## Attachment A



















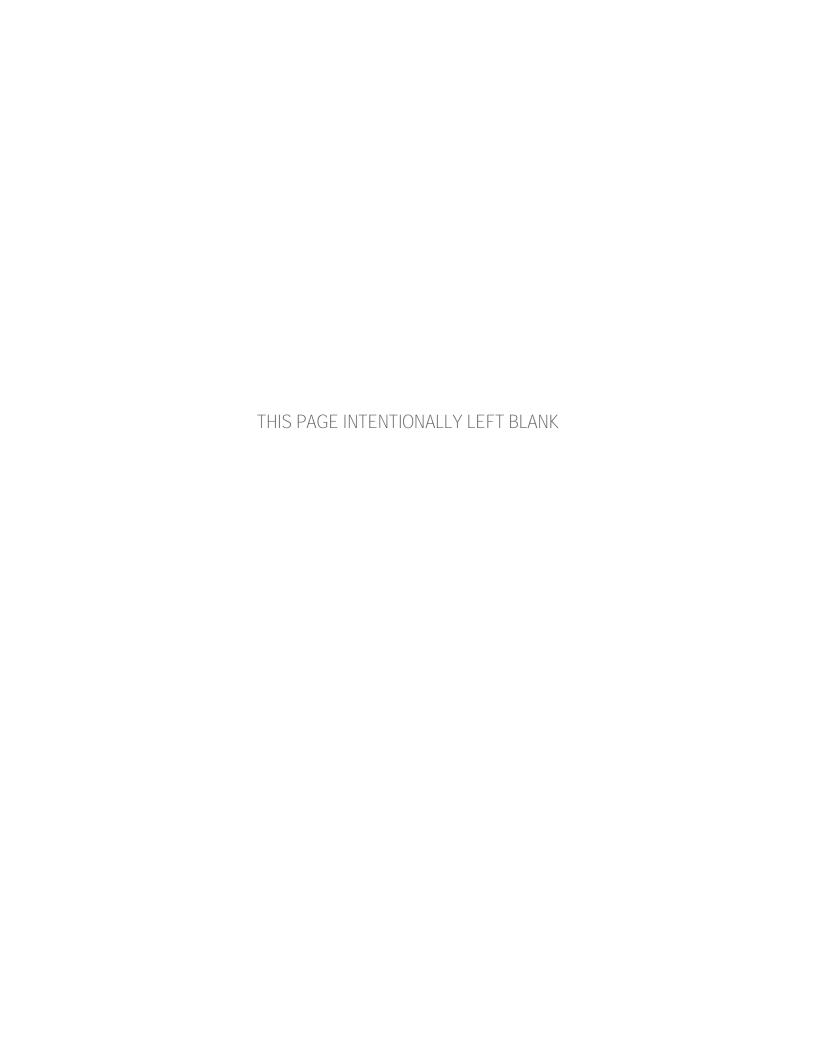






2019





# City of Kent Water System Plan

MAY 2019 FINAL SEPTEMBER 2019

## **Mayor** Dana Ralph

City Council Bill Boyce, President

Brenda Fincher Dennis Higgins Satwinder Kaur Marli Larimer Les Thomas Toni Troutner

**Public Works Director** Timothy LaPorte

City of Kent 220 Fourth Avenue S Kent, WA 98032

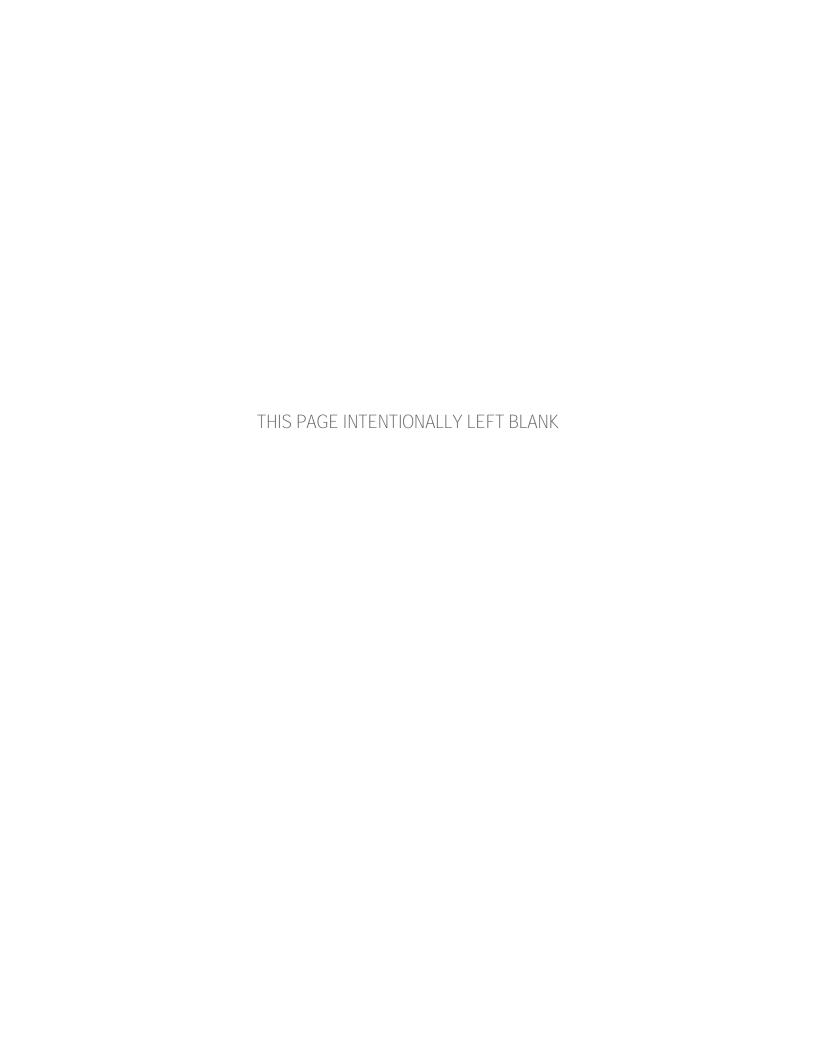
## Prepared by:



RH2 Engineering, Inc. 22722 29<sup>th</sup> Drive SE, Suite 210 Bothell, WA 98021

Contact: Michele Campbell, P.E. (425) 951-5394





## **CERTIFICATION**

This Water System Plan for the City of Kent was prepared under the direction of the following registered professional engineers.



Ryan M. Withers, P.E.



Michele R. Campbell, P.E.

GEORGE

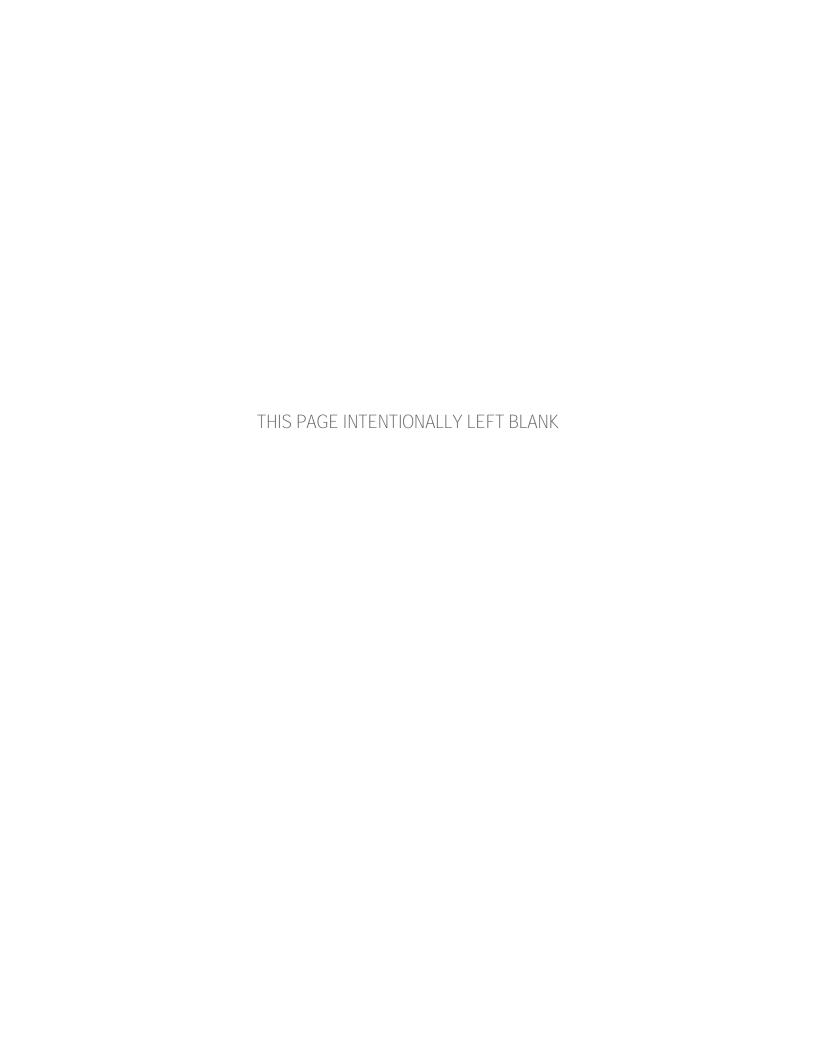
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REGISTERED

05/10/2019

Mosfrey G. Dillard, P.E.





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- Appendix B Retail Water Service Area and Other Agreements
- Appendix C Consistency Statement Checklists
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- Appendix K Consumer Confidence Report
- Appendix L Hydraulic Model Node Diagram
- Appendix M Water Ordinances
- Appendix N Agency Review Comments

## ES | EXECUTIVE SUMMARY

## PURPOSE OF THE WATER SYSTEM PLAN

The City of Kent's (City) water system is a major infrastructure, much of which is invisible to the customers that receive its water. The water system requires qualified staff to operate and maintain an ongoing capital improvement program to replace old components to meet the requirements mandated by federal and state laws. The primary purpose of the City of Kent Water System Plan (WSP) is to identify and schedule water system improvements that correct existing system deficiencies and ensure a safe and reliable supply of water to current and future customers. This WSP complies with Washington State Department of Health (DOH) regulations under Chapter 246-290 Washington Administrative Code (WAC), which requires water purveyors to update their water system plans every 10 years. This WSP has been written to meet 10-year planning requirements.

The City's previous WSP was prepared in 2011. This updated 2019 WSP reflects King County's (County) population allocation to the City and the City's current Urban Growth Area (UGA), which are consistent with the City's 2015 *Comprehensive Plan* and the County's 2018 *Comprehensive Plan* updates. The WSP also reflects improvements and changes to the water system since the completion of the 2011 WSP.

