the existing system for the pressure analysis contains all active existing system facilities with settings that correspond to peak hour demand events. The Alderwood Supply Station was operating in pressure control mode to maintain pressures in the 596 Zone. The Five Corners Pump Station was modeled to reflect the recent pump station improvements. The reservoirs were modeled with water levels that reflect full utilization of operational and equalizing storage. All active pressure reducing stations were modeled as being in service and at their normal set points.

The hydraulic model of the existing system for the fire flow analyses contains all active existing system facilities with settings that correspond to peak day demand events. The Alderwood Supply Station was set up to operate in pressure control mode to maintain pressures in the 596 Zone. The Five Corners Pump Station was modeled to operate under pressure control, based on inflow from the Alderwood Supply Station and system pressures. The reservoirs were modeled with water levels that reflect full utilization of operational, equalizing, and fire flow storage. The depletion of fire flow storage for the analyses in all pressure zones, except the 325 Zone, was based on a maximum fire flow requirement of 5,000 gpm for a 4-hour duration. The depletion of fire flow storage for the analyses in the 325 Zone was based on a maximum fire flow requirement of 3,000 gpm for a 3-hour duration. All active pressure reducing stations were modeled as being in service and at their normal set points.

The hydraulic model representing the proposed system in the year 2034 contains all active existing system facilities and planned system improvements that are identified in **Chapter 9**. The settings for all active existing and proposed facilities were set to correspond to the future peak day demand events for the fire flow analysis of the proposed water system. Otherwise, facility settings were the same as in the existing system analyses.

### *Calibration*

Hydraulic model calibration is the process of using field pressure and flow data to improve the accuracy of the hydraulic model so that it can be used to accurately simulate operation of the actual water system. Initial calibration was accomplished by adjusting water main roughness coefficients based on a compilation of pipe material and year data. Additional calibration of the model was achieved using the most recent elevation data available for the water system, field flow and pressure data, which was collected from flow tests that the City performed throughout the system.

## Hydraulic Analyses Results

Hydraulic analysis was performed to determine the capability of the system to meet the pressure and flow requirements identified in **Chapter 5** and contained in *WAC 246-290-230*. The first analysis was performed to evaluate pressures throughout the system under existing (i.e., 2014) peak hour demand conditions. The results of this analysis were used to identify locations of low and high pressures. To satisfy the minimum pressure requirements, pressures at all water service locations were required to be at least 30 psi during these demand conditions. The results of this analysis indicated that all areas of the system have pressures greater than 30 psi.

Fire flow analyses were performed throughout the system to determine the capability of the existing water system to provide adequate fire flow under peak day demand conditions. A separate fire flow analysis was performed for each node in the hydraulic model to determine the available fire flow at a minimum residual pressure of 20 psi. For each node analyzed, the

resulting fire flow was compared to its target fire flow requirement, which was assigned according to the land use classification that it is located within, as summarized in **Table 4-9**. A summary of the analyses results for representative locations in each pressure zone is shown in **Table 8-6**. The available fire flow shown in the table represents the flow in the area from a single fire hydrant location. The available fire flow from nearby hydrants, which would also be activated to fight an actual fire, is greater than the amounts shown in the table. Multiple fire hydrants are generally used to extinguish a fire by generating higher flows and simultaneously fighting the fire from multiple locations. The single hydrant modeling approach is used primarily for planning purposes to locate areas in the system that should be improved to ensure sufficient fire flow is available in each area of the system.

The results of the fire flow analyses were used to identify improvements for water mains that are currently undersized or not looped adequately to provide sufficient fire flow. Upon completion of the existing system fire flow analyses, proposed water main improvements were included in the model and fire flow analyses were performed throughout the system to demonstrate that the improvements eliminate the existing system deficiencies and meet the future requirements of the system. These analyses were modeled under future year 2034 demand conditions without planned reductions from conservation to ensure that the improvements are sized sufficiently to meet the most stringent requirements anticipated in the future.

The results of the fire flow analyses with planned improvements are summarized in **Table 8-6**. These results highlight that fire flows are significantly increased with the proposed water main improvements. A description of the planned improvements and a figure exhibiting their location is presented in **Chapter 9**. **Table 8-6** shows that some areas are anticipated to have a minor decrease in available fire flows in the future. The increase in residential demands from 2014 to 2034 caused some areas to see a small reduction in available fire flows, but did not create any fire flow deficiencies.

## Table 8-6
## Fire Flow Analysis Summary

| Description | Approximate Location | Pressure Zone | Available Fire Flow (gpm) at 20 psi | | Target Fire Flow (gpm) |
|---|---|---|---|---|---|
| | | | Existing System [1] | Future System with Improvements [1] | |
| Swedish Medical Center | 216th St SW & 73rd Pl W | 596 | 2,661 | 8,112 | 5,000 |
| Commercial Area | 76th Ave W & 242nd St SW | 596 | 1,404 | 4,415 | 3,000 |
| Multi-Family Residential / Condominium Area | 196th St SW & 80th Ave W | 596 | 1,544 | 3,765 | 3,000 |
| Single Family Residential Area | 89th Pl W, North of 200th St SW | 596 | 392 | 1,567 | 1,000 |
| Multi-Family Residential Area | 83rd Ave W & Woodlake Dr | 596 | 2,335 | 4,422 | 3,000 |
| Single Family Residential Area | 182nd Pl SW, East of 88th Ave W | 505 | 392 | 1,567 | 1,000 |
| Single Family Residential Area | 90th Ave W, south of 184th St SW | 505 | 881 | 1,567 | 1,000 |
| Single Family Residential Area | Glen St & 10th Ave N | 420 | 392 | 2,168 | 1,000 |
| Single Family Residential Area | Excelsior Pl & 94th Pl | 420 | 881 | 1,567 | 1,000 |
| Single Family Residential Area | Glen St & 9th Ave N | 420 | 494 | 2,053 | 1,000 |
| Single Family Residential Area | Main St & Olympic Ave | 486 | 866 | 1,550 | 1,000 |
| Single Family Residential Area | Main St & 10th Ave S | 486 | 873 | 1,557 | 1,000 |
| Single Family Residential Area | 7th Ave S & Elm Pl | 486 | 875 | 1,560 | 1,000 |
| Single Family Residential Area | Meadowdale Beach Rd & 74th Pl W | 500 | 866 | 1,550 | 1,000 |
| Single Family Residential Area | Meadowdale Beach Rd & 169th Pl | 500 | 861 | 1,544 | 1,000 |
| Single Family Residential Area | Sound View Dr & 176th St SW | 425 | 881 | 1,567 | 1,000 |
| Single Family Residential Area | Soundview Drive, South of 176th St SW | 425 | 881 | 1,567 | 1,000 |
| Multi-Family Residential / Condominium Area | 4th Ave S & Edmonds Way | 325 | 1,567 | 3,525 | 3,000 |
| Edmonds Elementary School | Viewland Way & Olympic Ave | 325 | 2,313 | 3,740 | 3,000 |

[1] *Fire flows shown are from a single fire hydrant. Higher flows are commonly available from nearby hydrants. See page 8-9 for more information.*

## System Capacity

System capacity analyses were performed to determine the maximum number of equivalent residential units (ERUs) that the system can serve, based on an independent evaluation of each component of the City's water system. A separate analysis was performed for the existing system with year 2014 demand levels and the future system with year 2034 projected demand levels. The results of these analyses provide the City with information to ensure sufficient capacity is available when reviewing applications for new connections to the water system.

## Determination of Adequate Water Supply for New Buildings

By law, governments cannot issue a building permit until water is available for the applicant's property. The requirement for providing evidence of an adequate water supply was codified in 1990 under Title 19.27.097 of the Revised Code of Washington (RCW) in the Building Code Section. To assist governments with implementing these requirements, the Department of Health has developed a handbook, entitled *Guidelines for Determining Water Availability for New Buildings*. A public water system will issue a "Certificate of Water Availability," or similar document, during the building permit review process when there is sufficient water supply to meet the domestic water service and the fire flow requirements of the applicant's proposed project.

## Analysis Criteria

The capacity of the City's water system and the ability to serve additional customers is based on the limiting capacity of either supply or storage, whichever is associated with the least ERUs. The analysis of supply was computed from the Alderwood Supply Station capacity and the system's peak day demand per ERU. The analysis of storage was computed from the total usable capacity of the storage facilities and the storage requirement per ERU. The storage requirement per ERU was determined from the existing storage requirement presented in this chapter and the existing ERUs presented in **Chapter 4**.

## Existing System Capacity Analysis Results

The results of the existing system capacity analysis, as shown in **Table 8-7**, indicate that the existing system has sufficient capacity to serve an additional 3,393 ERUs. **Table 8-7** also shows the storage component is the limiting facility of the system.

**Table 8-7**
**Existing (2014) System Capacity Analysis**

| Demands Per ERU Basis | |
|---|---|
| Average Day Demand Per ERU (gal/day) | 201 |
| Peak Day Demand Per ERU (gal/day) | 403 |
| Peak Hour Demand Per ERU (gal/day) | 725 |
| **Supply Capacity** | |
| Limiting Supply Rate - AWWD Supply Station (gal/day) | 10,080,000 |
| Peak Day Demand Per ERU (gal/day) | 403 |
| Maximum Supply Capacity (ERUs) | 25,043 |
| **Storage Capacity** | |
| Maximum Storage Capacity (gal) | 6,540,153 |
| Storage Requirement Per ERU (gal) | 361 |
| Maximum Storage Capacity (ERUs) | 18,123 |
| **Maximum System Capacity** | |
| Based on Limiting Facility - Storage | 18,123 |
| **Available System Capacity** | |
| Maximum System Capacity (ERUs) | 18,123 |
| Existing (2014) ERUs | 14,729 |
| **Available System Capacity (ERUs)** | **3,393** |

## Future System Capacity Analysis Results

The results of the 20-year projected system capacity analysis, as shown in **Table 8-8**, indicate that the water system in the year 2034 will have sufficient capacity to serve an additional 1,889 ERUs. Again, storage is the limiting facility for the system capacity.

## Table 8-8
## 20-Year (2034) Projected System Capacity Analysis

| Demands Per ERU Basis | |
|---|---|
| Average Day Demand Per ERU (gal/day) | 201 |
| Peak Day Demand Per ERU (gal/day) | 403 |
| Peak Hour Demand Per ERU (gal/day) | 725 |
| **Supply Capacity** | |
| Limiting Supply Rate - AWWD Supply Station (gal/day) | 10,080,000 |
| Peak Day Demand Per ERU (gal/day) | 403 |
| Maximum Supply Capacity (ERUs) | 25,043 |
| **Storage Capacity** | |
| Maximum Storage Capacity (gal) | 6,540,153 |
| Storage Requirement Per ERU (gal) | 356 |
| Maximum Storage Capacity (ERUs) | 18,389 |
| **Maximum System Capacity** | |
| Based on Limiting Facility - Storage | 18,389 |
| **Available System Capacity** | |
| Maximum System Capacity (ERUs) | 18,389 |
| Projected (2034) ERUs | 16,500 |
| **Available System Capacity (ERUs)** | **1,889** |

# CHAPTER 9 | WATER SYSTEM IMPROVEMENTS

## Introduction

This chapter presents water system improvements that the City of Edmonds (City) plans to implement within the 20-year planning period to resolve existing system deficiencies and meet the future demands of the water system. This chapter also presents criteria used for prioritizing the capital improvements, planning level project cost estimates, and an implementation schedule for the improvements. The water system improvements were identified from the results of the water system analyses, presented in **Chapter 8**, and have been sized to accommodate the projected demands that were established in **Chapter 4**.

## Description of Improvements

This section provides a general description of capital improvements that have been completed since the last Comprehensive Water System Plan was prepared in 2010 and provides a brief description of the currently planned capital improvements. The water system improvements are shown schematically in **Figure 9-1** and summarized in a table near the end of this chapter.

The water system improvements for this Plan are grouped into the following categories, including:

- Water Main Improvements
- PRV Station and Pressure Relief Improvements
- Facility Improvements, and
- Other Improvements

These improvements are presented following the discussion of improvements completed since 2010.

### Water System Improvements Completed Since 2009

The City has completed several water system improvements that were identified in the 2010 Comprehensive Water System Plan. These include improvements to the Five Corners Site, pressure reducing station upgrades, rehabilitation of lift stations, extension of water services, and replacement of old and undersized water main. A summary of water system improvements completed since 2009 is shown in **Table 9-1**.