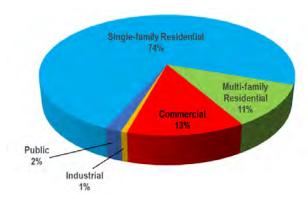
## SUMMARY OF KEY ELEMENTS

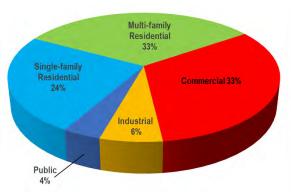
This WSP presents a description of the existing water system and service area, a forecast of future water demands, policies and design criteria for water system operation and improvements, the operations and maintenance program, staffing requirements, a schedule of improvements, and a financial plan to accomplish the improvements. The WSP also includes several ancillary elements that include a water use efficiency program, a water quality monitoring plan, a wellhead protection program, and a cross-connection control program. A summary of the key issues related to these elements is provided in the following sections.

#### WATER SERVICE AREA

In 2016, the City provided water service to approximately 68,157 people throughout its water service area boundary, which extends beyond the City's corporate limits to include small areas of Auburn, Tukwila, and unincorporated King County. The City is responsible for providing public water service, utility management, and water system development within this area. The City will provide new water service within the City limits and designated retail water service area (i.e., where there are existing water mains). Requests for new water service outside of the City limits but within the UGA, where there are no existing water mains fronting the property, will only be granted upon extension of water service and completion of an annexation agreement.

In 2016, the City provided water service to an average of 14,907 connections, which were mainly comprised of single-family connections. Single-family connections represent approximately 74 percent of all accounts, but the single-family class only consumed 24 percent of all water supplied to the system in 2016.





2016 Water Connections

2016 Water Consumption

#### **EXISTING WATER SYSTEM**

The City's water system initially dates to the latter part of the nineteenth century, when a spring was tapped on the East Hill to provide water to the Kent Water and Light Company. The City purchased the water system in 1892. In 1926, the City purchased the Kent Springs water source, and began developing the Clark Springs source in the 1930s. In the 2000s, the City partnered in the Tacoma Regional Water Supply System, which became the City's third primary water source. The City has ten additional well sources; however, these wells are typically only used periodically to ensure they are regularly exercised due to the higher operation costs. A summary of the City's supply sources is shown in **Table ES-1**.

Table ES-1 Supply Facilities Summary

Facility	Туре	Supplies Water To	Year Installed	Use	Existing Capacity (gpm)	Water Treatment	Generator
208th Street/ 212th Street Wellfield	4 wells	240 Zone	1982, 2001	Active	3,500	Chlorination, Fluoridation, Manganese/Iron/Hydrogen Sulfide Removal, pH Adjustment	208th: None 212th: Hookup for portable generator
Armstrong Springs Wells	2 wells	CSTM/ KSTM	1982	Active	1,050	Chlorination, Fluoridation, pH Adjustment	On-site
Clark Springs	Infiltration gallery and collector, 3 wells	CSTM	1957, 1969	Active	5,400	Chlorination, Fluoridation, pH Adjustment	On-site generator partially powers facility
East Hill Well	1 well	590 Zone	1979	Active	1,900	Chlorination, Fluoridation, pH Adjustment	On-site
Garrison Creek Well	1 well	240 Zone	1981	Active	500	Chlorination, Fluoridation	On-site generator for SCADA system only
Kent Springs	Infiltration gallery, 3 wells	KSTM	1908, 1977, 2001	Active	3,680	Chlorination, Fluoridation, pH Adjustment	On-site generator
O'Brien Well	1 well	240 Zone	1951	Active	243	Chlorination, Fluoridation	None on-site, towed generator is used
Seven Oaks Well	1 well	CSTM/ KSTM	1982	Active	350	Chlorination, Fluoridation, pH Adjustment	None
Tacoma RWWS	Intertie	KSTM/ 590 Zone	2005	Active	8,778	Chlorination, Fluoridation, Filtration, Ozone Treatment, pH Adjustment <sup>1</sup>	Site has full backup power

<sup>1 =</sup> pH adjustment occurs in Tacoma system and when RWSS water is directed through the KSTM to the Guiberson Reservoir.

The City's water system has nine storage facilities that provide storage directly to various zones in the system. Details of the City's storage facilities are shown in **Table ES-2**.

Table ES-2 Storage Facilities Summary

Reservoir	Approximate Location	Pressure Zone	Year Constructed	Construction Type	Capacity (MG)	Diameter (feet)	Base Elev. (feet)	Overflow Elev. (feet)
6 Million Gallon #2 Reservoir	Garrison Creek Park	240 Zone	1969	Reinforced concrete below grade	6	Variable	212	240
Guiberson Reservoir	E Guiberson St and Kensington Ave S	240 Zone	Late 1930s	Reinforced concrete below grade	3	Variable	222	240
Reith Road Standpipe	Reith Rd S, just north of W Fenwick Park	354.5 Zone	1959	Steel	1.0	66	315.0	354.5
6 Million Gallon #1 Reservoir	98th Ave S and S 239th PI	416 Zone	1967	Steel	6.0	146	370.0	418.0
125K Tank	98th Ave S and S 239th PI	485 Zone	1958	Elevated steel	0.125	32	462.0 <sup>1</sup>	485.0
Cambridge Tank	S 264th St and Military Rd S	529 Zone	1959	Elevated steel	0.3	53.33	499.1 <sup>2</sup>	529.0
3.5 MG Tank	124th Ave SE and SE 286th PI	590 Zone	1978	Steel	3.5	74	483.4	592.9
640 Tank	SE 248th St and 124th Ave SE	590 Zone (Future: 640 Zone)	2011	Steel	4.0	75	523.0	595.0 (Future: 645.0)
Blue Boy Standpipe	112th Ave SE and SE 246th Pl	590 Zone	1965	Steel	0.97	42	499.7	593.8

<sup>1 =</sup> Ground elevation 386.8 feet.

The City's water system has six booster pump station facilities that provide supply to the 354.5 Zone, 485 Zone, 529 Zone, 575 Zone, 587 Zone, and 590 Zone. A summary of the City's pumping facilities is shown in **Table ES-3**.

<sup>2 =</sup> Ground elevation 441 feet.

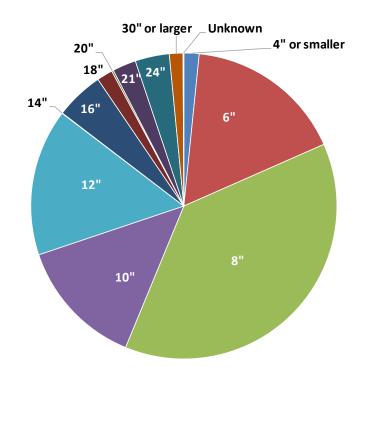
Table ES-3
Booster Pump Station Facilities Summary

Pump Station	Suction Pressure Zone	Discharge Pressure Zone	Year Constructed	Existing Pumping Capacity (gpm)	Number of Pumps	Pump Type	Pump Motor Size (HP)	Generator
Pump Station #3	240 Zone	354.5 Zone	1959	1,800	2	Horizontal split case	(2) 50	On-site
Pump Station #4	354.5 Zone	529 Zone	1959	3,800	3	Horizontal split case	(2) 75 (1) 150	On-site
Pump Station #5	416 Zone	485 and 590 Zones	1975	6,350	4	Horizontal split case	(2) 125, (1) 40, (1) 40/125	On-site
Pump Station #6	529 Zone	587 Zone	1984	1,200	3	Vertical turbine	(3) 20	Has hookup for portable generator
Pump Station #7	529 Zone	575 Zone	1985	500	2	Horizontal	(2) 10	On-site
Pump Station #8	Highline Water District 560 Zone	587 Zone	1986	1,200	3	Vertical turbine	(3) 20	Has hookup for portable generator

The City's water system contains 284 miles of water main ranging in size from 1 inch to 36 inches in diameter. As shown in **Table ES-4**, most of the water main (approximately 85 percent) within the system is 12 inches in diameter or less. The remaining 15 percent of the water main is 14 inches in diameter or larger.

Table ES-4
Water Main Diameter Inventory

Diameter (Inches)	Length (Feet)	% of Total
4 or smaller	24,139	1.6
6	251,772	16.{
8	567,492	37.{
10	204,265	13.6
12	232,958	15.
14	579	0.0
16	76,769	5.1
18	25,118	1.7
20	2,817	0.2
21	37,316	2.5
24	54,154	3.6
30 or larger	21,626	1.4
Unknown	1,203	0.1
Total	1,500,208	100%



#### PAST WATER USAGE

In general, the amount of water consumed by the City's customers has increased approximately 13 percent since the year 2011. This is most likely the result of the 700 new service connections added to the system and the increased usage of water per connection of both commercial and multi-family residential customer classes. During this time, the average water use of single-family residential customers has remained relatively steady, at an average of 157 gallons per day per connection. **Table ES-5** lists the total amount of water supplied to the system from 2011 through 2016.

Table ES-5
Historical Water Supply

Year	Annual Supply (gallons)
2011	2,498,178,000
2012	2,566,823,000
2013	2,593,245,000
2014	2,659,170,000
2015	2,811,692,000
2016	2,818,790,000

## FUTURE WATER DEMANDS AND WATER SUPPLY

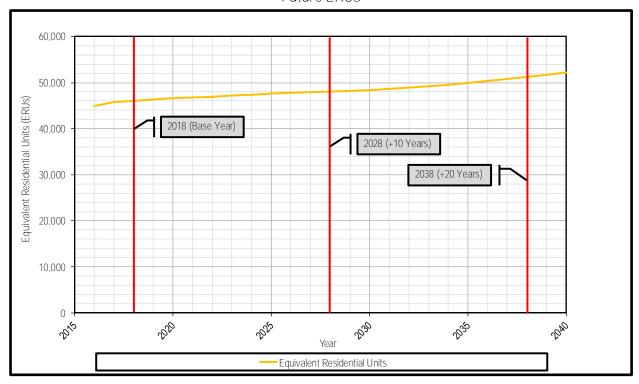
Overall water demand within the City's system is expected to increase by approximately 14 percent of 2016 demand by the end of the 20-year planning period, without savings from the City's Water Use Efficiency program. The projected water demand and supply capacity data is shown graphically in **Chart ES-1**.

The existing and projected ERU data is shown graphically in Chart ES-2.

30,000 25,000 2018 (Base Year) 20,000 MDD and Supply (gpm) 2028 (+10 Years) 2038 (+20 Years) 15,000 10,000 5,000 0 -2015 2030 2040 2020 P. S. Year MDD without WUE --- MDD with WUE Supply

Chart ES-1 Future Water Demand and Supply Capacity





#### WATER SOURCE AND OUALITY

Water supply in the City's system is supplied predominantly from Kent Springs, Clark Springs, and the Tacoma Regional Water Supply System as shown in **Chart ES-3**. Water also can be supplied by ten other groundwater wells. The 208<sup>th</sup> Street/212<sup>th</sup> Street Wellfield consists of four wells, two wells are located at the Armstrong Springs site, and one well is located at each of the East Hill Well, Garrison Creek Well, O'Brien Well and Seven Oaks Well sites. As shown in **Chart ES-1**, the City's water sources have sufficient capacity to meet the existing and projected needs of the water system through the 20-year planning period.