**Table 9-1**
**Water System Improvements Completed Since 2009**

| Water Projects 2009 to Present | Year completed |
|---|---|
| Lift Station #7 & #8 Rehabilitation* | 2009 |
| Sound Transit Station* | 2010 |
| 2010 Waterline Replacement | 2011 |
| 2011 Waterline Replacement | 2011 |
| Woodway Waterline Extension/Replacement | 2011 |
| 203rd Waterline Replacement | 2011 |
| Lift Station #2 Rehabilitation* | 2011 |
| Shell Valley Access Road Water Main | 2011 |
| Main St Waterline Extension (near ferry terminal) | 2011 |
| Stonebridge Development* | 2011 |
| 2012 Waterline Replacement | 2012 |
| Lift Station #14 Rehabilitation* | 2012 |
| 76th Ave Waterline Replacement | 2012 |
| 2013 Waterline Replacement | 2013 |
| Shoreshire Development* | 2013 |
| 224th Waterline Replacement | 2013 |
| Main Street Improvements* | 2013 |
| 2014 Waterline Replacement | 2014 |
| Five Corners Roundabout* | 2014 |
| Sewerline Replacement Project, Phase 1* | 2014 |
| Sewerline Replacement Project, Phase 2* | 2014 |
| Swedish Medical Center Expansion Projects* | 2014 |
| 2015 Waterline Replacement | 2015 |
| 2016 Waterline Replacement | 2016 |
| 2017 Waterline Replacement | 2017 |

**Projects included portions of water main replacements.*

## Water Main Improvements

The following water main improvements were identified from the results of the distribution system analyses presented in **Chapter 8** and from the City's list of planned projects.

### *CIP WM1: Annual Water Main Replacement Program*

Deficiency: Most of the water mains to be replaced within this ongoing program are aging, undersized water mains that do not provide adequate fire flow to meet current requirements. Much of this water main is older, cast iron pipe and some areas have had occurrences of

leaks or breaks. Water main improvement projects previously identified in the City's 2010 CIP program have been carried forward and are included within this CIP project.

Improvement: Replace existing water main with new ductile iron pipe in accordance with the City's construction standards. The individual water main improvements grouped under this project are shown in **Figure 9-2**. Information on the individual projects, including proposed water main size, location, and project cost estimate is presented later in this chapter, in **Table 9-6**.

The selection of specific projects will be accomplished annually during the City's budget development process and will be guided by the prioritization presented later in this chapter. This provides the City with the flexibility to coordinate projects that may occur within the same area(s). The projects will include replacing water main appurtenances such as isolation valves, fire hydrants, blow-off assemblies, air release/vacuum relief assemblies and water services.

## PRV Station and Pressure Relief Improvements

The following PRV station improvements and pressure relief improvements include new facilities, abandoning old facilities, and improvements to existing facilities.

### *CIP PRV1: PRV Station 13 Replacement (88th Ave W and 185th St SW)*

Deficiency: The existing PRV station is old and has reached the end of its useful service life.

Improvement: Design and install a new PRV station.

### *CIP PRV2: PRV Station 14 Replacement (188th St W and 89th Ave W)*

Deficiency: The existing PRV station is old and has reached the end of its useful service life.

Improvement: Design and install a new PRV station.

### *CIP PRV3: PRV Station 15 Replacement (192nd St SW)*

Deficiency: The existing PRV station is old and has reached the end of its useful service life.

Improvement: Design and install a new PRV station.

### *CIP PRV4: PRV Station 16 Replacement (12th Ave N and Viewland Way)*

Deficiency: The existing PRV station is old and has reached the end of its useful service life.

Improvement: Design and install a new PRV station.

### *CIP PRV5: Annual PRV Station Improvements Program*

Deficiency: Several of the existing PRV stations are anticipated to reach the end of their useful service life during this Plan's 20-year planning period. Other PRV stations require minor improvements to ensure long-term operation and reliability.

Improvement: Annually improve or replace PRV stations throughout the system. The City will evaluate needs and select one or more PRV stations to be improved each year.

## Facility Improvements

The following water system facility projects consist of improvements to existing facilities to improve operation, increase capacity, or to ensure long-term performance of the facility.

### *CIP F1: Five Corners Reservoir Improvements*

Deficiency: A seismic and structural evaluation determined that both the 1.5 MG and 3.0 MG Five Corners Reservoirs lack sufficient freeboard. In addition, both the steel reservoirs were last coated (interior and exterior) in 1994. Based on the typical life of coating on steel reservoirs, recoating is prescribed every 15 to 20 years. Finally, a facility evaluation completed in 2015 determined that both reservoirs have multiple appurtenance deficiencies.

Improvement: Structural and seismic improvements including lowering the overflow piping inside both reservoirs, making roof improvements to the 1.5 MG reservoir, and replacing reservoir appurtenances to improve access, venting and overflow piping. The project also includes recoating the interior and exterior of the reservoirs.

### *CIP F2: Yost Reservoir Piping Maintenance and Replacement*

Deficiency: The piping inside of the reservoir is aging and reaching the end of its useful service life. The reservoir itself is aging and the remaining service life is unknown.

Improvement: Evaluate tank conditions to determine remaining useful life and need for further repairs, upgrades, or replacement (as identified in the assessment). Replace piping inside of reservoir.

### *CIP F3: Seaview Reservoir Piping Maintenance and Replacement*

Deficiency: The piping inside of the reservoir is aging and reaching the end of its useful service life. The reservoir itself is aging and the remaining service life is unknown.

Improvement: Evaluate tank conditions to determine remaining useful life and need for further repairs, upgrades, or replacement (as identified in the assessment). Replace piping inside of reservoir.

### *CIP F4: SPU Intertie & Emergency Intertie Improvements*

Deficiency: The SPU emergency intertie is not connected to a telemetry system and it is difficult to maintain due to its age. The City maintains a total of eleven emergency interties between the City of Lynnwood (five) and OVWSD (six). Ten of these interties do not have the ability to be flushed or metered. Further, they are not outfitted with telemetry equipment.

Improvement: Install a new supply station with control valves, flow meters, and a telemetry system for the SPU Intertie. Upgrade the interties with flow meters, telemetry systems, and flushing infrastructure (e.g., fire hydrants or blowoff assemblies) for the ten identified emergency interties.

## Other Improvements

The following improvements include a small pressure zone reconfiguration, and comprehensive planning.

### *CIP M1: Pressure Zone Conversion (325 to 486)*

Deficiency: A small portion of the 325 Zone, bounded by 8th Ave S, 9th Ave S, Dayton St, and Maple St, has moderately low pressure.

Improvement: Convert mains in the area to be served by the 486 Zone by constructing approximately 1,000 linear feet of water main and, if not already installed, adding PRVs on approximately 25 water services. The proposed water main connects the existing 486 Zone water main to the converted 325 Zone water main (12-in, Cast Iron) in Dayton St to the north, in Maple St to the south with water main running parallel to the 325 Zone main, in 8th Ave S to the west, and to existing 486 Zone water main in 9th Ave S to the east. The converted pressure zone impacts further north, to the southside of Main St.

### *CIP M2: Comprehensive Water System Plan Update*

Deficiency: The City is required to update its Comprehensive Water System Plan every ten years and submit to the Department of Health for review and approval. Drinking water regulations are continuously changing and must be addressed in the City's Comprehensive Water System Plan.

Improvement: Update the Comprehensive Water System Plan every ten years to meet the requirements that are in effect at the time of the update and to provide the City with an updated plan for implementing water system improvements.

## Project Cost Estimates

Project costs were estimated for each of the planned improvements and are presented in 2016 dollars. The planning level project cost estimates include the estimated construction cost and indirect costs. The construction cost estimate portion includes all construction related costs, sales tax and a 10 percent contingency. The indirect cost portion is estimated at 35 percent of the construction cost and includes engineering (preliminary design, final design, and construction management services), surveying, permitting, legal, construction inspection, and administrative services. For projects identified within the downtown area, an additional 20 percent contingency was added to reflect traditionally higher construction costs in the downtown area.

## Water Main Cost Estimates

Construction costs for water main projects were estimated using the water main unit costs (i.e., cost per foot length) shown in **Table 9-2**. The unit cost of construction for each water main size is based on estimates of all construction-related improvements, which include materials and labor for the water main installation, water services, fire hydrants, fittings, valves, connections to the existing system, trench restoration, full-width roadway asphalt overlay, and other work for a complete installation. The indirect cost component is not included in the water main unit costs shown in **Table 9-2**.

**Table 9-2**
**Water Main Unit Costs for Construction**

| Water Main Diameter (inches) | Construction Cost per Foot Length (2016 $$/LF)[1] |
|---|---|
| 8 | $310 |
| 12 | $360 |
| 16 | $420 |

[1] *An additional 20 percent was applied to project costs located in Downtown Edmonds. Unit Costs include all Construction Costs, Sales Tax, and a 10 percent Contingency. Construction Costs include all materials and labor for the water main installation, water services, fire hydrants, fittings, valves, connections to the existing system, trench restoration, full roadway width asphalt surface overlay, and other work for a complete installation. Other Project Costs not included in the Construction Unit Costs are estimated at 35 percent of the Construction Cost and represents engineering (preliminary design, final design, and construction management services), surveying, permitting, legal, and administrative fees.*

## Prioritizing Improvements

The planned improvements were prioritized using established criteria to help guide the City with scheduling and budgeting water system improvement projects in future years. A description of the criteria is provided below.

## Prioritizing Water Main Improvements

**Table 9-3** shows the criteria used for prioritizing the water main improvements. The criteria are based on the existing water main deficiencies for each of the categories defined in the table, including existing fire flow capability, age (year of installation), and material. Each category is assigned a weight factor that reflects the relative importance of each category compared to the others. The *Existing Water Main Fire Flow Capability* category ranks the water main improvements based on the ability of the existing water mains to provide the required fire flow, as determined from the results of the hydraulic analyses presented in **Chapter 8**. The *Existing Water Main Year of Installation* and *Existing Water Main Material* categories rank the water main improvements based on the existing pipe age and material.

The water main priority ranking criteria was applied to each water main improvement project, which resulted in a total ranking score for each project. For CIP projects with multiple pipes, the average priority point was assigned to the CIP project. The results of the priority ranking are summarized in **Table 9-4** according to the CIP number. **Table 9-5** presents the results in an order that is sorted according to total ranking points.

**Table 9-3**
**Water Main Improvements Priority Scoring Criteria**

| Points | Category | Weight Factor | Weighted Points |
|---|---|---|---|
| **Existing Water Main Fire Flow Capability** | | | |
| 3 | Available Fire Flow is 69% of Target Fire Flow or Less | 4 | 12 |
| 2 | Available Fire Flow is 70% to 80% of Target Fire Flow | 4 | 8 |
| 1 | Available Fire Flow is 81% of Target Fire Flow or Greater | 4 | 4 |
| **Existing Water Main Year of Installation** | | | |
| 6 | <1950 | 2 | 12 |
| 3 | 1950 - 1970 | 2 | 6 |
| 1 | >1970 | 2 | 2 |
| **Existing Water Main Material** | | | |
| 4 | Steel | 2 | 8 |
| 2 | Cast Iron | 2 | 4 |
| 0 | Ductile Iron | 2 | 0 |
| 0 | HDPE | 2 | 0 |

## Table 9-4
## Water Main Improvements Priority Scoring – Sorted by CIP Number

| Number | Priority, Weighted Scoring Points | | | |
|---|---|---|---|---|
| | Fire Flow | Material | Pipe Year | Total Points |
| 3[1] | 4 | 3 | 5 | 12 |
| 5[1] | 8 | 4 | 0 | 12 |
| 6[1] | 8 | 0 | 0 | 8 |
| 7[1] | 12 | 0 | 6 | 18 |
| 9[1] | 0 | 4 | 0 | 4 |
| 14[1] | 0 | 1 | 0 | 1 |
| 15[1] | 6 | 1 | 0 | 7 |
| 16[1] | 8 | 2 | 1 | 12 |
| 18[1] | 3 | 3 | 0 | 6 |
| 20[1] | 6 | 4 | 3 | 13 |
| 21[1] | 1 | 3 | 3 | 7 |
| 24[1] | 4 | 4 | 0 | 8 |
| 25[1] | 4 | 0 | 6 | 10 |
| 26[1] | 8 | 4 | 0 | 12 |
| 27[1] | 4 | 4 | 6 | 14 |
| 28[1] | 8 | 2 | 0 | 10 |
| 29[1] | 4 | 4 | 0 | 8 |
| 30[1] | 4 | 0 | 0 | 4 |
| 32[1] | 8 | 4 | 6 | 18 |
| 33[1] | 4 | 4 | 0 | 8 |
| 34[1] | 4 | 4 | 6 | 14 |
| 35[1] | 4 | 0 | 6 | 10 |
| 36[1] | 12 | 4 | 0 | 16 |
| 37[1] | 8 | 0 | 0 | 8 |
| 38[1] | 8 | 4 | 6 | 18 |
| 39[1] | 4 | 4 | 0 | 8 |
| 40[1] | 4 | 4 | 0 | 8 |
| 41[1] | 5 | 2 | 1 | 8 |
| 43[1] | 4 | 4 | 6 | 14 |
| 44[1] | 2 | 4 | 0 | 6 |
| 46[1] | 8 | 4 | 0 | 12 |
| 48[1] | 12 | 0 | 0 | 12 |
| 49[1] | 4 | 4 | 0 | 8 |
| 50[1] | 2 | 2 | 6 | 10 |
| 53[1] | 8 | 0 | 0 | 8 |
| 56[1] | 0 | 4 | 0 | 4 |
| 57[1] | 4 | 4 | 0 | 8 |