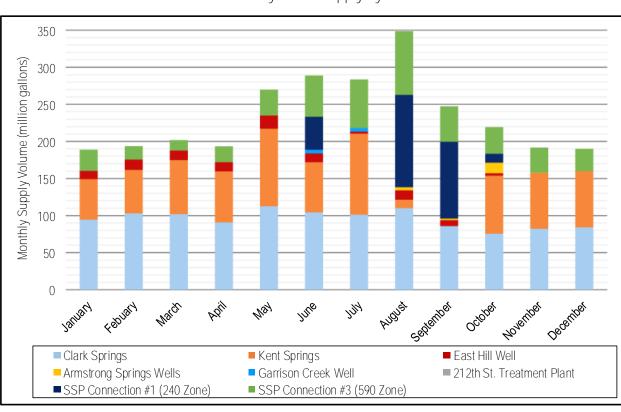


Chart ES-3
2016 Monthly Water Supply by Source

Water from all the City's sources are chlorinated and fluoridated. In addition, aeration and sodium hydroxide pH adjustment are used at the Guiberson Reservoir site to treat blended Kent Springs and Tacoma water. The City also uses pH adjustment at the 212<sup>th</sup> Street Treatment Plant, Pump Station #5, and the East Hill Well.

#### OPERATIONS AND MAINTENANCE

The City's operations and maintenance organization is staffed by well qualified, technically trained personnel. City staff regularly participate in safety and technical seminars to keep abreast of the latest changes in the water industry and ensure a smooth and safe operation of the water system. The current staff of supervisory personnel and field crew, in which many are responsible for the water system and other utilities, have effectively operated and maintained the water

system in the past. As the water system expands in the future and continues to age, additional staff will also be required. The City plans to add staff to meet the increased requirements from system expansion as the budget allows.

The City has taken several steps to prepare for emergency situations. A vulnerability assessment and City-Wide Emergency Response Plans have been prepared that conform to the requirements of the Bioterrorism Act of 2002. The documents contain a vulnerability assessment of the City's water system facilities, a contingency operation plan for responding to emergency events, a list of water personnel responsible for making decisions in emergency situations, and other elements.

Additionally, a seismic vulnerability assessment was completed in 2017 that identifies the City's risk to seismic hazards and recommends mitigation to reduce the risk of failure due to those hazards. Results of the assessment were considered in the development of the water system capital improvement program. The Water Department also participated in a SCADA system vulnerability assessment with the City's IT Department and the Department of Homeland Security in 2017 and 2018. The recommendations from the assessment are being implemented by the City.

#### WATER SYSTEM EVALUATION

The existing water system was evaluated to determine its ability to meet the policies and design criteria of the City and those mandated by DOH. The results of the evaluation are summarized below.

- The City has sufficient water source capacity to meet the demands of existing and future customers until at least 2038.
- The O'Brien Well is not normally operated because sand is present inside the well screen and high levels of manganese are present in the groundwater. Improvements to provide 480-volt power to the site, redevelop the well, and provide treatment are included in **Chapter 9**.
- The City has sufficient water storage capacity to meet the demands of the existing and future customers until at least 2038.
- A new 587 Zone reservoir will be constructed by 2028 to provide redundancy in the West Hill operating area. The reservoir will be accompanied by a new BPS that will provide an additional 1,000 gpm of firm capacity to the West Hill operating area. The existing pump stations on the West Hill will be equipped with new PRVs to facilitate these operational changes in the service area.
- The Guiberson Reservoir was constructed in the 1930s, is nearing the end of its useful life and is in need of replacement.
- The easterly portion of the City's existing 590 Zone will be converted to a 640 Zone to resolve storage deficiencies in the 590 Zone and moderately low pressures in the conversion area.
- The 575 Zone will be converted to the 587 Zone to improve the level of service to the 575 Zone.
- Several areas of the system require water main replacements to resolve deficiencies related to high water velocities, aging water main, and undesirable materials.

#### PROPOSED WATER SYSTEM IMPROVEMENTS AND FINANCING PLAN

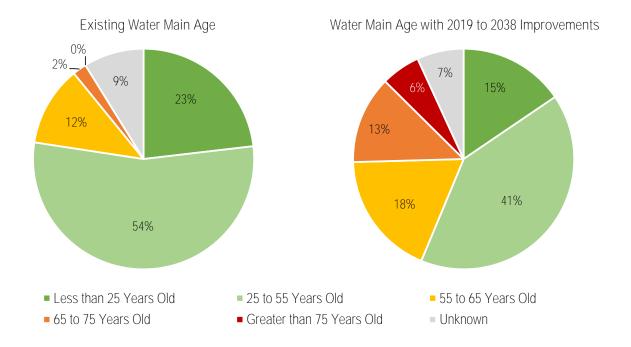
Improvements to the water system are necessary, primarily to resolve existing system deficiencies, but also to accommodate the increase in water demands from future growth. Improvements identified for the first 5 years of the capital improvement program (2019 through 2023) are estimated to cost approximately \$36,346,000, which results in an average expenditure of approximately \$7,269,200 per year. Improvements in the following 5 years (2024 through 2028) are estimated to cost approximately \$30,000,000, or approximately \$6,000,000 per year. The financial analysis is intended to illustrate the feasibility of funding the capital and non-capital improvements for the water system in the next 10 years. It is anticipated that projects identified in this WSP will be financed from cash on hand.

The combination of the historical financial data presented in **Chapter 10**, in conjunction with the financial plan for future revenues and expenditures, demonstrate the financial viability of the City's Water Utility.

The funding for capital improvements in this WSP is balanced. However, the City recognizes that the economy and other factors can change the needs of the water system. In 2016, the city completed a water rate study and adopted a new rate structure for the water utility that addressed the operating and capital needs for the system. The current rate structure adopted a fund balance reserve policy that requires 20 percent of operating expenses balance that would be available for emergency situations. The City anticipates beginning another rate study in 2020 to be completed in 2022.

As the existing infrastructure continues to age, managing and funding the water system CIP is essential to maintaining a safe and reliable water supply for the City's customers. Based on the existing level of repair and replacement identified by the City for the water system CIP, the amount of water main in the system that is greater than 65 years old will increase from 2 percent to 19 percent by the end of the 20-year planning period, as shown in **Chart ES-4**. As funding becomes available, the City should consider a more aggressive water main repair and replacement program or continue to develop asset management strategies to address future infrastructure needs.

Chart ES-4
Existing and Future Water Main Age



## 1 | INTRODUCTION

### WATER SYSTEM OWNERSHIP AND MANAGEMENT

The City of Kent (City) is a municipal corporation that owns and operates a public water system that covers the majority of its corporate boundaries and some areas outside the City's corporate boundaries. Water system data on file at the Washington State Department of Health (DOH) for the City's system is shown in **Table 1-1**.

Table 1-1
Water System Ownership Information

Information Type	Description
System Type	Group A - Community - Public Water System
System Name	Kent Water Department
County	King
DOH System ID Number	381501
Owner Number	002950
Address	220 4th Avenue S, Kent, WA 98032
Contact	Mr. Sean Bauer, Water System Manager
Contact Phone Number	(253) 856-5610

## OVERVIEW OF EXISTING SYSTEM

In 2016, the City provided water service to an average of approximately 14,907 customer connections, or 44,854 equivalent residential units (ERUs), within the City's water service area. The City limits comprise an area of approximately 34.4 square miles, and the existing retail water service area is approximately 23.7 square miles. The 2016 population served by the water system was approximately 68,157, whereas the population residing in the City limits was approximately 124,500. Other areas within the City limits are within the water service areas of the City of Renton, Highline Water District, Soos Creek Water and Sewer District, and Lake Meridian Water District.

The City's water supply is currently provided by 16 wells, 2 springs, and an intertie connection with the City of Tacoma (Tacoma). All City sources are chlorinated and fluoridated. The 208<sup>th</sup> Street/212<sup>th</sup> Street Wellfield is also treated for manganese, iron, and hydrogen sulfide removal. Water from the 208<sup>th</sup> Street/212<sup>th</sup> Street Wellfield, Armstrong Springs Wells, Clark Springs, East Hill Well, Kent Springs, Seven Oaks Well, and the Tacoma intertie are treated for pH adjustment. Water from the Tacoma intertie also receives filtration and ozone treatment in Tacoma's system. The City is a partner with Tacoma, Lakehaven Water and Sewer District, and Covington Water District on the Second Supply Pipeline source. Water storage is provided by 9 reservoirs that have a total capacity of approximately 24.9 million gallons (MG). In addition, the City's water system has 13 pressure zones, with 18 pressure reducing stations. The system

also has 6 booster pump stations and approximately 284 miles of water main. A summary of the 2016 water system data is shown in **Table 1-2**.

Table 1-2 2016 Water System Data

Description	Data
Water Service Population	68,157
Water Service Area	23.7 square miles
Total Connections	14,907
Total ERUs	44,854
Demand per ERU	172 gallons per day
Average Day Demand	5,348 gpm
Distribution System Leakage	6.0%
Maximum Day/Average Day Demand Factor	2.17
Peak Hour/Maximum Day Demand Factor	1.46
Number of Pressure Zones	13
Number of Wells	16
Number of Spring Sources	2
Total Capacity of City Sources	16,623 gpm
Tacoma Intertie Capacity	8,778 gpm
Number of Pump Stations and Total Capacity	6 (15,505 gpm)
Number of Reservoirs and Total Capacity	9 (24.9 MG)
Number of Pressure Reducing Stations	18
Total Length of Water Main	284 miles

## **AUTHORIZATION AND PURPOSE**

The City authorized RH2 Engineering, Inc., (RH2) to prepare this Water System Plan (WSP) as required by state law under Washington Administrative Code (WAC) 246-290-100. In accordance with WAC 246-290-100, the WSP shall be updated and submitted to DOH every 10 years. This WSP has been written to meet 10-year planning requirements. The previous WSP was prepared for the City in 2011. The purpose of this updated WSP is as follows:

- To evaluate existing water demand data and project future water demands;
- To analyze the existing water system to determine if it meets minimum requirements mandated by DOH and the City's own policies and design criteria;
- To identify water system improvements that resolve existing system deficiencies and accommodate the system's future needs for at least 20 years into the future;
- To prepare a schedule of improvements that meets the goals of the City's financial program;

- To document the City's existing water rights, their current status, and future requirements;
- To evaluate past water quality and identify water quality improvements, as necessary;
- To document the City's operations and maintenance program;
- To prepare water use efficiency, cross-connection control, wellhead protection, and water quality monitoring plans; and
- To comply with all other WSP requirements of DOH.

### SUMMARY OF WSP CONTENTS

A brief summary of the content of the chapters in the WSP is as follows.