[1] *2010 CIP Project carried forward*

## Table 9-4
## Water Main Improvements Priority Scoring – Sorted by CIP Number (continued)

| CIP | Priority, Weighted Scoring Points | | | |
|---|---|---|---|---|
| Number | Fire Flow | Material | Pipe Year | Total Points |
| 58[1] | 5 | 4 | 4 | 13 |
| 60[1] | 5 | 3 | 4 | 12 |
| 61[1] | 0 | 2 | 3 | 5 |
| 65[1] | 8 | 2 | 0 | 10 |
| 66[1] | 0 | 4 | 0 | 4 |
| 67[1] | 12 | 3 | 9 | 24 |
| 73[1] | 1 | 1 | 1 | 3 |
| 75[1] | 2 | 2 | 0 | 3 |
| 76[1] | 2 | 4 | 0 | 6 |
| 78[1] | 0 | 3 | 2 | 5 |
| 81[1] | 0 | 4 | 0 | 4 |
| 82[1] | 8 | 4 | 0 | 12 |
| 83[1] | 0 | 4 | 3 | 7 |
| 84[1] | 12 | 4 | 0 | 16 |
| 92[1] | 0 | 0 | 3 | 3 |
| 96[1] | 12 | 0 | 0 | 12 |
| 99[1] | 12 | 4 | 0 | 16 |
| 108[1] | 1 | 4 | 8 | 13 |
| 109[1] | 4 | 4 | 6 | 14 |
| 110[1] | 0 | 4 | 12 | 16 |
| 111[1] | 0 | 4 | 12 | 16 |
| 112[1] | 0 | 4 | 12 | 16 |
| 113[1] | 0 | 4 | 12 | 16 |
| 114[1] | 0 | 4 | 12 | 16 |
| 115[1] | 0 | 4 | 12 | 16 |
| 116[1] | 2 | 4 | 12 | 18 |
| 117[1] | 0 | 4 | 12 | 16 |
| 118[1] | 0 | 4 | 12 | 16 |
| 119[1] | 0 | 4 | 12 | 16 |
| 120[1] | 0 | 4 | 12 | 16 |
| 121[1] | 0 | 4 | 12 | 16 |
| 122[1] | 2 | 4 | 11 | 16 |
| 123[1] | 0 | 4 | 12 | 16 |
| 124[1] | 0 | 4 | 12 | 16 |
| 125[1] | 0 | 4 | 12 | 16 |
| 127 | 8 | 0 | 0 | 8 |
| 128 | 8 | 2 | 6 | 16 |

[1] *2010 CIP Project carried forward*

## Table 9-4
## Water Main Improvements Priority Scoring – Sorted by CIP Number (continued)

| CIP | Priority, Weighted Scoring Points | | | |
|---|---|---|---|---|
| Number | Fire Flow | Material | Pipe Year | Total Points |
| 129 | 0 | 0 | 12 | 12 |
| 130 | 12 | 0 | 0 | 12 |
| 131 | 4 | 0 | 0 | 4 |
| 132 | 8 | 0 | 0 | 8 |
| 133 | 4 | 0 | 0 | 4 |
| 134 | 4 | 0 | 0 | 4 |
| 135 | 12 | 0 | 0 | 12 |
| 136 | 8 | 0 | 6 | 14 |
| 137 | 10 | 4 | 0 | 14 |
| 138 | 4 | 2 | 3 | 9 |
| 139 | 10 | 4 | 0 | 14 |
| 140 | 12 | 0 | 0 | 12 |
| 141 | 5 | 1 | 2 | 9 |
| 142 | 4 | 0 | 0 | 4 |
| 143 | 0 | 0 | 6 | 6 |
| 144 | 6 | 2 | 0 | 8 |
| 145 | 0 | 4 | 12 | 16 |

## Table 9-5
## Water Main Improvements Priority Scoring – Sorted by Total Points

| CIP Number | Priority, Weighted Scoring Points | | | |
|---|---|---|---|---|
| | Fire Flow | Material | Pipe Year | Total Points |
| 67[1] | 12 | 3 | 9 | 24 |
| 32[1] | 8 | 4 | 6 | 18 |
| 38[1] | 8 | 4 | 6 | 18 |
| 116[1] | 2 | 4 | 12 | 18 |
| 7[1] | 12 | 0 | 6 | 18 |
| 122[1] | 2 | 4 | 11 | 16 |
| 84[1] | 12 | 4 | 0 | 16 |
| 99[1] | 12 | 4 | 0 | 16 |
| 110[1] | 0 | 4 | 12 | 16 |
| 111[1] | 0 | 4 | 12 | 16 |
| 112[1] | 0 | 4 | 12 | 16 |
| 113[1] | 0 | 4 | 12 | 16 |
| 114[1] | 0 | 4 | 12 | 16 |
| 115[1] | 0 | 4 | 12 | 16 |
| 117[1] | 0 | 4 | 12 | 16 |
| 118[1] | 0 | 4 | 12 | 16 |
| 119[1] | 0 | 4 | 12 | 16 |
| 120[1] | 0 | 4 | 12 | 16 |
| 121[1] | 0 | 4 | 12 | 16 |
| 123[1] | 0 | 4 | 12 | 16 |
| 124[1] | 0 | 4 | 12 | 16 |
| 125[1] | 0 | 4 | 12 | 16 |
| 36[1] | 12 | 4 | 0 | 16 |
| 128 | 8 | 2 | 6 | 16 |
| 145 | 0 | 4 | 12 | 16 |
| 137 | 10 | 4 | 0 | 14 |
| 109[1] | 4 | 4 | 6 | 14 |
| 139 | 10 | 4 | 0 | 14 |
| 27[1] | 4 | 4 | 6 | 14 |
| 34[1] | 4 | 4 | 6 | 14 |
| 43[1] | 4 | 4 | 6 | 14 |
| 136 | 8 | 0 | 6 | 14 |
| 58[1] | 5 | 4 | 4 | 13 |
| 108[1] | 1 | 4 | 8 | 13 |
| 20[1] | 6 | 4 | 3 | 13 |
| 5[1] | 8 | 4 | 0 | 12 |
| 26[1] | 8 | 4 | 0 | 12 |
| 46[1] | 8 | 4 | 0 | 12 |
| 48[1] | 12 | 0 | 0 | 12 |
| 82[1] | 8 | 4 | 0 | 12 |
| 96[1] | 12 | 0 | 0 | 12 |
| 129 | 0 | 0 | 12 | 12 |

*[1] 2010 CIP Project carried forward*

## Table 9-5
## Water Main Improvements Priority Scoring – Sorted by Total Points (continued)

| CIP | Priority, Weighted Scoring Points | | | |
|---|---|---|---|---|
| Number | Fire Flow | Material | Pipe Year | Total Points |
| 135 | 12 | 0 | 0 | 12 |
| 130 | 12 | 0 | 0 | 12 |
| 140 | 12 | 0 | 0 | 12 |
| 16[1] | 8 | 2 | 1 | 12 |
| 60[1] | 5 | 3 | 4 | 12 |
| 3[1] | 4 | 3 | 5 | 12 |
| 50[1] | 2 | 2 | 6 | 10 |
| 28[1] | 8 | 2 | 0 | 10 |
| 65[1] | 8 | 2 | 0 | 10 |
| 25[1] | 4 | 0 | 6 | 10 |
| 35[1] | 4 | 0 | 6 | 10 |
| 138 | 4 | 2 | 3 | 9 |
| 141 | 5 | 1 | 2 | 9 |
| 41[1] | 5 | 2 | 1 | 8 |
| 144 | 6 | 2 | 0 | 8 |
| 132 | 8 | 0 | 0 | 8 |
| 6[1] | 8 | 0 | 0 | 8 |
| 37[1] | 8 | 0 | 0 | 8 |
| 24[1] | 4 | 4 | 0 | 8 |
| 29[1] | 4 | 4 | 0 | 8 |
| 33[1] | 4 | 4 | 0 | 8 |
| 39[1] | 4 | 4 | 0 | 8 |
| 40[1] | 4 | 4 | 0 | 8 |
| 49[1] | 4 | 4 | 0 | 8 |
| 53[1] | 8 | 0 | 0 | 8 |
| 57[1] | 4 | 4 | 0 | 8 |
| 127 | 8 | 0 | 0 | 8 |
| 15[1] | 6 | 1 | 0 | 7 |
| 83[1] | 0 | 4 | 3 | 7 |
| 21[1] | 1 | 3 | 3 | 7 |
| 18[1] | 3 | 3 | 0 | 6 |
| 44[1] | 2 | 4 | 0 | 6 |
| 76[1] | 2 | 4 | 0 | 6 |
| 143 | 0 | 0 | 6 | 6 |
| 61[1] | 0 | 2 | 3 | 5 |
| 78[1] | 0 | 3 | 2 | 5 |
| 134 | 4 | 0 | 0 | 4 |
| 142 | 4 | 0 | 0 | 4 |
| 133 | 4 | 0 | 0 | 4 |
| 9[1] | 0 | 4 | 0 | 4 |

[1] *2010 CIP Project carried forward*

**Table 9-5**
**Water Main Improvements Priority Scoring – Sorted by Total Points (continued)**

| CIP Number | Priority, Weighted Scoring Points | | | |
|---|---|---|---|---|
| | Fire Flow | Material | Pipe Year | Total Points |
| 30[1] | 4 | 0 | 0 | 4 |
| 56[1] | 0 | 4 | 0 | 4 |
| 66[1] | 0 | 4 | 0 | 4 |
| 81[1] | 0 | 4 | 0 | 4 |
| 131 | 4 | 0 | 0 | 4 |
| 75[1] | 2 | 2 | 0 | 3 |
| 73[1] | 1 | 1 | 1 | 3 |
| 92[1] | 0 | 0 | 3 | 3 |
| 14[1] | 0 | 1 | 0 | 1 |

[1] *2010 CIP Project carried forward*

## Prioritizing Other Improvements

All other improvements were prioritized based on project need, maintenance requirements, existing deficiencies, capacity requirements, and reliability considerations. The results of the priority ranking of the water main and all other improvements were used to schedule the improvements, as presented in the section that follows.

## Schedule of Improvements

All water main projects are shown in **Table 9-6**, which includes a breakdown of each project along with the proposed pipe size, location, and estimated project cost. The estimated project costs are based on 2016 dollars and include all costs (engineering, construction and other costs).

The selection and implementation of the water main projects will be accomplished annually by the City, utilizing both the priority ranking information presented earlier in this plan and other information to ensure projects representing the greatest need are completed first. For example, water main projects in an area with low fire flow are a high priority and will be scheduled before projects in a low priority area. Examples of additional information that would be used to establish the annual project list include, but are not limited to, upcoming City and private sector utility projects and City or State transportation projects to be constructed in the same rights-of-way as water main projects. The process would also consider the effect that water main improvements installed as part of private property development projects would have on fire flows, which may change the priorities of projects on the list of annual water main replacements. This approach provides the City with the flexibility to coordinate water main projects with other projects planned for the same area to capture efficiencies and reduce project costs.

The water main projects will be implemented under the Annual Water Main Replacement Program, which is identified as project WM1 in **Table 9-7**. An annual budget allowance has been established for this ongoing program, as shown in the table.

The implementation schedule shown in **Table 9-7** includes the previously described water main improvements and all other improvements described earlier in this chapter that are planned in the next 20 years. The implementation schedule will be used by the City to assist in the planning and budgeting of capital improvement projects for the Water Utility.

The project cost estimates shown in the table are based on 2016 dollars for all years shown. These cost estimates will be adjusted by the City at the time of project implementation to include an escalation factor that represents inflation and the construction market conditions anticipated at the actual time of construction. The financial program in **Chapter 10** describes in more detail the escalation factor to be used for future project cost adjustments.

# Table 9-6
# Water Main Improvement Projects

| CIP | Size | | Description | | | Estimated |
|---|---|---|---|---|---|---|
| No. | Length | Dia | In | From | To | Project Cost |
| 3[1] | 650 | 8 | 68th Ave | 172nd St | Dead-end | $272,000 |
| | 520 | 8 | 67th Ave | 172nd St | Dead-end | $218,000 |
| | 280 | 8 | 172nd St | 67th Ave | 68th Ave | $117,000 |
| | 500 | 8 | 172nd St | Olympic View Drive | 67th Ave | $209,000 |
| 5[1] | 240 | 8 | 81st Ave W | 206th St SW | Dead-end | $100,000 |
| | 320 | 8 | 81st Ave | 206th St | Dead-end | $134,000 |
| 6[1] | 240 | 8 | Sea Lawn Dr | 171st St SW | Dead-end | $100,000 |
| | 590 | 8 | Sea Lawn Dr | 171st St | Dead-end | $247,000 |
| 7[1] | 2,090 | 8 | Lake Ballinger Way | 76th Ave | Dead-end | $875,000 |
| 9[1] | 220 | 8 | 217th St SW | 96th Ave W | 95th Ave | $92,000 |
| 14[1] | 410 | 12 | 81st Pl | 212th St | Dead-end | $199,000 |
| | 330 | 12 | 208th Pl | 82nd Ave | 80th Ave | $160,000 |
| | 540 | 12 | 82nd Ave | 208th Pl | Dead-end | $262,000 |
| | 730 | 8 | 208th Pl | 82nd Ave | 80th Ave | $306,000 |
| 15[1] | 420 | 12 | 83rd Ave W | Woodlake Dr. | 208th St SW | $204,000 |
| | 310 | 12 | 81st Pl W | - | Dead-end | $151,000 |
| | 320 | 12 | 83rd Ave W | - | Woodlake Dr | $156,000 |
| | 120 | 12 | Woodlake Dr | 84th Ave W | 83rd Ave W | $58,000 |
| | 820 | 12 | 83rd Ave | 84th Ave | 82nd Ave | $399,000 |
| 16[1] | 1,110 | 12 | Lake Ballinger Way | Hwy 99 | McAleer Way | $539,000 |
| | 500 | 12 | SR 104 | Hwy 99 | - | $243,000 |
| | 290 | 12 | - | SR 104 | 242nd St | $141,000 |
| | 640 | 12 | McAleer Way | 242nd St | Lake Ballinger Way | $311,000 |
| | 840 | 12 | 242nd St | - | McAleer Way | $408,000 |
| 18[1] | 390 | 8 | 175th St SW | 76th Ave W | Dead-end | $163,000 |
| | 370 | 8 | 176th St | 76th Ave | Sound View Way | $155,000 |
| | 300 | 8 | Sound View Way | 176th St | Sound View Dr | $126,000 |
| | 880 | 8 | 175th St | 76th Ave | Dead-end | $368,000 |
| 20[1] | 80 | 12 | 216th St SW | 73rd Pl W | - | $39,000 |
| | 140 | 12 | 76th Ave W | - | 215th St SW | $68,000 |
| | 470 | 12 | 76th Ave W | - | - | $228,000 |
| | 340 | 12 | 76th Ave W | 212th St SW | - | $165,000 |
| | 150 | 12 | 216th St SW | - | - | $73,000 |
| | 120 | 16 | 216th St SW | 73rd Pl W | - | $68,000 |
| | 830 | 12 | 215th St | 76th Ave | 73rd Pl | $403,000 |
| | 480 | 12 | 73rd Pl | 216th St | 215th St | $233,000 |
| | 560 | 12 | Stevens Hospital | - | - | $272,000 |
| 21[1] | 100 | 12 | 76th Ave W | - | 220th St SW | $49,000 |
| | 60 | 12 | 76th Ave W | 220th St SW | - | $29,000 |
| | 310 | 12 | 76th Ave | 219th St | 220th St | $151,000 |
| | 350 | 12 | 76th Ave | 218th St | 219th St | $170,000 |
| | 390 | 12 | 76th Ave | 218th St | - | $190,000 |
| | 300 | 12 | 76th Ave | - | 216th St | $146,000 |
| | 230 | 12 | 76th Ave | 215th St | - | $112,000 |

[1] *2010 CIP Project carried forward*

## Table 9-6
## Water Main Improvement Projects (continued)

| CIP | Size | | Description | | | Estimated |
|---|---|---|---|---|---|---|
| No. | Length | Dia | In | From | To | Project Cost |
| 24[1] | 680 | 8 | 172nd St | 72nd Ave | 74th Ave | $285,000 |
| | 310 | 8 | 173rd St | 72nd Ave | 73rd Pl | $130,000 |
| 25[1] | 660 | 8 | 176th St | 72nd Ave | Dead-end | $276,000 |
| 26[1] | 290 | 8 | 179th St SW | 72nd Ave W | Dead-end | $121,000 |
| | 350 | 8 | 179th St | 72nd Ave | Dead-end | $146,000 |
| 27[1] | 750 | 8 | 80th Pl | 212th St | Dead-end | $314,000 |
| 28[1] | 460 | 8 | 80th Pl W | 200th St SW | Dead-end | $193,000 |
| | 690 | 8 | 80th Pl | 200th St | Dead-end | $289,000 |
| 29[1] | 550 | 8 | 86th Pl | Maplewood Ln | Dead-end | $230,000 |
| 30[1] | 620 | 8 | 198th Pl | Maplewood Ln | Dead-end | $259,000 |
| 32[1] | 260 | 8 | 12th Pl N | 12th Ave N | Dead-end | $109,000 |
| | 280 | 8 | 12th Pl N | 12th Ave | - | $117,000 |
| 33[1] | 360 | 8 | 185th Pl | 92nd Ave | Dead-end | $151,000 |
| 34[1] | 570 | 8 | 186th Pl | 92nd Ave | Dead-end | $239,000 |
| 35[1] | 670 | 8 | - | 184th St | Dead-end | $280,000 |
| 36[1] | 630 | 8 | 182nd Pl | 88th Ave | Dead-end | $264,000 |
| 37[1] | 520 | 8 | 74th Pl | Meadowdale Beach Rd | - | $218,000 |
| | 520 | 8 | 74th Pl | Meadowdale Beach Rd | Dead-end | $218,000 |
| 38[1] | 210 | 8 | 104th Pl SW | 72nd Ave W | Dead-end | $88,000 |
| | 320 | 8 | 164th Pl | 72nd Ave | Dead-end | $134,000 |
| 39[1] | 820 | 8 | 192nd Pl | 80th Ave | Dead-end | $343,000 |
| 40[1] | 830 | 8 | Main St | Olympic Ave | - | $347,000 |
| 41[1] | 310 | 8 | Olympic Ave | Glen ST | Daley St | $130,000 |
| | 660 | 8 | Glen St | Olympic Ave | 10th Ave | $276,000 |
| | 380 | 8 | Olympic Ave | Sierra Pl | Glen St | $159,000 |
| | 350 | 8 | 9th Ave N | Glen St | Daley St | $146,000 |
| | 1,270 | 8 | Daley St | Olympic Ave | 9th Ave | $531,000 |
| 43[1] | 430 | 8 | 179th Pl | Talbot Rd | Dead-end | $180,000 |
| 44[1] | 640 | 8 | Sound View Pl | Wharf St | Dead-end | $268,000 |
| | 400 | 8 | Wharf St | Sound View Pl | Olympic View Dr | $167,000 |
| 46[1] | 420 | 8 | Water St | Sound View Dr | Ocean Ave | $176,000 |
| | 660 | 8 | Ocean Ave | Water St | Dead-end | $276,000 |
| 48[1] | 640 | 8 | Puget Ln | 8th Ave | Dead-end | $268,000 |
| 49[1] | 380 | 8 | Brookmere Dr | 8th Ave | Dead-end | $159,000 |
| 50[1] | 490 | 12 | - | 3rd Ave | Daley St | $238,000 |
| | 1,180 | 8 | 3rd Ave | Caspers St | - | $494,000 |
| 53[1] | 580 | 8 | High St | 183rd Pl | Dead-end | $243,000 |
| 56[1] | 550 | 8 | 86th Pl W | 188th St SW | Dead-end | $230,000 |
| 57[1] | 670 | 8 | 170th Pl | Olympic View Dr | Dead-end | $280,000 |
| 58[1] | 500 | 8 | Soundview Dr | 72nd Ave W | Dead-end | $209,000 |
| | 290 | 8 | Sound View Dr | Sound View Ln | Dead-end | $121,000 |
| | 200 | 8 | 177th St | 72nd Ave | Sound View Ln | $84,000 |

[1] *2010 CIP Project carried forward*

## Table 9-6
## Water Main Improvement Projects (continued)

| CIP | Size | | Description | | | Estimated |
|---|---|---|---|---|---|---|
| No. | Length | Dia | In | From | To | Project Cost |
| 60* | 490 | 12 | 196th St | 80th Ave | 81st Pl | $238,000 |
| | 620 | 12 | 196th St | 82nd Pl | 84th Ave | $301,000 |
| | 270 | 12 | 196th St | 81st Pl | 82nd Pl | $131,000 |
| | 520 | 12 | 192nd St | 80th Ave | 83rd Ave | $253,000 |
| | 20 | 12 | - | 80th Ave W | 196th St SW | $10,000 |
| 61* | 710 | 12 | 196th St | 86th Ave | 88th Ave | $345,000 |
| | 650 | 12 | 196th St | 84th Ave | 86th Ave | $316,000 |
| | 440 | 12 | 194th St | 88th Ave | 89th Pl | $214,000 |
| | 680 | 12 | 88th Ave | 196th St | 194th St | $330,000 |
| 65* | 920 | 12 | 4th Ave S | Dead-end | Pine St | $447,000 |
| | 340 | 12 | Pine St | 4th Ave S | 5th Ave S | $165,000 |
| 66* | 620 | 8 | 69th Pl | 174th St | 176th St | $259,000 |
| 67* | 500 | 8 | Sunset Ave N | Caspers St | - | $209,000 |
| | 300 | 12 | Railroad Ave | Main St | Dead-end | $146,000 |
| | 560 | 12 | Sunset Ave | Edmonds St | - | $272,000 |
| | 1,070 | 8 | Sunset Ave | Edmonds St | Caspers St | $448,000 |
| 73* | 670 | 8 | 76th Ave W | 228th St SW | 230 St SW | $280,000 |
| | 1,380 | 16 | Pacific Highway | 76th Ave W | 230th St SW | $782,000 |
| | 780 | 12 | Pacific Highway | 224th St SW | 76th Ave W | $379,000 |
| | 130 | 12 | - | Hwy 99 | 76th Ave | $63,000 |
| | 600 | 12 | 76th Ave | - | 228th St | $292,000 |
| | 880 | 12 | 76th Ave | Hwy 99 | 224th St | $428,000 |
| 75* | 450 | 12 | Private Property | 212th St | 213th Pl | $219,000 |
| | 250 | 8 | 216th St SW | 73rd Pl W | - | $105,000 |
| | 310 | 8 | 216th St SW | - | - | $130,000 |
| | 180 | 8 | 72nd Ave W | 213th Pl SW | N/A | $75,000 |
| | 290 | 8 | 72nd Ave W | N/A | 216th St SW | $121,000 |
| 76* | 580 | 12 | Olympic Ave | Main St | Maple St | $282,000 |
| | 90 | 8 | - | Olympic Ave | Main St | $38,000 |
| 78* | 40 | 12 | Main St | 9th Ave S | - | $19,000 |
| | 330 | 12 | 9th Ave S | Main St | Dayton St | $160,000 |
| | 300 | 12 | 9th Ave | Maple St | Dayton St | $146,000 |
| | 630 | 12 | 9th Ave | Main St | Edmonds St | $306,000 |
| 81* | 650 | 8 | Puget Way | 8th Ave | 9th Ave | $272,000 |
| 82* | 330 | 12 | Viewland Way | Olympic Ave | Dead-end | $160,000 |
| | 380 | 12 | - | Viewland Way | Brookmere St | $185,000 |
| | 700 | 8 | Puget Way | 9th Ave N | Dead-end | $293,000 |
| 83* | 580 | 8 | Emerald Hill Dr/Highland Dr | 12th Ave N | Highland Dr | $243,000 |
| | 320 | 8 | 12th Ave N | Emerald Hills Dr | Main St | $134,000 |
| 84* | 280 | 12 | 77th Pl | 195th St | 196th St | $136,000 |
| 92* | 850 | 8 | 81st Pl W | 196th St | - | $356,000 |
| | 500 | 8 | 81st Pl W | - | 200th St SW | $209,000 |
| 96* | 340 | 8 | 92nd Pl W | Bowdoin Way | Dead-end | $142,000 |
| 99* | 360 | 8 | 215th Pl SW | 96th Ave W | Dead-end | $151,000 |