- The **Executive Summary** provides a brief summary of the key elements of this WSP.
- Chapter 1 introduces the reader to the City's water system, the objectives of the WSP, and its organization.
- Chapter 2 presents the water service area, describes the existing water system, and identifies adjacent water purveyors.
- Chapter 3 presents related plans, land use, and population characteristics.
- Chapter 4 identifies existing water demands and projected future demands.
- Chapter 5 presents the City's operational policies and design criteria.
- Chapter 6 discusses the City's water source, water rights, and water quality monitoring.
- Chapter 7 discusses the water system analyses and existing system deficiencies.
- Chapter 8 discusses the City's operations and maintenance program.
- Chapter 9 presents the proposed water system improvements, and their estimated costs and implementation schedule.
- Chapter 10 summarizes the financial status of the water system and presents a plan for funding the water system improvements.
- The **Appendices** contain additional information and plans that supplement the main chapters of the WSP.

## **DEFINITION OF TERMS**

The following terms are used throughout this WSP.

**Capital Facilities Charge**: A one-time fee paid by a property owner when connecting to the City's water system. This fee pays for a 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.

**Consumption**: The true volume of water used by the water system's customers. The volume is measured at each customer's connection to the distribution system.

**Connection Charge**: A one-time fee paid by a property owner when connecting to the City's system that is made up of both the Capital Facilities Charge and the Meter Installation Charge.

**Cross Connection**: A physical arrangement that connects a public water system, directly or indirectly, with facilities that could present the potential for contaminating the public water system.

**Demand:** The quantity of water required from a water supply source over a period of time to meet the needs of domestic, commercial, industrial, and public uses, and provide enough water to supply firefighting, 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. Flow rates pertinent to the analysis and design of water systems are as follows.

- 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.
- **Maximum Day Demand (MDD)**: 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 1-hour time period of a given year. A system's peak hour demand usually occurs during the same day as the MDD.

**Distribution System Leakage (DSL)**: Water that is measured as going into the distribution system but not metered as going out of the system.

**Equivalent Residential Units (ERUs)**: 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 ERUs 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 firefighting, which is usually expressed in terms of gpm.

**Head**: A measure of pressure or force exerted 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**: Pressure reduction resulting from pipeline wall friction, bends, physical restrictions, or obstructions.

**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 246-290-300, Table 3.

**Meter Installation Charge**: The installation charge or hook-up fee that is paid by a property owner to reimburse the City for the cost incurred to make the physical connection to the water system. This cost includes both direct and indirect costs for installing the service line off the system's water main up to and including the City-owned water meter and advanced metering infrastructure (AMI) equipment.

Potable: Water suitable for human consumption.

**Pressure Zone**: A portion of the water system that operates from sources at a common hydraulic elevation. For example, the 240 Zone refers to the City's lower pressure zone, which has a reservoir with an overflow elevation of 240 feet.

**Purveyor**: An agency, subdivision of the state, municipal corporation, firm, company, mutual or cooperative association, institution, partnership, or 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, springs, 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, which are defined and discussed in more detail in **Chapter 7**: operational storage, equalizing storage, standby storage, fire flow storage, and dead storage.

## LIST OF ABBREVIATIONS

The abbreviations listed in **Table 1-3** are used throughout this WSP.

Table 1-3 Abbreviations

Abbreviation	Description
ADD	Average Day Demand
AMI	Advanced Metering Infrastructure
AWWA	American Water Works Association
CCR	Consumer Confidence Report
CIP	Capital Improvement Program
City	City of Kent
County	King County
CWD	Covington Water District
CWSP	Coordinated Water System Plan
CWSSA	Critical Water Supply Service Area
DBP	Disinfection Byproduct
DOH	Washington State Department of Health
DSL	Distribution System Leakage
EPA	U.S. Environmental Protection Agency
ERU	Equivalent Residential Unit
fps	feet per second
GMA	Growth Management Act
gpm	gallons per minute
HWD	Highline Water District
JOA	Joint Operating Agreement
LMWD	Lake Meridian Water District
LWSD	Lakehaven Water and Sewer District
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDD	Maximum Day Demand
MG	Million Gallons
MGD	Million Gallons per Day
mg/L	milligrams per Liter
OFM	Office of Financial Management
OSHA	Occupational Safety & Health Administration
PHD	Peak Hour Demand
	pounds per square inch
psi RCW	Revised Code of Washington
SCWSD	Soos Creek Water and Sewer District
SDWA	Safe Drinking Water Act
SEPA	State Environmental Policy Act
SOC SWTR	Synthetic Organic Chemical Surface Water Treatment Rule
Tacoma	City of Tacoma (Tacoma Public Utilities)
THM	Trihalomethane
UGA	Urban Growth Area
USGS	United States Geological Survey
VOC	Volatile Organic Chemical
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety & Health Act
WSP	Water System Plan
WUCC	Water Utility Coordinating Committee
WUE	Water Use Efficiency

## 2 | WATER SYSTEM DESCRIPTION

## INTRODUCTION

This chapter describes the City of Kent's (City) retail water service area and water service agreements, and provides a thorough description of the water system and its individual components. The results of the evaluation and analyses of the existing water system are presented in **Chapter 7**.

## WATER SERVICE AREA

#### HISTORY

The City was incorporated in 1890. The water system's origins date to the latter part of the nineteenth century, when a spring was tapped on the East Hill to provide water to the Kent Water and Light Company. In 1891, the City granted a 25-year franchise to the Farmers Water Company and the Kent Water and Light Company to furnish water to the City. The City retained the option to purchase the water system, which it did one year later in 1892.

In 1892, the City financed the construction of a reservoir at the top of Kennebeck Street. Further improvements were made to the water system in 1910. In 1926, the City purchased the Kent Springs water source and began construction of the original Kent Springs Transmission Main 4 years later. In the 1930s, development of the Clark Springs source began and the Guiberson Reservoir was constructed.

In the 1950s, Pump Station #3 and Pump Station #4 were constructed to pump water to the Cambridge Tank and the Reith Road Standpipe on the West Hill to provide service to this area. The 125K Tank was also added near 98<sup>th</sup> Avenue South and South 239<sup>th</sup> Place. The City adopted its first Water System Plan (WSP) in 1955.

The 1960s saw the construction of the 6 Million Gallon (MG) #1 Reservoir, 6 MG #2 Reservoir, and Blue Boy Standpipe, as well as the completion of the transmission main from Clark Springs, which provided the City with redundant spring water sources and transmission mains.

In the 1970s, the 3.5 million-gallon (MG) Tank and Pump Station #5 were constructed. The East Hill Well was developed, the City of Renton (Renton) and City of Tukwila (Tukwila) interties were constructed, and the South 212<sup>th</sup> Street and South 208<sup>th</sup> Street wells were drilled. Chlorination was also added to Kent Springs.

In the 1980s, Pump Station #6 and Pump Station #7 were constructed to improve the level of service on the West Hill. Pump Station #8 also was constructed to provide an intertie with the Highline Water District (HWD). The Garrison Creek Well, Armstrong Springs Wells, and Seven Oaks Well also were developed to provide additional supply. Fluoridation was added to Clark Springs. The City became a member of the South King County Critical Water Supply Service Area (SKCCWSSA) to coordinate water planning efforts and began the process of obtaining additional supply from the City of Tacoma (Tacoma).

In the 1990s, the South 212<sup>th</sup> Street Iron and Manganese Treatment Facility was completed, and the City's first Water Conservation Plan was adopted. As a member of the SKCCWSSA, the

City participated in the development and adoption of the *South King County Coordinated Water System Plan* (CWSP). In addition, major transmission and distribution pipeline improvements were completed, and the Infrastructure Maintenance Management and Inventory System was brought online to assist with planned maintenance. Lead and Copper Rule treatment and siting studies were accomplished in accordance with Safe Drinking Water Act (SDWA) requirements, and seismic evaluations and upgrades were completed on the City's reservoirs and other distribution system infrastructure.

In the 2000s, the Tacoma Regional Water Supply System (RWSS) became the City's third primary water source. The City partnered with Tacoma, Covington Water District (CWD), and Lakehaven Water and Sewer District (LWSD) on this project and in doing so, added 12.64 million gallons per day (MGD) to the City's available supply. Seismic, security, and redundancy upgrades were also made to many of the City's facilities.

In the 2010s, the 640 Tank and additional upgrades were constructed in preparation for the creation of the new 640 Pressure Zone. The Guiberson Corrosion Control Facility was constructed, and additional seismic, security, and redundancy upgrades also have been constructed throughout the system.

#### RETAIL WATER SERVICE AREA

The City's retail water service area, which covers an area of approximately 23.7 square miles, is shown on **Figure 2-1**. The existing service area is predominantly contained within the City's incorporated boundaries, but also includes areas of the City of Auburn (Auburn), and unincorporated King County. The existing service area is approximately bordered by Interstate 5 (I-5) to the west, SE 304<sup>th</sup> Street to the south, S 180<sup>th</sup> Street to the north, and 128<sup>th</sup> Avenue SE to the east. Along the north-south axis of the system, the retail water service area is approximately 7.6 miles long. Along the east-west axis, the existing retail water service area is approximately 5.7 miles wide. The City will provide water service throughout the existing retail water service area in accordance with the Municipal Water Law's duty to provide service requirements. The existing retail water service area defines the place of use for each water right held by the City for municipal water supply purposes. The place of use can be updated through subsequent water system planning or engineering document submittals that are approved by the Washington State Department of Health (DOH).

Along with the existing retail water service area, Kent's city limits, neighboring city limits, the King County urban growth area (UGA) boundary, and Kent's Potential Annexation Areas (PAAs) are shown in **Figure 2-1**.

#### TOPOGRAPHY

The topography of the existing service area is lowest in the valley (20 feet) at the center of the city that runs north and south (Green River Valley), with the highest elevations on the east and west hillsides of the City, respectively called East Hill and West Hill. The highest existing service elevations are located on East Hill, at approximately 500 feet. The majority of the existing system is located within the Green River watershed.

#### GEOLOGY1

The City is located in the southeastern part of the Puget Sound Lowland, which is a topographically low region between the Olympic Mountains and the Cascade Range. This area has been subjected to repeat episodes of advancing and retreating continental glaciation, as well as the deposition of sediment from rivers and streams flowing from the Cascade Range during periods when the continental glaciers were not present. The City's service area includes topographic uplands to the east (Covington Upland) and west (Des Moines Upland) flanking a wide, flat-bottomed north-south trending valley (Green River Valley). Downtown Kent is located on the eastern edge of the Green River Valley.

Bedrock, consisting primarily of sedimentary rock such as sandstone, siltstone, shale, and coal, is found below an elevation of approximately 400 feet below sea level beneath Downtown Kent. Bedrock crops out, or is found closer to ground surface, farther to the north and east of the City.

Above the bedrock are unconsolidated sediments that have been deposited during glacial and non-glacial periods over the past several hundred thousand years. Glacial sequences typically consist of advance outwash (sand), glacial till (unsorted mixture of silt, sand, and gravel), and recessional outwash (sand and gravel). Non-glacial sequences are typically alluvial (layered silt, sand, and gravel) and lacustrine (clay and silt) in nature. The glacial sequences that have been named in this area include the Double Bluffs Glaciation (greater than 100,000 years old), the Possession Glaciation (80,000 to 60,000 years old), and the Vashon Glaciation (23,000 to 10,000 years old). The non-glacial deposits include the Whidbey Interglaciation (100,000 to 80,000 years old), the Olympia Interglaciation (60,000 to 23,000 years old), and the Holocene age sediments (10,000 years old to present).

The upland areas (Des Moines Upland and Covington Upland) are glaciated drift plains that were shaped by the Vashon Glaciation. The most prevalent geologic unit at the ground surface on the drift plains are Vashon Glacial Till, which was laid down beneath the most recent continental glacier. The glaciated drift plains contain oblong north-south orientated hills and depressions created by the advance and retreat of the Vashon continental glacier over the area. In various locations the recessional outwash was deposited preferentially in the depressions; in other areas the recessional outwash streams incised into the glacial till and formed thicker recessional outwash channels.

The alluvial deposits on the uplands are typically very thin, whereas the alluvial deposits beneath the Green River Valley can be hundreds of feet thick.

All sediments older than the Vashon recessional outwash have been overridden by a glacier and compacted. This compaction means that those sediments more easily support foundations. Liquefaction susceptibility of these sediments, as presented by the Washington State Department of Natural Resources, range from very low to moderate. The Vashon recessional outwash deposits have low liquefaction susceptibility. The recent alluvium deposits can be loose and, where saturated, can be susceptible to liquefaction, which has implications for infrastructure. All alluvial deposits in the Green River Valley have medium to high liquefaction susceptibility.

Groundwater recharge to the City's sources primarily originates as precipitation. Groundwater flows both laterally (east to west) and vertically downward under the uplands, which are the

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<sup>&</sup>lt;sup>1</sup> Reference: Woodward, D.G., Packard, F.A., Dion, N.P., and Sumioka, S.S. 1995. *Occurrence and Quality of Ground Water in Southwestern King County, Washington*. U.S. Geological Survey. Water-Resources Investigations Report 92-4098.

recharge areas. Groundwater flow beneath the Green River Valley is generally downstream (north) and vertically upward since this is a regional discharge area.

The City's spring sources are primarily situated at locations where the Vashon recessional outwash aquifer, or older adjacent aquifers, are pinched or constricted, which forces the water to discharge from the aquifer.

## INVENTORY OF EXISTING WATER FACILITIES

This section provides a detailed description of the existing water system and the current operation of the facilities. The analysis of the existing water facilities is presented in **Chapter 7**. Additional information on the City's existing water system facilities is included on DOH Water Facilities Inventory (WFI) form in **Appendix A**.

#### PRESSURE ZONES

The City serves customers within an elevation range from 20 feet above sea level in the valley running north and south through the middle of the system to approximately 500 feet above sea level on the east side of the system, also referred to as East Hill. This wide elevation range requires that the water pressure be increased or reduced to maintain pressures that are safe and sufficient to meet the flow requirements of the system. The City achieves this by dividing the water system into 13 different pressure zones, as shown in **Figure 2-1**. The pressure in each zone is regulated by reservoir levels, pressure reducing station settings and other control valve settings, pump settings, or a combination of these, as illustrated in the hydraulic profile (**Figure 2-2**).

#### Central Valley

#### 240 Pressure Zone

The 240 Zone is the largest pressure zone in the City, serving the lowest elevations in the valley between the East Hill and West Hill. The Kent Springs Transmission Main (KSTM) terminates at the 240 Zone's Guiberson Reservoir, and can provide water to the zone from Kent Springs, the Armstrong Springs Wells, the Seven Oaks Well, and Tacoma. The zone also can be supplied directly with water from the O'Brien Well, the 208<sup>th</sup> Street/212<sup>th</sup> Street Wellfield, and the Garrison Creek Well. Pressures in the 240 Zone are established by the 6 MG #2 Reservoir and the Guiberson Reservoir. This zone currently serves customers within an elevation range between approximately 20 feet and 135 feet. There also are interties with Tacoma, Tukwila, Auburn, and Renton connected to the 240 Zone.

#### East Hill

#### 271 Alvord Pressure Zone

The 271 Alvord Zone is supplied by one pressure reducing station from the 485 Zone that establishes pressures in the zone. This pressure zone currently serves customers within an elevation range between approximately 60 feet and 170 feet, and is located near the base of the East Hill, just north of Mill Creek, primarily between Alvord Avenue N and Hazel Avenue.

#### 308 Hilltop Pressure Zone

The 308 Hilltop Zone is a very small zone supplied by one pressure reducing station from the 485 Zone that establishes pressures in the zone. This pressure zone currently serves customers within an elevation range of 120 feet and 130 feet. This pressure zone also is located near the base of the East Hill and only provides water to customers along 91st Avenue South.

#### 339 Seattle Pressure Zone

Water is supplied to the 339 Seattle Zone by one pressure reducing station from the 485 Zone that establishes pressures within the zone. The 339 Seattle Zone is located on a small plateau near the base of East Hill, predominantly between Van De Vanter Avenue to the east and Scenic Way to the west. The zone currently serves customers within an elevation range between approximately 70 feet and 270 feet.

#### 366 Stetson Pressure Zone

The 366 Stetson Zone is a small pressure zone located on the East Hill; this zone is supplied water by one pressure reducing station from the 485 Zone. The 366 Stetson Zone serves customers on the following four streets: Hazel Avenue N; Valley Place; Stetson Avenue; and Crest Place. This zone currently serves customers within an elevation range between approximately 170 feet and 230 feet.

#### 368 Weiland Pressure Zone

Water is supplied to the 368 Weiland Zone by one pressure reducing station from the 485 Zone that establishes pressure in this zone. This zone currently serves customers within an elevation range between approximately 110 feet and 210 feet, and is located just north of Mill Creek along Canyon Drive and Weiland Street.

#### 416 Pressure Zone

The 416 Zone is a very small zone that consists predominantly of the transmission main from the 416 Zone 6 MG #1 Reservoir to the 240 Zone 6 MG #2 Reservoir. The transmission main follows 98<sup>th</sup> Avenue S northwards from the 6 MG #1 Reservoir before crossing through several neighborhoods to the northwest until the main intersects S 218<sup>th</sup> Street, where it heads east to fill the 6 MG #2 Reservoir. There are a limited number of customers connected to the transmission main, and the City plans to transfer these customers to other pressure zones in the future. Elevations in this pressure zone range from approximately 80 feet to 380 feet. The Clark Springs Transmission Main (CSTM) terminates at the 6 MG #1 Reservoir, supplying water from Clark Springs, the Armstrong Springs Wells, and the Seven Oaks Well.

#### 485 Pressure Zone

The 485 Zone is supplied with water from Pump Station #5 and three pressure reducing stations connected to the 590 Zone. Pressures in this zone are established by the 125K Tank. This zone currently serves customers within an elevation range between approximately 150 feet and 400 feet, and is located between S 218<sup>th</sup> Street at its northern extent, and East Maple Street to its southern extent.

#### 590 Pressure Zone

The 590 Zone is the system's second largest pressure zone and serves the eastern portions of the water system. This zone is supplied water by a direct connection to the Tacoma RWSS at Point of Delivery (POD) #3, the East Hill Well, and Pump Station #5. Pressure is established by the Blue Boy Standpipe, the 3.5 MG Tank, and the 640 Tank. The 640 Tank was constructed to provide storage for a future 640 Pressure Zone but is operated in the 590 Zone until all necessary facilities are constructed for establishment of the 640 Zone. Customers in the 590 Zone are located in an elevation range between approximately 290 feet and 500 feet. The 590 Zone serves customers between SE 225<sup>th</sup> Place and SE 304<sup>th</sup> Street.

West Hill

#### 354.5 Pressure Zone

The 354.5 Zone, the lowest West Hill pressure zone, is supplied water by Pump Station #3. A pressure reducing valve (PRV) at Pump Station #4 also allows the zone to be supplied from the higher elevation zones on the West Hill in a maintenance or emergency situation. The pressure in the 354.5 Zone is established by the Reith Road Standpipe. This zone currently serves customers within an elevation range between approximately 90 feet and 280 feet and is located primarily between Reith Road and Lake Fenwick Road.

#### 529 Pressure Zone

Water is supplied to the 529 Zone by Pump Station #4. In an emergency situation, water can be supplied from the 587 Zone through the 42<sup>nd</sup> Avenue South PRV. Pressure in the zone is established by the Cambridge Tank, located in the southwest corner of the zone. The 529 Zone serves customers within an elevation range between approximately 280 feet and 430 feet and is located in the southwest corner of the system between Military Road South and Lake Fenwick Road South.

#### 575 Pressure Zone

The 575 Zone is a small, closed pressure zone that is supplied water from Pump Station #7, which establishes the pressure in this zone. During a fire flow event exceeding the capacity of Pump Station #7, the pump station will shut off and the zone will be supplied through a check valve from the Cambridge Tank, which has an overflow elevation of 529 feet. The check valve is located at Pump Station #7. The 575 Zone is also located in the southwest corner of the City's system between S 268<sup>th</sup> Street and S 263<sup>rd</sup> Street. This zone currently serves customers within an elevation range between approximately 410 feet and 450 feet.

#### 587 Pressure Zone

The 587 Zone is a closed pressure zone supplied water by Pump Station #6, which establishes the pressure in the zone. Like the 575 Zone, during a fire flow event exceeding the capacity of Pump Station #6, the pump station will shut off and the zone will be supplied from the Cambridge Tank, which has an overflow elevation of 529 feet, via two check valves. One check valve is located at the Pump Station #6 site, and the second is located near the intersection of Military Road South and S 259<sup>th</sup> Place. Pump Station #8 is also connected to the 587 Pressure Zone. This pump station provides water from the HWD intertie, which is available for emergency supply, fire flow, and maintenance purposes. Pump Station #8 provides the only

redundant supply to the West Hill pressure zones, which is otherwise supplied only by Pump Station #3. The 587 Zone is located in the southwest corner of the City's system, between S Reith Road and S 239<sup>th</sup> Place. This zone provides water to customers located at an elevation between approximately 330 feet and 450 feet.

#### SUPPLY FACILITIES

#### Introduction

Water in the City's system is supplied predominantly from Kent Springs, Clark Springs, and the Tacoma Second Supply Pipeline. The City utilizes its wells periodically to ensure that all sources are regularly exercised, but does not typically operate these sources due to their higher cost of operation compared to Kent Springs, Clark Springs, and the Tacoma intertie.

A summary of the City's sources of supply is shown in **Table 2-1**. Additional information on the City's sources of supply, water treatment, and water quality monitoring is contained in **Chapter 6**.