[1] *2010 CIP Project carried forward*

## Table 9-6
## Water Main Improvement Projects (continued)

| CIP | Size | | Description | | | Estimated |
|---|---|---|---|---|---|---|
| No. | Length | Dia | In | From | To | Project Cost |
| 108* | 290 | 8 | 8th Ave N | Edmonds St | Bell St | $121,000 |
| | 470 | 8 | Bell St | 8th Ave N | 9th Ave N | $197,000 |
| | 280 | 8 | 7th Ave N | Edmonds St | Bell St | $117,000 |
| 109* | 600 | 8 | Main St | 8th Ave N | 9th Ave N | $251,000 |
| | 640 | 12 | Main St | 7th Ave N | 8th Ave N | $311,000 |
| 110* | 330 | 8 | Main St | 8th Ave S | Durbin St | $138,000 |
| 111* | 310 | 12 | Dayton St | Durbin St | 7th Ave N | $151,000 |
| | 1,010 | 12 | Dayton St | 5th Ave S | Durbin St | $491,000 |
| 112* | 160 | 8 | 7th Ave S | Cedar St | Magnolia Dr | $67,000 |
| | 300 | 8 | 7th Ave S | Walnut St | Cedar St | $126,000 |
| | 270 | 12 | 7th Ave S | Dayton St | Maple St | $131,000 |
| | 290 | 12 | 7th Ave S | Maple St | Alder St | $141,000 |
| | 300 | 12 | 7th Ave | Alder St | Walnut St | $146,000 |
| 113* | 150 | 8 | Hemlock St | 7th Ave S | 8th Ave S | $63,000 |
| | 570 | 8 | 7th Ave S | Spruce St | Laurel St | $239,000 |
| 114* | 340 | 12 | 7th Ave N | Edmonds St | Main St | $165,000 |
| | 300 | 12 | 5th Ave S | Maple St | Alder St | $146,000 |
| | 270 | 12 | 5th Ave S | Dayton St | Maple St | $131,000 |
| | 300 | 12 | 5th Ave S | Alder St | Walnut St | $146,000 |
| 115* | 380 | 8 | 6th Ave N | - | Bell St | $159,000 |
| | 250 | 8 | 6th Ave N | Sprague St | - | $105,000 |
| | 290 | 8 | 6th Ave N | Daley St | Sprague St | $121,000 |
| 116* | 640 | 8 | Bell St | 6th Ave N | 7th Ave N | $268,000 |
| | 470 | 8 | Bell St | 5th Ave N | 6th Ave N | $197,000 |
| 117* | 380 | 8 | 5th Ave N | Edmonds St | Bell St | $159,000 |
| | 460 | 8 | 5th Ave N | Bell St | Main St | $193,000 |
| 118* | 880 | 8 | 4th Ave N | Edmonds St | Main St | $368,000 |
| 119* | 870 | 8 | 3rd Ave N | Edmonds St | Main St | $364,000 |
| 120* | 870 | 8 | 2nd Ave N | Edmonds St | Main St | $364,000 |
| 121* | 870 | 8 | Sunset Ave N | Edmonds St | Main St | $364,000 |
| 122* | 480 | 8 | Sprague St | 4th Ave N | 6th Ave N | $201,000 |
| | 340 | 8 | Edmonds St | 4th Ave N | 5th Ave N | $142,000 |
| | 310 | 8 | Edmonds St | 3rd Ave N | 4th Ave N | $130,000 |
| | 330 | 8 | Edmonds St | 2nd Ave N | 3rd Ave N | $138,000 |
| | 310 | 8 | Edmonds St | Sunset Ave N | 2nd Ave N | $130,000 |
| | 390 | 12 | Daley St | 3rd Ave N | 4th Ave N | $190,000 |
| | 90 | 12 | Daley St | 4th Ave N | 6th Ave N | $44,000 |
| | 560 | 8 | 3rd Ave N | - | - | $234,000 |
| | 200 | 12 | 3rd Ave N | Daley St | Edmonds St | $97,000 |
| 123* | 1,630 | 8 | 2nd Ave N | Edmonds St | Dead-end | $682,000 |

[1] *2010 CIP Project carried forward*

## Table 9-6
## Water Main Improvement Projects (continued)

| CIP | Size | | Description | | | Estimated |
|---|---|---|---|---|---|---|
| No. | Length | Dia | In | From | To | Project Cost |
| 124[1] | 30 | 12 | Main St | Sunset Ave N | Sunset Ave S | $15,000 |
| | 40 | 8 | Main St | 5th Ave N | Dead-end | $17,000 |
| | 300 | 12 | Main St | 4th Ave N | 5th Ave N | $146,000 |
| | 310 | 12 | Main St | 3rd Ave N | 4th Ave N | $151,000 |
| | 320 | 12 | Main St | 2nd Ave N | 3rd Ave N | $156,000 |
| | 320 | 12 | Main St | Sunset Ave N | 2nd Ave N | $156,000 |
| | 140 | 12 | Main St | James St | Dead-end | $68,000 |
| 125[1] | 400 | 8 | Sunset Ave S | Main St | James St | $167,000 |
| 127 | 740 | 8 | N Meadowdale Rd | 72nd Ave W | 163rd Pl SW | $310,000 |
| 128 | 230 | 8 | Meadowdale Beach Rd | 169th Pl SW | - | $96,000 |
| | 810 | 8 | Meadowdale Beach Rd | 74th Pl W | 169th Pl SW | $339,000 |
| 129 | 810 | 8 | Sunset Way | Olympic View Dr | 184th St SW | $339,000 |
| 130 | 700 | 12 | Olympic View Dr | 76th Ave W | Homeview Dr | $340,000 |
| 131 | 480 | 8 | 94th Pl W | - | Puget Dr | $201,000 |
| 132 | 450 | 8 | 89th Pl W | 200th St SW | Dead-end | $188,000 |
| 133 | 340 | 12 | 3rd Ave S | James St | Dayton St | $165,000 |
| 134 | 500 | 12 | Admiral Way | Dayton St | - | $243,000 |
| 135 | 880 | 12 | 4th Ave S | Dayton St | Walnut St | $428,000 |
| 136 | 150 | 8 | 10th Ave S | Maple Way | Maple St | $63,000 |
| 137 | 220 | 12 | 212th St SW | 70th Ave W | Pacific Highway | $107,000 |
| | 660 | 12 | Pacific Highway | 208th St SW | 212th St SW | $321,000 |
| 138 | 1,240 | 12 | Pine St | Nootka Rd | 2nd Ave S | $603,000 |
| | 490 | 12 | Pine St | 2nd Ave S | 3rd Ave S | $238,000 |
| 139 | 770 | 8 | 218th St SW | 80th Ave W | 77th Pl W | $322,000 |
| | 570 | 12 | 218th St SW | 77th Pl W | 76th Ave W | $277,000 |
| 140 | 230 | 8 | 7th Ave S | Elm St | Elm Pl | $96,000 |
| 141 | 120 | 12 | 224th St SW | 73rd Pl W | - | $58,000 |
| | 280 | 12 | 224th St SW | 72nd Pl W | - | $136,000 |
| | 470 | 12 | 224th St SW | Pacific Highway | 73rd Pl W | $228,000 |
| 142 | 800 | 8 | 236th St SW | Pacific Highway | 78th Ave W | $335,000 |
| | 170 | 8 | 236th St SW | 78th Ave W | 78th Ave W | $71,000 |
| 143 | 40 | 12 | 238th St SW | Pacific Highway | - | $19,000 |
| 144 | 70 | 12 | 76th Ave W | 242nd St SW | 242nd Pl SW | $34,000 |
| | 620 | 12 | 76th Ave W | 242nd Pl SW | N 205th St | $301,000 |
| 145 | 396 | 12 | Dayton St | 2nd Ave S | 3rd Ave S | $192,000 |
| | 476 | 12 | Dayton St | 3rd Ave S | 4th Ave S | $232,000 |
| | 211 | 12 | Dayton St | 4th Ave S | 5th Ave S | $103,000 |
| **Total Waterline Main Improvements** | | | | | | **$43,874,000** |

[1] *2010 CIP Project carried forward*

**THIS PAGE INTENTIONALLY LEFT BLANK**

## Table 9-7
## Planned Improvements Implementation Schedule

| CIP No. | Description | Estimated Cost (2016 $$) | 20-Year Schedule of Improvements<br>Planned Year of Project and Estimated Cost in 2016 $$ (x 1,000) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027-2035 |
| **Water Main Improvements** | | | | | | | | | | | | | |
| **WM1** | Annual Water Main Replacement Program[1] | $51,707,247 | $3,801 | $1,628 | $2,248 | $1,920 | $2,960 | $2,960 | $2,610 | $2,610 | $2,610 | $2,610 | $25,750 |
| **Subtotal Water Main Improvements** | | **$51,707,247** | **$3,801** | **$1,628** | **$2,248** | **$1,920** | **$2,960** | **$2,960** | **$2,610** | **$2,610** | **$2,610** | **$2,610** | **$25,750** |
| **PRV Station & Pressure Relief Improvements** | | | | | | | | | | | | | |
| **PRV1** | PRV #13 Replacement | $125,000 | - | $125 | - | - | - | - | - | - | - | - | - |
| **PRV2** | PRV #14 Replacement | $125,000 | - | $125 | - | - | - | - | - | - | - | - | - |
| **PRV3** | PRV #15 Replacement | $125,000 | - | $125 | - | - | - | - | - | - | - | - | - |
| **PRV4** | PRV #16 Replacement | $125,000 | - | $125 | - | - | - | - | - | - | - | - | - |
| **PRV5** | Annual PRV Station Improvements Program | $400,000 | - | - | - | - | - | - | - | - | - | - | $400 |
| **Subtotal PRV Station & Relief Improvements** | | **$900,000** | **$0** | **$500** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$400** |
| **Facility Improvements** | | | | | | | | | | | | | |
| **F1** | 5 Corners Reservoir Improvements | $1,813,000 | - | $1,813 | - | - | - | - | - | - | - | - | - |
| **F2** | Yost Reservoir Piping Maintenance and Replacement | $85,000 | - | - | - | $85 | - | - | - | - | - | - | - |
| **F3** | Seaview Reservoir Piping Maintenance and Replacement | $85,000 | - | - | - | $85 | - | - | - | - | - | - | - |
| **F4** | SPU Intertie & Emergency Interties Improvements | $1,945,000 | - | - | - | $195 | - | - | $350 | $350 | $350 | $350 | $350 |
| **Subtotal Facility Improvements** | | **$3,928,000** | **$0** | **$1,813** | **$0** | **$365** | **$0** | **$0** | **$350** | **$350** | **$350** | **$350** | **$350** |
| **Other Improvements** | | | | | | | | | | | | | |
| **M1** | 325 to 486 Pressure Zone Conversion | $675,000 | - | - | - | $675 | - | - | - | - | - | - | - |
| **M2** | Comprehensive Water System Plan Update | $215,000 | $65 | - | - | - | - | - | - | - | - | - | $150 |
| **Subtotal Other Improvements** | | **$890,000** | **$65** | **$0** | **$0** | **$675** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$150** |
| **Total All Improvements** | | **$57,425,247** | **$3,866** | **$3,941** | **$2,248** | **$2,960** | **$2,960** | **$2,960** | **$2,960** | **$2,960** | **$2,960** | **$2,960** | **$26,650** |

[1] *Given the longevity of the program, the budget amount for the Annual Water Main Replacement Program (CIP No. WM1) includes currently known replacement projects as well as an allowance for additional water main replacements that are not currently identified.*

FIGURE 9-1

# Comprehensive Water System Plan

## 2010 - 2017 Water Main Improvements

June 2017

### Legend

- Emergency Intertie
- Pressure Reducing Station
- Pump Station
- Reservoir
- Supply Station
- Pressure Relief Facility
- City of Edmonds Retail Water Service Area
- Other Water Service Areas
- City Limits
- Snohomish/King County Boundary

**Existing Water Mains:**

- 325 Zone Water Main
- 420 Zone Water Main
- 425 Zone Water Main
- 486 Zone Water Main
- 500 Zone Water Main
- 505 Zone Water Main
- 596 Zone Water Main

**Year of Installation*:**

- 2017
- 2016
- 2015
- 2014
- 2013
- 2012
- 2011
- 2010

N

0 2,000

Scale in Feet

ALDERWOOD WATER & WASTEWATER DISTRICT

PRV #3

Pressure Relief #4

Emergency Intertie with City of Lynnwood 573 Zone

Supply from Alderwood Water District (635 Zone)

PRV #2

PRV #6

PRV #5

PRV #7

PRV #8

PRV #13

PRV #10

Seaview Reservoir (1.5 MG)

PRV #14

PRV #24

PRV #9

Emergency Interties with City of Lynnwood 573 Zone

PRV #15

CITY OF EDMONDS

Puget Sound

PRV #23

PRV #16

Pressure Relief #19

CITY OF LYNNWOOD

PRV #18

PRV #17

Yost Reservoir (1.5 MG)

Five Corners Reservoirs and Pump Station (3.0 MG & 1.5 MG)

Emergency Interties with City of Lynnwood 573 Zone

Emergency Intertie with Olympic View Water District Woodway 353 Zone

PRV #20

Emergency Interties with Olympic View Water District 415 Zone

Emergency Interties with Olympic View Water District 505 Zone

Chase Lake

Emergency Intertie with Olympic View Water District 540 Low Zone

UNINCORPORATED SNOHOMISH COUNTY

CITY OF MOUNTLAKE TERRACE

TOWN OF WOODWAY

OLYMPIC VIEW WATER & SEWER DISTRICT

Lake Ballinger

Standby Supply from Seattle Public Utilities (592 Zone)

SNOHOMISH COUNTY

KING COUNTY

SEATTLE PUBLIC UTILITIES

NORTH CITY WATER DISTRICT

524

99

104

5

The City of Edmonds makes no representations, express or implied, as to the accuracy, completeness and timeliness of the information displayed. This map is not suitable for legal, engineering, or surveying purposes. Notification of any errors is appreciated.
Source: City of Edmonds GIS, Washington State Dept. of Health and Snohomish County GIS (March 2016).