Table 2-1
Supply Facilities Summary

			11 )		,	,	
Facility	Туре	Supplies Water To	Year Installed	Use	Existing Capacity (gpm)	Water Treatment	Generator
208th Street/ 212th Street Wellfield	4 wells	240 Zone	1982, 2001	Active	3,500	Chlorination, Fluoridation, Manganese/Iron/Hydrogen Sulfide Removal, pH Adjustment	208th: None 212th: Hookup for portable generator
Armstrong Springs Wells	2 wells	CSTM/ KSTM	1982	Active	1,050	Chlorination, Fluoridation, pH Adjustment	On-site
Clark Springs	Infiltration gallery and collector, 3 wells	CSTM	1957, 1969	Active	5,400	Chlorination, Fluoridation, pH Adjustment	On-site generator partially powers facility
East Hill Well	1 well	590 Zone	1979	Active	1,900	Chlorination, Fluoridation, pH Adjustment	On-site
Garrison Creek Well	1 well	240 Zone	1981	Active	500	Chlorination, Fluoridation	On-site generator for SCADA system only
Kent Springs	Infiltration gallery, 3 wells	KSTM	1908, 1977, 2001	Active	3,680	Chlorination, Fluoridation, pH Adjustment	On-site generator
O'Brien Well	1 well	240 Zone	1951	Active	243	Chlorination, Fluoridation	None on-site, towed generator is used
Seven Oaks Well	1 well	CSTM/ KSTM	1982	Active	350	Chlorination, Fluoridation, pH Adjustment	None
Tacoma RWWS	Intertie	KSTM/ 590 Zone	2005	Active	8,778	Chlorination, Fluoridation, Filtration, Ozone Treatment, pH Adjustment <sup>1</sup>	Site has full backup power

 $<sup>1 =</sup> pH \ adjustment \ occurs \ in \ Tacoma \ system \ and \ when \ RWSS \ water \ is \ directed \ through \ the \ KSTM \ to \ the \ Guiberson \ Reservoir.$ 

#### Water Treatment

All City water sources are chlorinated and fluoridated. In 2015, the Tacoma Green River filtration facility was completed, allowing for less-constrained use of the Tacoma supply. Aeration and sodium hydroxide pH adjustment are used at the Guiberson Reservoir site to treat blended Kent Springs and Tacoma water. The City also uses pH adjustment at the 212<sup>th</sup> Street Treatment Plant, Pump Station #5, and the East Hill Well.

#### 212th Street Treatment Plant

The 212<sup>th</sup> Street Treatment Plant is located at 9001 S 212<sup>th</sup> Street and was put into service in 1993. The 212<sup>th</sup> Treatment Plant treats the water from the 208<sup>th</sup> Street/212<sup>th</sup> Street Wellfield. Like all of the City's well and spring sources, the water goes through a chlorination and fluoridation process. Pressure filters use potassium permanganate and greensand technology to remove iron, manganese, and hydrogen sulfide at this plant. The plant also introduces a pH adjustment with the addition of sodium hydroxide to reduce the corrosivity of the finished water on household plumbing and maintain compliance with the Lead and Copper Rule.

In 2008, the treatment plant received new programmable logic controller (PLC) upgrades. In 2016, a mag meter upgrade took place and a new auma valve control actuator was installed.

#### Water Supply

#### 208th Street/212th Street Wellfield

The 208<sup>th</sup> Street/212<sup>th</sup> Street Wellfield consists of four wells – three on the 212<sup>th</sup> Street Treatment Plant site and one behind WinCo foods on S 208<sup>th</sup> Street – that supply water to the 240 Zone. The first wells were constructed in 1982, the treatment plant was brought online in 1993, and an additional well was constructed on the treatment plant site in 2001 to address a drought and declining capacity in Wells #1 and 2. The total capacity of the wellfield is approximately 3,500 gallons per minute (gpm). Interference between the three 212<sup>th</sup> Street Wells can sometimes affect the total capacity. In 2015, the 212<sup>th</sup> Street Well #3 received a motor replacement.



212<sup>th</sup> Street Treatment Plant Building

Because the 212<sup>th</sup> Street Treatment Plant is relatively expensive to operate compared to the City's spring sources and the Tacoma supply, the wellfield is typically only operated for around 2 weeks annually for exercise and operator familiarization.

#### Armstrong Springs Wells

The Armstrong Springs Wells are a wellfield located south of SE 272<sup>nd</sup> Street, immediately next to Jenkins and Cranmar Creek, south of Covington. The immediate surrounding area has been annexed into the City. The two wells were installed in 1982 and are approximately 80 to 90 feet deep. Permanent treatment facilities, which provide chlorination and fluoridation, were installed in 2002, and the chlorination equipment was upgraded in 2013. The wells are capable of producing approximately 1,050 gpm and can pump to either the CSTM or KSTM. Facilities at the termination points of the CSTM and KSTM provide pH adjustment. In 2016, a back-up power generator with motor control center (MCC) upgrades was installed, and the City made a

property purchase for the purpose of source protection. The property purchase consisted of 10 acres to the north of the wells, between the wells and Highway 516. The City has demolished all buildings on the property.

#### Clark Springs

The Clark Springs source is the easternmost City-owned source, located south of SE Kent-Kangley Road, east of Maple Valley, adjacent to Rock Creek. Like Kent Springs, the approximately 320 acres of property surrounding the Clark Springs source has been annexed to the City for municipal supply purposes. The Clark Springs water source consists of an infiltration gallery and collector, and three wells that supply water to the system via the CSTM. The water is treated with chlorine and fluoridation at the source, and is also treated at a pH adjustment facility located at the Pump Station #5 site. The total capacity of the source is approximately 5,400 gpm.

Constructed in 1957, the Clark Springs infiltration gallery and collector consists of a gallery of several hundred feet of 16-inch perforated steel pipe, lying horizontally 15 to 20 feet below ground surface and extending under Rock Creek. Water is collected in the gallery from a wide area and diverted to a chamber at the beginning of the CSTM. A valved section of 12-inch pipe extending beneath the Rock Creek channel to the southern side also is connected to the gallery. Like the Kent Springs source, the Clark Springs source experiences reduced capacity in the summer months as the aquifer levels decline.

The three Clark Springs wells, which are approximately 50 to 80 feet deep, were constructed in 1969 and rehabilitated in 1985 due to corrosion-related capacity reduction. Maintenance and rehabilitation of the pumps occurred in 2002. The area is subject to electrolysis problems that limit the remaining useful life of the wellfield. In 2008, a security fence was added around the infiltration gallery. Levee improvements were constructed to protect the infiltration gallery in 2008 and 2012. In 2009, the clearwell variable frequency drive (VFD) was replaced, and in 2010 the Well #2 pump received a VFD upgrade. Security improvements to the clearwell and a hood installation were completed in 2011, and a surge tank electrical upgrade was completed in 2012. In 2015, the Well #1 MCC was replaced.

Due to the close proximity of the Clark Springs sources to the Landsburg Mine site, over many years the City has advised the Washington State Department of Ecology (Ecology) of the City's serious concerns about the site and the efforts overseen by Ecology to address the site's environmental conditions. In recent years, the City submitted to Ecology comments in opposition to Ecology's cleanup action plan for the site, seeking further investigation/action at the site, and a cleanup action plan more protective of area groundwater, including the Clark Springs source aquifers. The City also has implemented various activities to increase monitoring and sampling at and near Clark Springs.

The Rock Creek Habitat Conservation Plan was completed in 2011.

#### East Hill Well

The East Hill Well was originally constructed in 1979. The well provides water directly to the 590 Zone and is located on 104<sup>th</sup> Avenue SE between SE 244<sup>th</sup> Street and SE 248<sup>th</sup> Street. The well pump and motor were replaced in 2000; a pH adjustment treatment facility was installed in 2003; and the well received new chlorination equipment in 2007. The source is also fluoridated. An on-site engine generator set for back-up power was installed in 2013. The well was redeveloped in 2017, and a new pump and motor were installed. The East Hill Well is capable of providing approximately 1,900 gpm to the system.



**East Hill Well** 

#### Garrison Creek Well

Located at Garrison Creek Park on the same site as the 6 MG #2 Reservoir, the Garrison Creek Well supplies water directly to the 240 Pressure Zone. The original Garrison Creek Well, installed in 1981, lost capacity as a result of the 2001 Nisqually earthquake. The well was re-drilled in 2004.

Water from the Garrison Creek Well is typically pumped directly into the 6 MG #2 Reservoir but can be pumped to the distribution system. The water is chlorinated and fluoridated. The well is capable of providing approximately 500 gpm to the system.



Garrison Creek Well

#### Kent Springs

The Kent Springs source was originally constructed in 1908 and has been providing water to the City for over 100 years. The source is located near Black Diamond just north of Lake Sawyer, several miles east of the distribution system, in an area of approximately 75 acres that has been annexed into the City for municipal supply purposes. The source consists of a spring-fed infiltration gallery and a wellfield, both of which can provide water to the KSTM. The water from this source is treated with a chlorination and fluoridation process before being supplied to the City. New chlorination equipment was installed in 2015. Additionally, pH adjustment takes place at the Guiberson Reservoir site. The total capacity of the source is approximately 3,680 gpm.

Located at the base of a hillside where the springs discharge, the Kent Springs infiltration gallery was constructed in 1908, and remains in good condition. The gallery is constructed of several hundred feet of perforated concrete pipe buried up to 10 to 15 feet deep. During the warmer months, the capacity of the infiltration gallery drops, and the wellfield is utilized. In 2015, a gallery level sensor was installed.

The Kent Springs wellfield consists of three wells. Well #1 and #2 were drilled in 1977, and Well #3 was drilled during drought conditions in 2001. The wells are drilled to approximately 70 to 105 feet deep and experience a reduced capacity during the summer due to lower aquifer levels, which are speculated to be caused by increasing withdrawals from exempt wells in the area. This reduced capacity limits the ability of Kent Springs to respond to peak demand events during the summer. The wellfield is also subjected to significant corrosion problems, caused by the nearby Bonneville Power Administration power lines. In 2008, security fencing was added

around Wells #1, #2, and #3. Kent Springs currently has a small generator which cannot power the entire facility; a larger-capacity generator is anticipated to be installed in the near future.

#### O'Brien Well

The O'Brien Well was originally constructed in 1951 and re-drilled in 1999. The well is located in the 240 Zone, approximately ½ mile south of the 212<sup>th</sup> Street Treatment Plant. The O'Brien Well is an artesian well, and equipped with pumping equipment to deliver up to 243 gpm to the 240 Zone. The water produced from the well is chlorinated and fluoridated. Typically, the well is only operated during periods of peak demands to supplement the primary sources. However, the well has been experiencing water quality issues and is run only occasionally to exercise the source. No back-up power is available on site.



O'Brien Well

#### Seven Oaks Wells

The Seven Oaks Well was drilled in 1982 and is located near the intersection of 116<sup>th</sup> Avenue SE and SE Kent-Kangley Road. The water is treated with a chlorination and fluoridation process before it is sent into the City's distribution system. Water from the Seven Oaks Well can be pumped to either the CSTM or KSTM. Facilities at the termination points of these transmission mains provide pH adjustment. The well is capable of producing approximately 350 gpm but is run only occasionally to exercise the source.

#### Tacoma RWSS

In 1985, the City entered into an agreement wherein the City would share in the capital costs and operational and maintenance costs of what was previously referred to as the City of Tacoma's Green River Pipe Line No. 5 (also previously



Seven Oaks Well

referred to as the Second Supply Pipeline or SSP), including portions of the water right and surface water storage behind the Howard Hansen Dam. Several other purveyors also participated in the project. The City's portion of the available capacity is 12.64 MGD, or approximately 8,778 gpm.