H:\EVT_Projects\15\1662 Edm WSP\GIS\MXD\15-1662-WA-FIGURE 9-2.mxd 6/15/2017 7:34:02 AM Thomas.Walsh

FIGURE 9-2

# Comprehensive Water System Plan

## Proposed Capital Improvements

murraysmith

June 2017

N

0 2,000

Scale in Feet

## Legend

- Emergency Intertie
- Pressure Reducing Station
- Pump Station
- Reservoir
- Supply Station
- Pressure Relief Facility
- Zone Valve (Closed)
- City of Edmonds Retail Water Service Area
- Other Water Service Areas
- City Limits
- Snohomish/King County Boundary

**Pressure Zones:**

- 325 Zone
- 420 Zone
- 425 Zone
- 486 Zone
- 500 Zone
- 505 Zone
- 596 Zone
- CIP Project ID

**Water Main Improvements:**

- 8"
- 12"
- 16"

ALDERWOOD WATER & WASTEWATER DISTRICT

Pressure Relief #4

PRV #3

PRV #2

Emergency Intertie with City of Lynnwood 573 Zone

F5

Supply from Alderwood Water District (635 Zone)

PRV #6

PRV #5

PRV #7

PRV #8

PRV #10

PRV #13

F3

PRV1

Seaview Reservoir (1.5 MG)

PRV #14

PRV2

PRV3

PRV #15

PRV #24

PRV #9

PRV4

CITY OF EDMONDS

PRV5

PRV #23

PRV #16

CITY OF LYNNWOOD

Puget Sound

Pressure Relief #19

PRV #18

PRV #17

Yost Reservoir (1.5 MG)

F2

Five Corners Reservoirs and Pump Station (3.0 MG & 1.5 MG)

F1

M1

Emergency Intertie with Olympic View Water District Woodway 353 Zone

PRV #20

Emergency Interties with Olympic View Water District 415 Zone

Emergency Interties with Olympic View Water District 505 Zone

Chase Lake

Emergency Intertie with Olympic View Water District 540 Low Zone

TOWN OF WOODWAY

OLYMPIC VIEW WATER & SEWER DISTRICT

UNINCORPORATED SNOHOMISH COUNTY

CITY OF MOUNTLAKE TERRACE

Lake Ballinger

Standby Supply from Seattle Public Utilities (592 Zone)

F4

SEATTLE PUBLIC UTILITIES

NORTH CITY WATER DISTRICT

SNOHOMISH COUNTY

KING COUNTY

Close-up of CIP M1
Conversion of 325 Zone to 486 Zone
Cross-hatching indicates converted area

Close-up of Updated CIP 21

# CHAPTER 10 | FINANCIAL PLAN

## Introduction

The primary goal of the financial plan is to develop a multi-year rate strategy that generates enough revenue to cover the operating and capital costs associated with providing water utility service in the City of Edmonds. This analysis focuses on defining the amount of revenue needed to meet the system's financial obligations including:

- Fiscal policies
- Operation and maintenance costs
- Administrative and overhead costs
- Capital costs
- Existing/new debt service obligations

The financial analysis evaluates the affordability of the City's water rates, considering the impacts of completing the water utility capital improvement program (CIP).

## Past Financial Performance

**Table 10-1** summarizes the water utility's financial performance from 2010 – 2015, as documented in the City's financial statements (Statement of Net Position). It is worth noting that the City historically tracked its water, sewer, and stormwater utilities in a combined operating fund, making it relatively difficult to evaluate the water utility's financial performance alone. The City was able to provide utility accounting reports at a sub-account level of detail, which enabled the construction of a simple financial report mimicking an income statement for 2010 – 2012. Because the City changed its accounting practices in 2013 to track each utility's operating fund separately, **Table 10-1** reflects the water utility's actual Statement of Net Position for 2013 – 2015.

In addition to the income statement, this analysis tracks several financial metrics:

- O&M Coverage Ratio: This ratio summarizes the ability of operating revenues to cover operating expenses, and is computed by dividing total operating revenues by total operating expenses (excluding depreciation, which is a non-cash expense). A ratio of 1.00 or greater suggests that revenues are adequate to cover operating expenses, with higher values indicating stronger financial performance.

- Net Operating Income (as a Percent of Operating Revenue): This metric shows the ability of operating revenue to cover operating expenses. For consistency with the City's financial statements, this metric includes depreciation as an expense.

- Debt Service Coverage Ratio: This ratio provides a basis for evaluating financial performance in the context of the amount of net revenue available for parity debt

service (on an annual basis). It is calculated by dividing net revenue (revenues less expenses before depreciation) by annual parity debt service.

**Table 10-1**
**Historical Financial Performance (2010 – 2015)**

| Summary of Water Utility Financial Performance | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|
| Operating Revenues | | | | | | |
| Water Sales Revenue | $ 3,817,342 | $ 4,273,829 | $ 4,617,109 | $ 5,054,764 | $ 5,533,916 | $ 6,089,810 |
| Hydrant Revenue | 141,789 | 107,888 | 68,616 | 145,523 | 188,170 | 92,523 |
| Water Utility Tax Collections | 713,748 | 798,993 | 863,132 | 944,824 | 1,034,551 | 1,138,481 |
| Other Charges for Services | - | - | - | 2,469 | 1,174 | 3,254 |
| Other Operating Revenues | 91,590 | 120,034 | 122,748 | 136,207 | 136,359 | 67,406 |
| Total Operating Revenues | $ 4,764,469 | $ 5,300,744 | $ 5,671,605 | $ 6,283,787 | $ 6,894,170 | $ 7,391,475 |
| Operating Expenses | | | | | | |
| Personnel Services | $ 830,889 | $ 977,471 | $ 983,615 | $ 1,069,045 | $ 1,063,953 | $ 1,060,442 |
| Water Purchased for Resale | 1,242,227 | 1,347,968 | 1,448,400 | 1,499,289 | 1,492,894 | 1,514,798 |
| Operations and Maintenance | 1,728,127 | 1,808,633 | 1,930,633 | 2,107,257 | 2,730,461 | 2,593,293 |
| Professional Services | 432,034 | 41,210 | 45,810 | 51,285 | 144,861 | 133,864 |
| Insurance | 81,729 | 84,512 | 70,440 | 67,607 | 74,688 | 70,904 |
| Depreciation | 486,844 | 487,135 | 516,900 | 614,518 | 736,330 | 856,511 |
| Total Operating Expenses | $ 4,801,851 | $ 4,746,929 | $ 4,995,798 | $ 5,409,001 | $ 6,243,187 | $ 6,229,812 |
| Net Operating Income (Loss) | $ (37,382) | $ 553,815 | $ 675,807 | $ 874,786 | $ 650,983 | $ 1,161,663 |
| Non-Operating Revenues (Expenses) | | | | | | |
| Intergovernmental | $ 50,844 | $ 237,884 | $ 152,068 | $ 161,294 | $ 88,835 | $ 58,129 |
| Investment Earnings | 4,944 | 3,280 | 17,464 | 8,855 | 19,582 | 38,557 |
| Gain (Loss) on Sale of Capital Assets | 3,002 | - | - | - | - | (23,935) |
| Interest Expense | (74,809) | (70,417) | (281,376) | (69,187) | (29,339) | (618,288) |
| Total Non-Operating Revenues (Expenses) | $ (16,020) | $ 170,746 | $ (111,844) | $ 100,962 | $ 79,078 | $ (545,537) |
| Income (Loss) Before Contributions and Transfers | $ (53,402) | $ 724,561 | $ 563,963 | $ 975,748 | $ 730,061 | $ 616,126 |
| Capital Contributions | 38,668 | 37,879 | 79,781 | 97,382 | 331,499 | 269,222 |
| Transfers Out | 962,375 | 77,134 | 245,800 | - | (833) | (1,885) |
| Change In Accounting Principle - GASB 68 | | | | | | (678,603) |
| Change In Net Position | $ 947,641 | $ 839,574 | $ 889,544 | $ 1,073,130 | $ 1,060,727 | $ 204,860 |
| Total Net Position - Beginning | $ 11,494,126 | $ 12,441,767 | $ 13,281,340 | $ 14,170,884 | $ 15,244,014 | $ 16,580,270 |
| Prior Period Adjustments | - | - | - | - | 275,529 | (17,091) |
| Adjusted Net Position - Beginning | $ 11,494,126 | $ 12,441,767 | $ 13,281,340 | $ 14,170,884 | $ 15,519,543 | $ 16,563,179 |
| Change In Net Position | 947,641 | 839,574 | 889,544 | 1,073,130 | 1,060,727 | 204,860 |
| Total Net Position - Ending | $ 12,441,767 | $ 13,281,340 | $ 14,170,884 | $ 15,244,014 | $ 16,580,270 | $ 16,768,039 |
| *O&M Coverage Ratio* | *1.10* | *1.24* | *1.27* | *1.31* | *1.25* | *1.38* |
| *Net Operating Income as % of Operating Revenue* | *-0.78%* | *11.67%* | *13.53%* | *16.17%* | *10.43%* | *18.65%* |
| *Debt Service Coverage Ratio* | *3.15* | *7.72* | *3.24* | *3.17* | *2.10* | *2.33* |

Key findings from **Table 10-1** include:

- Total water sales revenue increased by 55.1% from 2010 – 2015, primarily due to the fact that the City increased its water rates by 47.6% during that period.

- Total operating expenses (including depreciation) increased by 29.7% from 2010 – 2015. Excluding depreciation, the water utility's cash operating expenses increased by 24.5% over the past six years.

- The O&M coverage ratio began at 1.10 in 2010, and has since varied from 1.24 – 1.38. This suggests that the water utility's operating revenues have been adequate to cover operating expenses (excluding depreciation) for the past six years.

- Net operating income was slightly below zero in 2010, signifying that operating revenues were inadequate to fully cover operating expenses and depreciation. It has generally increased each year thereafter.

- The debt service coverage ratio has consistently remained above 2.00, comfortably above the minimum of 1.25 required by the City's bond covenants. When the City issued revenue bonds in 2015, Moody's cited the utilities' healthy coverage ratio and stable operating history as grounds for a bond rating of "Aa3" (signifying that the City has "very strong" capacity to meet its financial commitments).

## Capital Funding Sources

The City may fund the water CIP from a variety of sources, described in further detail below.

## Government Programs

Federal and state grant programs were historically available to local utilities for capital funding assistance, but have largely been scaled back or replaced by loan programs due to budgetary constraints. Those that remain are generally lightly funded and heavily subscribed. Nevertheless, even low-interest loans present worthwhile opportunities for cost savings.

Funding programs for which the City might be eligible include:

### *Community Economic Revitalization Board (CERB) Grant and Loan Program*

A division of the Washington State Department of Commerce, CERB provides grants and loans for infrastructure improvements including utility projects (grants are available only when a loan is not reasonably possible). Eligible applicants include cities, towns, port districts, special-purpose districts, federally recognized Indian tribes, and other municipal corporations. This program prioritizes projects that create or retain jobs for low and moderate-income residents – because it is need-based and intended to be a "last-resort" relative to other funding sources, the City might not qualify for assistance. More information is available at http://www.commerce.wa.gov/building-infrastructure/community-economic-revitalization-board.

### *Public Works Trust Fund (PWTF) Loan Program*

Administered by the Public Works Board, this program provides low-interest loans for local governments to finance public infrastructure construction and rehabilitation. Eligible projects must improve public health and safety, respond to environmental issues, promote economic development, or upgrade system performance. Relying on funding decisions made by the State Legislature, this program has been very limited in recent years due to competing legislative priorities. The next funding cycle begins in the summer of 2017. Information regarding the application process as well as rates and terms are posted on the PWTF website in early spring. Further detail is available at http://www.pwb.wa.gov.