In 2005, the 34-mile-long pipeline began conveying water. Turbidity in the Green River has historically constrained use of the Tacoma supply to the months of June through September, resulting in the construction of the Green River filtration facility. With the completion of this facility in 2015, the Tacoma supply can now be utilized year-round. The City is required to accept a consistent flow rate from Tacoma, with a 1-week warning required to change this flow rate. Other City sources provide modulation in response to actual demands.

There are three City connections to the RWSS. The first, POD #1, is located at Kent Springs and supplies water to the KSTM. The second, POD #2, located near the intersection of 124<sup>th</sup> Avenue SE and SE 296<sup>th</sup> Street, has been left undeveloped. POD #2 currently consists of a manhole over the transmission main, which contains a tee with a blind flange. The third, POD #3, is located

near the 3.5 MG Tank, and can supply water to either the KSTM or the 590 Pressure Zone. In the future, POD #3 will provide water to the 640 Pressure Zone without the need for a booster pump station.

Water is filtered at the Green River filtration facility, chlorinated, fluoridated, adjusted for pH, and undergoes ozone treatment before it reaches the City. If RWSS water is directed to the KSTM, the water also undergoes a pH adjustment before entering the distribution system at the Guiberson Reservoir.

#### PUMP STATION FACILITIES

The City's water system has six booster pump station facilities that provide supply to the 354.5 Zone, 485 Zone, 529 Zone, 575 Zone, 587 Zone, and 590 Zone. A summary of the pumping facilities is shown in **Table 2-2**, and a detailed description of each facility is provided below.

Table 2-2
Booster Pump Station Facilities Summary

Pump Station	Suction Pressure Zone	Discharge Pressure Zone	Year Constructed	Existing Pumping Capacity (gpm)	Number of Pumps	Pump Type	Pump Motor Size (HP)	Generator
Pump Station #3	240 Zone	354.5 Zone	1959	1,800	2	Horizontal split case	(2) 50	On-site
Pump Station #4	354.5 Zone	529 Zone	1959	3,800	3	Horizontal split case	(2) 75 (1) 150	On-site
Pump Station #5	416 Zone	485 and 590 Zones	1975	6,350	4	Horizontal split case	(2) 125, (1) 40, (1) 40/125	On-site
Pump Station #6	529 Zone	587 Zone	1984	1,200	3	Vertical turbine	(3) 20	Has hookup for portable generator
Pump Station #7	529 Zone	575 Zone	1985	500	2	Horizontal	(2) 10	On-site
Pump Station #8	Highline Water District 560 Zone	587 Zone	1986	1,200	3	Vertical turbine	(3) 20	Has hookup for portable generator

#### Pump Station #3

Originally constructed in 1959, and upgraded in 1979 to increase capacity, Pump Station #3 is located at the intersection of Reith Road and Lake Fenwick Road. Pump Station #3 has two 900 gpm pumps that supply water from the 240 Zone to the 354.5 Zone. Besides the emergency intertie with HWD, Pump Station #3 is the only pump station supplying water to the City's West Hill pressure zones.

Typically, only one of the two pumps are operated at a time. The pump station has an on-site engine generator set for back-up power supply. Upgrades of the automatic transfer switch and motor control center, as well as the installation of either soft starts or VFDs are planned for 2018.



Pump Station #3

#### Pump Station #4

Like Pump Station #3, Pump Station #4 was originally constructed in 1959. It has received upgrades in 1979, 1983, and 1997 to improve pumping capacity and reliability. Pump Station #4 has two 900 gpm pumps and one 2,000 gpm pump that supply water from the 354.5 Zone to the 529 Zone.

This station is located on the same site as the Reith Road Standpipe. If the standpipe and Pump Station #3 are taken offline for maintenance or an emergency situation, a PRV on site can supply water to the 354.5 Zone from the HWD intertie via the 529 Zone. Pump Station #4 currently has a back-up diesel engine



**Pump Station #4** 

that can directly drive the 2,000 gpm pump if electrical power is lost. The City plans to add a new engine generator set on site because it is difficult to find replacement parts for the aging diesel engine.

## Pump Station #5

Located on the same site as the 6 MG #1 Reservoir and the 125K Tank, Pump Station #5 was constructed in 1975. The pump station has two 1,225 gpm pumps that supply water from the 416 Zone to the 485 Zone, and two dual-speed 1,950 gpm pumps that supply water from the 416 Zone to the 590 Zone. One of the 1,225 gpm pumps (Pump 2) is a dual speed pump that is also capable of supplying the 590 Zone. Two of these four pumps are used to supply water to the 485 Zone and the other two are used to provide water to the 590 Zone, alternating monthly which pumps are running. Back-up power is provided by an engine generator set inside the building. Control valve auma



Pump Station #5

replacements were installed in 2012. In 2015, an MCC upgrade took place, with soft starts for pumps 3 and 4. In 2016, the control vault for the 125K Tank was upgraded.

The Pump Station #5 building also contains a pH adjustment facility, which provides corrosion control for water supplied to the system through the CSTM. A PRV located inside the pump station also allows water to be supplied from the 590 Zone to the 416 Zone, and from here to the 240 Zone via the 6 MG #1 Reservoir to 6 MG #2 Reservoir Transmission Main. This provides a means for Tacoma water to be supplied to the 240 Zone and West Hill if the KSTM and CSTM are offline.

#### Pump Station #6

Originally constructed in 1984, Pump Station #6 is located in an underground vault near the intersection of South Reith Road and 38<sup>th</sup> Avenue South. Using three vertical turbine pumps, the booster pump station supplies water from the 529 Zone to the closed 587 Zone. One pump is typically running; the pumps alternate every 8 hours. If demands in the 587 Zone exceed approximately 1,220 gpm for 2 minutes, the pumps are automatically turned off and flow is provided by gravity through two check valves from the 529 Zone.

All of the pump motors are equipped with VFDs. Pump Station #6 is not equipped with on-site back-up power, but an emergency generator transfer switch was installed in 2011.



**Pump Station #6** 

#### Pump Station #7

Pump Station #7 was built in 1985 and is located in an underground vault on the same site as the Cambridge Reservoir, just south of S 264<sup>th</sup> Street. This pump station is equipped with two pumps that supply water from the 529 Zone to the 575 Zone. Pump 1 (the station's small pump) was taken offline in 2009. If demands in the 575 Zone exceed approximately 450 gpm for 3 minutes, the pumps are automatically turned off and flow is provided by gravity through a check valve from the 529 Zone. Control modifications to include VFDs took place in 2009, and a new mag meter was installed in 2012. An on-site engine generator set was installed in 2012 to provide back-up power.



**Pump Station #7** 

# Pump Station #8

Pump Station #8 is an underground pump station that was built in 1986. It is located just east of I-5 on S 240<sup>th</sup> Street. The pump station is used in emergency situations to provide water from HWD to the 587 Zone and other West Hill zones. The pump station contains three identical 400 gpm vertical turbine pumps equipped with VFDs. The VFDs were replaced in 2008.



**Pump Station #8** 

# STORAGE FACILITIES

The City's water system has nine storage facilities that provide storage to various zones in the system. A summary of the storage facilities is shown in **Table 2-3**, and a detailed description of each facility is provided in the following sections.

Table 2-3 Storage Facilities Summary

Reservoir	Approximate Location	Pressure Zone	Year Constructed	Construction Type	Capacity (MG)	Diameter (feet)	Base Elev. (feet)	Overflow Elev. (feet)
6 Million Gallon #2 Reservoir	Garrison Creek Park	240 Zone	1969	Reinforced concrete below grade	6	Variable	212	240
Guiberson Reservoir	E Guiberson St and Kensington Ave S	240 Zone	Late 1930s	Reinforced concrete below grade	3	Variable	222	240
Reith Road Standpipe	Reith Rd S, just north of W Fenwick Park	354.5 Zone	1959	Steel	1.0	66	315.0	354.5
6 Million Gallon #1 Reservoir	98th Ave S and S 239th PI	416 Zone	1967	Steel	6.0	146	370.0	418.0
125K Tank	98th Ave S and S 239th PI	485 Zone	1958	Elevated steel	0.125	32	462.0 <sup>1</sup>	485.0
Cambridge Tank	S 264th St and Military Rd S	529 Zone	1959	Elevated steel	0.3	53.33	499.1 <sup>2</sup>	529.0
3.5 MG Tank	124th Ave SE and SE 286th Pl	590 Zone	1978	Steel	3.5	74	483.4	592.9
640 Tank	SE 248th St and 124th Ave SE	590 Zone (Future: 640 Zone)	2011	Steel	4.0	75	523.0	595.0 (Future: 645.0)
Blue Boy Standpipe	112th Ave SE and SE 246th Pl	590 Zone	1965	Steel	0.97	42	499.7	593.8

<sup>1 =</sup> Ground elevation 386.8 feet.

<sup>2 =</sup> Ground elevation 441 feet.

#### 240 Zone

#### 6 MG #2 Reservoir

The 6 MG #2 Reservoir, also referred to as the Garrison Creek Reservoir, is a 6.0 MG covered, underground reinforced concrete reservoir located in Garrison Creek Park. Sports courts are located atop its roof slab. The reservoir was constructed in 1969 and provides storage for the 240 Zone. The reservoir has a base elevation of 211.5 feet and an overflow elevation of 240 feet. The reservoir diameter is variable. The 6 MG #1 Reservoir to 6 MG #2 Reservoir Transmission Main terminates at the reservoir.



6 MG #2 Reservoir

Seismic improvements were made to the reservoir in 1999. Vent security improvements were

constructed in 2008. The reservoir was last inspected and cleaned approximately 3 years ago. During that time, the overflow piping was also resealed. Hatch security improvements were constructed in 2016.

#### Guiberson Reservoir

The Guiberson Reservoir, constructed in the late 1930s as part of the Works Progress Administration (WPA) program, is a 3.0 MG covered, underground reinforced concrete reservoir located near the intersection of East Guiberson Street and Kensington Avenue South. The reservoir is the termination point for the KSTM and provides storage for the 240 Zone.

The reservoir has a base elevation of 221.5 feet and an overflow elevation of 240 feet. A back-up generator was installed on site in 2009. A 12-inch-diameter bypass was installed in 2010, and a 10-inch flow control valve was installed in 2012.



**Guiberson Reservoir** 

Reservoir lining was installed in 2016, along with inlet manifold and security door improvements. The exterior metal walls were recently painted. To maintain compliance with the Lead and Copper Rule (LCR), pH adjustment of water from the KSTM occurs onsite both by aeration/spraying of the discharge to strip carbon dioxide, and by a sodium hydroxide pH adjustment process at the Guiberson Corrosion facility, which was installed in 2011.

#### 354.5 Zone

#### Reith Road Standpipe

Installed in 1959, the Reith Road Standpipe is a 1.0 MG steel tank providing storage to the 354.5 Zone. The tank is located along Reith Road South, just north of West Fenwick Park. The tank has a base elevation of 315 feet, an overflow elevation of 354.5 feet, and a diameter of 66 feet.