### *Drinking Water State Revolving Fund (DWSRF) Loan Program*

DWSRF funding historically targets protection of public health, compliance with drinking water regulations, and assistance for small and disadvantaged communities. Applicants need an approved water system plan (or plan amendment) containing the DWSRF project prior to submitting an application. All public water systems that receive a DWSRF loan must undergo an environmental review, a cultural review, and an Investment-Grade Efficiency Audit (IGEA). The IGEA is an effort to apply energy efficiency to water systems and may be financed as part of the DWSRF loan. The 2017 application cycle will begin on October 2nd and conclude on November 30th. Further detail is available at http://www.doh.wa.gov.

### *Community Development Block Grant (CDBG) Program*

The CDBG program assists with final design and construction of water, sewer, stormwater, and other projects serving economic development. These projects must principally benefit low to moderate-income people in non-entitlement cities and counties. Cities or towns must have a population fewer than 50,000 people and counties must have a population fewer than 200,000 people. Applications for the 2017 program are due in June of 2017. More information can be found at www.commerce.wa.gov/cdbg.

## Public Debt

There are two major types of public debt that utilities use to finance capital investment:

### *General Obligation (G.O.) Bonds*

G.O. bonds are secured by the full faith and credit of the issuing agency, committing all available tax and revenue resources to debt repayment. With this high level of commitment, G.O. bonds have relatively low interest rates. However, the Washington Constitution and statutes limit the amount and use of G.O. bond funds in relation to assessed valuation. RCW 39.36.020 states that:

> "(ii) Counties, cities, and towns are limited to an indebtedness amount not exceeding one and one-half percent of the value of the taxable property in such counties, cities,

> or towns without the assent of three-fifths of the voters therein voting at an election held for that purpose.
>
> (b) In cases requiring such assent counties, cities, towns, and public hospital districts are limited to a total indebtedness of two and one-half percent of the value of the taxable property therein."

While bonding capacity can limit availability of G.O. bonds for utility purposes, they can play a useful role in project financing if available. These bonds can benefit ratepayers through lower interest rates and other related cost savings, but also spread the repayment obligation to all tax-paying properties (not just developed properties) through the authorization of an ad valorem property tax levy.

### *Revenue Bonds*

Commonly used to fund utility capital improvements, revenue bonds are secured solely by utility revenues. Revenue bonds do not require a commitment of the issuing agency's other revenue sources (e.g., taxes) for debt repayment, and as a result they typically bear higher interest rates than G.O. bonds. They also generally come with additional requirements to protect bondholders from default risk, including the maintenance of a dedicated bond reserve and minimum standards of financial performance (debt service coverage).
Revenue bonds can be issued in Washington without a public vote. There is no bonding limit, except perhaps the practical limit of the utility's ability to generate sufficient revenue to repay the debt and meet required coverage ratios.

## Utility Resources

The City's Water Utility Fund (Fund 421) consists of an accumulation of cash resources that the City can use for capital project funding. In addition to existing cash balances, the City can use utility revenues to either fund projects directly or repay debt issued to fund the projects. With respect to capital funding, rate revenue is most appropriate for moderate, ongoing investments such as annual replacement programs. For larger projects, the City would need to generate cash funding in advance (or issue debt if that is not possible).

## General Facilities Charges

Under the authority of RCW 35.92.025, the City imposes general facilities charges (GFCs) on development as a condition of service. In addition to any other costs related to physically connecting a customer to the system, the GFC is typically based on a blend of historical and planned future capital investment in system infrastructure – its underlying premise is that growth (future customers) will pay for an equitable share of the costs that the utility has incurred (or will incur) to provide capacity to serve new customers.
While the RCW does not explicitly define a methodology for calculating GFCs, the GFC is generally calculated by dividing an allocable "cost of the system" by the applicable customer

base served by the system to arrive at a cost per unit of capacity. The ensuing sections discuss the various aspects of the GFC calculation in further detail.

### *Existing Cost Basis*

The GFC cost basis includes costs associated with existing assets to recognize that those assets will provide benefit to new customers. In addition to this documented cost of existing assets, RCW 35.92.025 allows the City to recover a provision for interest accrued on assets. Conceptually, this interest provision (which is limited to ten years of interest accrual on each asset) attempts to account for opportunity costs that the City's customers incurred by supporting investments in infrastructure rather than having the money available for investment or other uses. This cost basis is adjusted to reflect:

- Construction Work In Progress: The City has substantial investments in capital projects that are currently underway – these projects are not completed or booked as assets, but do represent an investment made by the City in the system. Consequently, the cost of construction work in progress is added to the GFC cost basis.

- Contributed Assets: Assets funded by developer extensions are excluded from the cost basis on the premise that the GFC should only recover costs actually incurred by the City.

- Net Outstanding Debt Principal: When a new customer connects to the City's system and becomes a ratepayer, they will pay for a proportionate share of the annual debt service payments associated with the City's outstanding debt. To recognize this and avoid double charging customers for assets through GFCs and rates, the cost basis reflects a deduction for outstanding debt principal net of available cash balances.

- Provision for Asset Retirement: The City recognizes that many of the capital expenditures in the future cost basis are planned as repair and replacement projects for existing infrastructure. An adjustment is made to the existing cost basis for assets that will be replaced by the capital projects proposed to avoid double charging for both existing assets and their replacement.

### *Future Cost Basis*

The GFC cost basis also includes costs associated with future water CIP projects to recognize that (a) certain projects are needed to expand capacity for growth, and (b) other projects involve replacing existing assets at a higher cost than the City's original investment in those assets. The capital costs included in the future cost basis are generally based on the capital program developed in this Plan, though inflation is backed out of the cost estimates. The future cost basis excludes projects funded by grants or developer extensions, as well as project cost reimbursements from the City's other utilities (which represent investments by those utilities that would most equitably be recovered through their respective GFCs).

### Customer Base

Given that the City's customers can impose significantly different demands on the water system, the GFC calculation uses the concept of meter equivalents (MEs) to standardize the customer base. One ME represents the maximum continuous flow capacity of a defined "standard" meter (most often a 3/4" meter) – this analysis uses maximum continuous flow ratios published by the American Water Works Association (AWWA) to assign MEs to larger meters. The customer base is separated into two groups: existing customers and future growth. The existing customer base of 13,819 MEs is based on 2016 customer statistics provided by the City, excluding fire and sprinkler meters. The future customer base reflects the application of an annual growth rate of 0.50% to the existing ME count, resulting in a projected future customer base of 15,192 MEs by 2035.

### GFC Calculation

The GFC calculation is based on an "average cost" methodology, which computes a charge per ME by dividing the allocable cost by the applicable number of MEs. **Table 10-2** summarizes the updated GFC calculation.

**Table 10-2**
**General Facility Charge Calculation**

| Existing Cost Basis | Total |
|---|---|
| PLANT-IN-SERVICE | |
| Utility Capital Assets as of 12/31/16 | $ 37,415,792 |
| less: Contributed Capital | (1,097,505) |
| plus: Interest on Non-Contributed Plant | 12,267,235 |
| less: Estimated Cost of Water Mains to be Replaced | (1,320,547) |
| less: Estimated Interest on Water Mains to be Replaced | (832,403) |
| plus: 2016 Construction-Work-in-Progress | 346,578 |
| less: Net Debt Principal Outstanding | (7,527,487) |
| TOTAL EXISTING COST BASIS | $ 39,251,665 |

| Future Cost Basis | $ 57,425,247 |
|---|---|

| Customer Base (excluding Fire & Sprinkler Meters) | MEs |
|---|---|
| Existing Equivalent Residential Units (Meter Equivalents) | 13,819 |
| Future Equivalent Residential Units (Incremental) | 1,374 |
| TOTAL CUSTOMER BASE | 15,192 |

| Resulting Charge | |
|---|---|
| Total Cost Basis | $ 96,676,912 |
| Total Customer Base | 15,192 |
| TOTAL GFC PER METER EQUIVALENT | $ 6,364 |

Dividing the total cost basis of $96,676,912 by the projected 2035 customer base of 15,192 MEs generates a GFC of $6,364 per ME. This represents an increase of $1,314 over the City's current charge of $5,050 per ME. Since the calculated charges represent the

maximum allowable charge, the City may choose to implement a charge at any level up to the calculated charge. Revenues generated from the charge will vary depending on whether or not the full increase shown in **Table 10-2** is implemented upfront or phased in over time. Delaying or otherwise limiting GFC increases will generally reduce the amount of revenue available for capital funding. GFC revenues were conservatively estimated at current charge levels for the following financial plan.

## Financial Plan

The City of Edmonds' water utility operates as an enterprise fund, and is generally responsible to fully fund all of its needs without reliance on tax revenues or other General Fund resources. The primary source of funding for the utility is revenue from water service charges, which the City sets by ordinance and can adjust as needed to meet its objectives.

The financial plan evaluates the City's ability to fund the water utility's CIP and other financial needs while maintaining affordable water rates. It is a comprehensive analysis that includes both operating and capital elements:

- The revenue requirement analysis determines the amount of revenue necessary to fund the ongoing operation, maintenance, and administration of the utility on an annual basis, focusing specifically on the needs funded from operating revenues. It includes a framework of fiscal policies intended to promote long-term financial stability and viability.

- The capital funding plan develops a funding strategy for the 2016 – 2022 CIP that considers rate revenues, existing reserves, GFCs, debt financing, and any other anticipated resources (e.g., grants, developer contributions, etc.). It can impact the revenue requirement analysis through use of debt financing (resulting in annual debt service) and capital funding embedded in rates.

## Financial Policies

The ensuing discussion summarizes the key financial policies used in the revenue requirement analysis.

### *Utility Reserves*

Reserves are a key component of any utility financial strategy, as they provide the flexibility to manage variations in costs and revenues that could otherwise have an adverse impact on ratepayers. For the purpose of rate and financial planning, resources are separated into the following funds:

- Operating Fund: This fund provides an unrestricted fund balance to accommodate the short-term cycles of revenues and expenses. These reserves are intended to address variations in revenues and expenses, whether anticipated (e.g., billing/receipt cycles,

payroll cycles) or unanticipated (e.g., weather, economic conditions). Consistent with industry standards, the water utility maintains a balance equal to 45 – 60 days of operating expenses in this fund. Based on the City's 2016 Budget, this target range is approximately $488,000 – $651,000.

- Capital Fund: This fund provides a source of cash for unanticipated capital expenditures such as emergency asset replacements or capital project overruns. In the context of the financial analysis, it also enforces an appropriate segregation of resources restricted (or otherwise designated) for capital purposes. Recognizing that the City can defer projects and/or issue debt in response to unanticipated capital costs, this fund does not have an explicit minimum balance target.

- Bond Reserve: The City's bond covenants require that the City maintains a bond reserve based on the least of (1) maximum annual parity debt service, (2) 125% of average annual parity debt service, and (3) 10% of the original proceeds of the outstanding parity bonds. Based on the water utility's share of outstanding revenue bonds, its share of the bond reserve requirement is approximately $1.2 million.

### *System Reinvestment*

The water system's infrastructure assets lose value over time due to routine wear and tear, representing a future replacement liability. The concept of system reinvestment funding entails funding this future replacement liability through a regular and predictable rate provision. Benchmarks for annual system reinvestment funding are often linked to depreciation expense as a readily available measure of the decline in asset value over time, but annual funding levels can also be set by policy. Given the City's preference to fund future capital needs on a "pay-as-you-go" (cash) basis, the financial plan assumes annual system reinvestment funding of $1.8 – $2.9 million during the study period. It is important to note that this policy does not guarantee full cash funding for all future capital needs, but it intends to provide the City with the financial flexibility to issue debt at its discretion.

### *Financial Performance Standards*

The revenue requirement analysis uses a pair of sufficiency tests to establish the amount of revenue needed to meet the utility's financial obligations on an annual basis.

- Cash Flow Test: To satisfy this test, the utility's operating revenues must be adequate to fund all known cash requirements including O&M expenses, debt service payments, system reinvestment funding (and other rate-funded capital outlays), and reserve funding.

- Coverage Test: Intended to ensure compliance with the City's bond covenants, satisfying this test requires that net revenue is greater than or equal to 1.25 times annual parity debt service.

The annual revenue requirement is broadly defined as the amount of revenue needed to satisfy both of these tests. Short-term cash flow deficits may occur as part of a strategy to

phase rate increases in, as long as the utility has sufficient reserves on hand to absorb them. The financial plan assumes that the debt service coverage requirement must always be met.

## Capital Funding Plan

The CIP developed for this plan totals $18.9 million ($21.5 million inflated) over the 2017-2022 planning horizon. Costs are stated in 2016 dollars and escalated to the year of planned spending for financing projections at an annual inflation rate of 4%.

**Table 10-3** summarizes the annual CIP expenditures in 2016 and inflated dollars.

**Table 10-3**
**Water Utility Capital Improvement Program**

| Water CIP Summary | | |
|---|---|---|
| Year | 2016 $ | Inflated $ |
| 2017 | $ 3,865,990 | $ 4,020,630 |
| 2018 | $ 3,941,541 | $ 4,263,171 |
| 2019 | $ 2,248,489 | $ 2,529,244 |
| 2020 | $ 2,960,577 | $ 3,463,456 |
| 2021 | $ 2,960,577 | $ 3,601,994 |
| 2022 | $ 2,960,577 | $ 3,746,073 |
| 2017-2022 Total | $ 18,937,750 | $ 21,624,568 |
| 2023 - 2035 | $ 38,487,497 | $ 43,534,263 |
| 2017-2035 Total | $ 57,425,247 | $ 65,158,830 |

A capital funding plan is developed to determine the total resources available to meet the CIP needs and determine if new debt financing will be required. The water utility began 2017 with approximately $10.1 million – netting out $1.2 million restricted for debt service and $651,000 set aside for the Operating Fund leaves approximately $8.3 million available for capital investment. GFC revenue collections are estimated to contribute, on average, $340,000 per year from 2017 to 2022. All capital expenditures are expected to be funded directly through cash resources without any reliance on debt. The capital funding plan is summarized in **Table 10-4** below.

**Table 10-4**
**2016-2022 Annual Capital Fund Cash Flow**

| Capital Financing Plan | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Beginning Balance | $ 8,292,398 | $ 6,799,043 | $ 5,313,446 | $ 6,058,853 | $ 5,945,095 | $ 5,807,492 |
| plus: Interest Earnings | 20,731 | 33,995 | 39,851 | 45,441 | 44,588 | 43,556 |
| plus: Interfund Transfers from Funds 422/423 | 200,000 | - | - | - | - | - |
| plus: General Facilities Charges | 340,955 | 342,660 | 344,373 | 346,095 | 347,826 | 349,565 |
| plus: Capital Funding from Rates | 1,965,589 | 2,400,918 | 2,890,427 | 2,958,162 | 3,071,977 | 3,206,173 |
| less: Capital Expenditures | (4,020,630) | (4,263,171) | (2,529,244) | (3,463,456) | (3,601,994) | (3,746,073) |
| Ending Balance | $ 6,799,043 | $ 5,313,446 | $ 6,058,853 | $ 5,945,095 | $ 5,807,492 | $ 5,660,713 |

The CIP costs shown in the table are inflated to the year of spending. **Table 10-4** shows $16.5 million in capital funding from rates from 2017 – 2022 (through a combination of system reinvestment and Operating Fund transfers), which represents approximately 67.0% of the projected capital costs. The remainder is expected to be funded through a combination of existing cash balances, interest earnings, and GFC revenues.

## Revenue Requirement

The revenue requirement analysis enables the City to set utility rate structures which fully recover the total cost of operating the system. Capital improvement and replacement, operations and maintenance (O&M) expenses, general administration, fiscal policy attainment, cash reserve management, and debt repayment all come together to form the basis for the revenue requirement. The revenue needed to satisfy all the utility financial obligations is then compared to the revenue derived from the current level of rates to determine sufficiency.

### *Projected Financial Performance*

The revenue requirement analysis is based on the following assumptions:

- The 2016 budget forms the baseline for the forecast of revenues and expenses.
- Rate revenues under existing rates are forecast to increase with customer growth, which is projected to be approximately 0.5% per year.
- Most operating expenses are escalated annually at 3.0% for general cost inflation. Employee benefit costs are escalated at 10.0% per year to recognize recent and expected increases in those costs.
- Per City staff's direction, Alderwood Water and Wastewater District water rates are assumed to increase annually per the following schedule:

| 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| 5.5% | 5.6% | 3.9% | 4.2% | 9.9% | 3.1% | 5.3% |

- GFC revenues are assumed at an average annual amount of $340,000 per year throughout the study period.
- The City's annual fund interest earnings rate is assumed to be 0.25% in 2016 and 2017, 0.50% in 2018 and increasing to 0.75% thereafter.

**Table 10-5** summarizes the projected financial performance and rate revenue requirements of the water utility for 2016 through 2022 based upon the above assumptions.

**Table 10-5**
**Summary of Projected Financial Performance & Revenue Requirements**

| Revenue Requirements | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|
| Revenue | | | | | | | |
| Rate Revenues at 2016 Rates | $ 6,755,358 | $ 6,792,000 | $ 6,828,911 | $ 6,866,095 | $ 6,903,556 | $ 6,808,446 | $ 6,842,488 |
| Non-Rate Revenues | 124,950 | 109,579 | 114,349 | 119,236 | 119,441 | 119,786 | 119,987 |
| Total Revenue | $ 6,880,308 | $ 6,901,579 | $ 6,943,260 | $ 6,985,331 | $ 7,022,997 | $ 6,928,232 | $ 6,962,475 |
| Expenses | | | | | | | |
| Cash Operating Expenses | $ 3,959,820 | $ 4,131,337 | $ 4,283,873 | $ 4,450,177 | $ 4,730,105 | $ 4,893,233 | $ 5,119,811 |
| Debt Service | 1,248,072 | 1,252,624 | 1,254,168 | 1,256,540 | 1,258,950 | 1,254,358 | 1,254,742 |
| System Reinvestment | - | 1,800,000 | 2,000,000 | 2,300,000 | 2,500,000 | 2,700,000 | 2,900,000 |
| Total Expenses | $ 5,207,892 | $ 7,183,961 | $ 7,538,041 | $ 8,006,717 | $ 8,489,054 | $ 8,847,591 | $ 9,274,553 |
| Net Cash Flow | $ 1,672,416 | $ (282,383) | $ (594,782) | $ (1,021,386) | $ (1,466,057) | $ (1,919,359) | $ (2,312,078) |
| *Annual Rate Adjustment* | | *9.00%* | *9.00%* | *9.00%* | *4.00%* | *4.00%* | *4.00%* |
| After Rate Increases: | | | | | | | |
| Rate Revenues | $ 6,755,358 | $ 7,403,280 | $ 8,113,429 | $ 8,891,792 | $ 9,297,918 | $ 9,536,613 | $ 9,967,668 |
| Net Cash Flow | $ 1,672,416 | $ 193,784 | $ 425,992 | $ 617,764 | $ 504,178 | $ 398,792 | $ 343,419 |
| Debt Service Coverage | 2.40 | 2.67 | 3.03 | 3.44 | 3.51 | 3.59 | 3.71 |

As shown in **Table 10-5**, projected revenues under the existing (2016) rates are insufficient to fund projected rate needs, primarily due to the level of rate-funded system reinvestment needed to fund the capital improvement program. The proposed rate strategy envisions 9.0% annual rate increases from 2017 – 2019 and 4.0% annual increases thereafter.

It is important to note that these projections are based upon current assumptions and the capital program identified herein. Circumstances might change over time, causing actual rate adjustments to be higher or lower once actual costs are known. It would be prudent for the City to monitor the water utility's financial status regularly, revisiting the analysis in the event of any significant changes.

## Current and Projected Rates

### *Existing Rates*

The City's existing water rate structure has two components; a bimonthly base charge and a uniform volume charge. Residential and multi-family customers pay the base charge on each dwelling unit, while other customers' base charges vary by meter size. All customers pay the same volume rate per hundred cubic feet (ccf) of water consumption. The City's current rate structure is presented in **Table 10-6.**

In order to enhance conservation signals to water customers, the City might consider transitioning to an increasing block rate structure for single-family residential customers, and differentiate volume rates among the customer classes. Other potential options for enhancing

conservation signals would be designating irrigation customers (if there are any) as a separate customer class, and considering implementing seasonal rates for customer classes with seasonal usage patterns. It should be noted that such changes in the rate structure require a more comprehensive and detailed rate and cost of service analyses, which the City may consider in the future.

### *Projected Rates*

**Table 10-6** presents the City's water rate schedule, incorporating the rate adjustments shown in **Table 10-5**. It reflects an across-the-board application of the recommended rate adjustments. The City Council adopted the 2017 – 2019 rate increases; the 2020 – 2022 rates are shown for planning purposes only. The City plans to revisit the water rate analysis prior to adjusting rates in 2020.

**Table 10-6**
**Water Rate Forecast**

| Water Rate Schedule | Adopted | | | | *Projected* | | |
|---|---|---|---|---|---|---|---|
| | 2016 | 2017 | 2018 | 2019 | *2020* | *2021* | *2022* |
| Annual Rate Increase | 0.00% | 9.00% | 9.00% | 9.00% | *4.00%* | *4.00%* | *4.00%* |
| Bimonthly Base Rates | | | | | | | |
| Residential (per Unit) | | | | | | | |
| Single-Family | $28.68 | $31.26 | $34.07 | $37.14 | *$38.63* | *$40.17* | *$41.78* |
| Multi-Family | $25.26 | $27.53 | $30.01 | $32.71 | *$34.02* | *$35.38* | *$36.79* |
| All Other Customers: | | | | | | | |
| 3/4" Meter | $34.68 | $37.80 | $41.20 | $44.91 | *$46.71* | *$48.57* | *$50.52* |
| 1" Meter | $70.60 | $76.95 | $83.88 | $91.43 | *$95.09* | *$98.89* | *$102.85* |
| 1-1/2" Meter | $130.55 | $142.30 | $155.11 | $169.07 | *$175.83* | *$182.87* | *$190.18* |
| 2" Meter | $199.04 | $216.95 | $236.48 | $257.76 | *$268.07* | *$278.79* | *$289.94* |
| 3" Meter | $429.38 | $468.02 | $510.15 | $556.06 | *$578.30* | *$601.43* | *$625.49* |
| 4" Meter | $608.22 | $662.96 | $722.63 | $787.66 | *$819.17* | *$851.93* | *$886.01* |
| 6" Meter | $1,233.55 | $1,344.57 | $1,465.58 | $1,597.48 | *$1,661.38* | *$1,727.83* | *$1,796.95* |
| Variable Rates | | | | | | | |
| All Customers (per ccf) | $2.99 | $3.26 | $3.55 | $3.87 | *$4.02* | *$4.19* | *$4.35* |

## Affordability

The Washington State Department of Health and the State Public Works Board have historically used an affordability index to prioritize low-cost loan awards. The typical threshold looks at whether a system's rates exceed 1.5% to 2.0% of the median household income for the demographic area. As a result, if monthly bills are less than 1.5% of the median household income for the demographic area, they are generally considered affordable.

The median household income for the City of Edmonds in the 2015 census was $75,044. The 2015 census figure was escalated to 2016 using the U.S. Department of Labor, Bureau

of Labor Statistics Consumer Price Index (CPI) Calculator. Future years are escalated at 3.0% per year. **Table 10-7** presents the City's rates with the projected rate increases annually for the forecast period (using single-family residential rates and assuming 8 ccf of water usage bimonthly water consumption assumption), tested against the 2% threshold.

**Table 10-7**
**Affordability Test**

| Affordability Analysis | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|
| Bimonthly Single-Family Bill @ 16 ccf (1) | $90.83 | $97.66 | $104.96 | $112.98 | $116.09 | $117.86 | $122.57 |
| Median Household Income (2) | $75,991 | $78,270 | $80,619 | $83,037 | $85,528 | $88,094 | $90,737 |
| Annual Single-Family Bill as % of MHI | 0.72% | 0.75% | 0.78% | 0.82% | 0.81% | 0.80% | 0.81% |
| (1) City Utility Tax Rate | 18.70% | 17.07% | 15.50% | 14.05% | 12.68% | 10.00% | 10.00% |

(2) Median Income Data: US Census Bureau, 2015 ACS 5-year estimate adjusted by 3.0% per year

**Table 10-7** indicates that the City's rates are forecasted to remain well within the stated affordability threshold (2.0% of median household income) throughout the projection period. Note that the forecast of customer bills reflects a planned reduction in the City's utility tax rate from 18.7% to 10.0% over a five-year period.

## Conclusion

The revenue requirement analysis indicates that the City needs to increase its water rates to fund the water utility's financial obligations, particularly capital investment. The rate strategy increases rates by 9.0% per year from 2017 – 2019, followed by recommended 4.0% annual increases from 2020 – 2022. Even with these increases, the City's water rates are expected to remain "affordable" as defined by industry standards.

It is recommended that the City regularly monitor the financial position of the water utility, revisiting the key underlying assumptions to ensure that the utility's revenues remain adequate to meet its financial obligations.