The tank was last recoated in 1991, and received some fall protection equipment in 1997. Interior and exterior recoating, as well as additional fall protection, have been identified as future capital improvement projects. Following a seismic evaluation, repairs to the concrete ringwall and anchorage were completed in 2005. Access to the back of the tank is challenging due to close proximity to a steep slope; geotechnical consultants are evaluating the



Reith Road Standpipe

feasibility of constructing a retaining wall and road around the back of the tank to improve access.

416 Zone

#### 6 MG #1 Reservoir

The 6 MG #1 Reservoir is a 6.0 MG steel tank that was constructed in 1967 and is located on the same site as Pump Station #5 and the 125K Tank (approximately 98<sup>th</sup> Avenue South and S 239<sup>th</sup> Place). The reservoir is the termination point of the CSTM and the beginning point of the 6 MG #1 Reservoir to 6 MG #2 Reservoir Transmission Main. Water from the CSTM receives pH adjustment at Pump Station #5.

This reservoir is 146 feet in diameter, with a base elevation of 370 feet, and an overflow elevation of 418 feet. Following a seismic analysis, the reservoir received concrete ringwall and anchorage strap repairs in 2005; the exterior also was recoated at this time. The security fencing was upgraded in 2010.



6 MG #1 Reservoir

485 Zone

#### 125K Tank

The 125K Tank is located near 98<sup>th</sup> Avenue South and S 239<sup>th</sup> Place, on the same site as the 6 MG #1 Reservoir and Pump Station #5, where it provides 125,000 gallons of storage for the 485 Zone. The 32-foot-diameter elevated steel reservoir was constructed in 1958. The ground elevation is approximately 387 feet, the base of the tank itself is 462 feet, and the overflow elevation is 485 feet. The tank received seismic repairs, a recoating, and some fall protection improvements in 1999. Additional seismic upgrades were added in 2008. A tank drain check valve was installed in 2012. While the interior is in good condition, the exterior will need to be stripped and recoated as a future capital improvement project.



125K Tank

529 Zone

#### Cambridge Tank

The elevated steel Cambridge Tank, constructed in 1959, provides approximately 300,000 gallons of storage to the 529 Zone, and provides fire flow storage to the 587 and 575 Zones, which are supplied water from the 529 Zone through check valves during fire flow conditions. The reservoir is located at approximately S 264<sup>th</sup> Street and Military Road South.

The 53.33-foot-diameter tank has a ground elevation of 441 feet, a tank base elevation of 499.1 feet, and an overflow elevation of 529 feet. Fall protection improvements were made in 1991 and 1997. Seismic improvements were completed in 2005, and tank overflow and drain improvements were completed in 2012. The tank is slated for interior/exterior recoating in the near future.



**Cambridge Tank** 

#### 590 Zone

#### 3.5 MG Tank

The City's 3.5 MG Tank is located near the intersection of SE 286<sup>th</sup> Place and 124<sup>th</sup> Avenue SE, just north of Auburn Mountainview High School. The 74-foot-diameter steel tank, which provides storage for the 590 Zone, was constructed in 1978. The tank has a base elevation of 483.4 feet and an overflow elevation of 592.9 feet.

In 1999, the reservoir was cleaned and painted, and received fall protection modifications. A PAX mixer was installed in 2009. In 2012, a new supervisory control and data acquisition (SCADA) back-up power generator was installed. In 2016, a new drain vault flapper and control vault were installed, and flow meter was added, and fence security improvements were made.



3.5 MG Tank

#### 640 Tank

The 640 Tank, completed in 2011, is the newest storage facility in the City's water system. It is located near the intersection of SE 248<sup>th</sup> Street and 124<sup>th</sup> Avenue SE. The 640 Tank is a 4.0 MG steel tank with a diameter of 75 feet, a base elevation of 523 feet, and an overflow elevation of 645 feet. The tank currently operates with a maximum level of 595 feet to provide storage for the 590 Zone, but will be used for storage in the future 640 Zone when other facilities for this zone are completed.



640 Tank

#### Blue Boy Standpipe

Constructed in 1965, the Blue Boy Standpipe is located at 112<sup>th</sup> Avenue SE and SE 236<sup>th</sup> Place and provides 0.97 MG of storage to the 590 Zone. This 42-foot-diameter reservoir has a base elevation of 499.7 feet and an overflow elevation of 593.8 feet. The last painting occurred in 1996, with an interior coating touch up in 2013. Fall protection was added in 1997. Seismic improvements, and overflow and drain line improvements were made to the reservoir in 2011. In 2012, piping and control vault improvements for the future 640 Zone were installed.



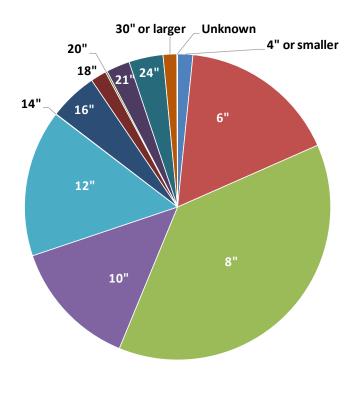
Blue Boy Standpipe

#### DISTRIBUTION AND TRANSMISSION SYSTEM

The City's water system contains 284 miles of water main ranging from 1 inch to 36 inches in diameter. As shown in **Table 2-4**, most of the water main (approximately 85 percent) within the system is 12 inches in diameter or less. The remaining 15 percent of the water main is 14 inches in diameter or larger. The existing water main diameter is shown on the water system node diagram figures contained in **Appendix L**.

Table 2-4
Water Main Diameter Inventory

Diameter (Inches)	Length (Feet)	% of Total
4 or smaller	24,139	1.6%
6	251,772	16.8%
8	567,492	37.8%
10	204,265	13.6%
12	232,958	15.5%
14	579	0.0%
16	76,769	5.1%
18	25,118	1.7%
20	2,817	0.2%
21	37,316	2.5%
24	54,154	3.6%
30 or larger	21,626	1.4%
Unknown	1,203	0.1%
Total	1,500,208	100%

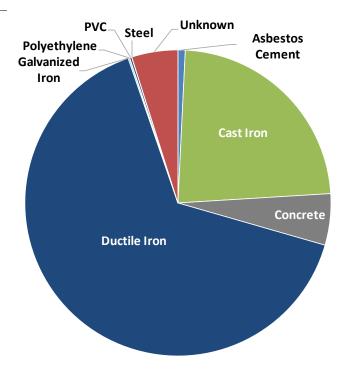


Water main in the City's system is constructed of asbestos cement, cast iron, concrete, ductile iron, galvanized iron, polyethylene, polyvinyl chloride (PVC), and steel piping, with approximately 65 percent of the system constructed of ductile iron pipe. Approximately 5 percent of the water main in the system is constructed of unknown material. All new water main installations are required to use Class 52 ductile iron pipe in accordance with the City's Standards for Water System Improvements. **Table 2-5** shows the City's existing water main inventory by material.

In response to the Governor's Directive 16-06 on lead, the City performed an assessment in 2016 to identify if any lead service lines or lead service components exist in the water system. The assessment found no lead service lines or lead service components present in the system.

Table 2-5 Water Main Material Inventory

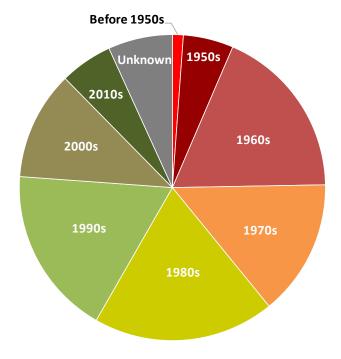
Material	Length (Feet)
Asbestos Cement	11,544
Cast Iron	348,899
Concrete	81,416
Ductile Iron	979,169
Galvanized Iron	2,041
Polyethylene	585
PVC	3,113
Steel	310
Unknown	73,131
Total	1,500,208



Per industry standard, the life expectancy of water main is generally 50 to 75 years, depending on a variety of piping, water quality, and soil conditions. Approximately 39 percent of the water main within the City's system was constructed in the 1970s or before and is reaching or has reached its projected life expectancy. The remainder of the water main in the City's water system (discounting water main of unknown installation year), was constructed in the 1980s or later and is generally in good condition. A detailed breakdown of the City's water main installation inventory per year is shown in **Table 2-6**.

Length % of Year Installed (Feet) **Total** Before 1950s 17,225 1.1% 1950s 79,590 5.3% 1960s 273,899 18.3% 1970s 216,196 14.4% 1980s 287,572 19.2% 1990s 267,942 17.9% 2000s 172,410 11.5% 2010s 83,322 5.6% Unknown 102,052 6.8% **Total** 1,500,208 100%

Table 2-6
Water Main Installation Year Inventory



#### Transmission Main

#### Clark Springs Transmission Main

Water supply from Clark Springs is delivered to the City through the CSTM, which is composed of 18-inch to 24-inch-diameter pipes. Water from the Armstrong Springs Wells and the Seven Oaks Well can also be delivered to the City through the CSTM. Much of the alignment is routed along SE Kent-Kangley Road. The CSTM is approximately 12 miles long and terminates at the 6 MG #1 Reservoir.

#### Kent Springs Transmission Main

The KSTM delivers water to the City from Kent Springs and RWSS POD #1 through a 24- to 36-inch supply line that is approximately 11 miles long. The KSTM and CSTM are parallel for part of their alignments. Water from the Armstrong Springs Wells and the Seven Oaks Well also can be delivered to the City through the KSTM. The KSTM terminates at the Guiberson Reservoir. The KSTM was originally constructed from wood and concrete pipe. A ductile iron replacement project was completed in 1997.

The CSTM has an 18-inch intertie with the KSTM at Kent Springs, a 12-inch intertie with the KSTM at the Armstrong Springs Wells, and 16-inch intertie with the KSTM at the intersection of 132<sup>nd</sup> Avenue SE and SE Kent-Kangley Road.

#### 6 MG #1 Reservoir to 6 MG #2 Reservoir Transmission Main

Between the 6 MG #1 Reservoir and 6 MG #2 Reservoir there are approximately 1.7 miles of 16-inch transmission main. There are a limited number of service connections on this transmission main. The City plans to connect these customers to smaller-diameter distribution system piping as it is constructed in this area.

#### PRESSURE REDUCING, PRESSURE SUSTAINING, AND FLOW CONTROL STATIONS

Pressure reducing stations are connections between adjacent pressure zones that allow water to flow from the higher pressure zone to the lower pressure zone while reducing the pressure of the water to maintain a safe range of operating pressures in the lower zone. A pressure reducing station typically consists of a below-grade vault (typically concrete) that normally contains two PRVs, sometimes a pressure relief valve, piping, and other appurtenances. The PRV hydraulically varies the flow rate through the valve (up to the flow capacity of the valve) to maintain a constant set pressure on the downstream side of the valve for water flowing into the lower pressure zone.

Pressure reducing stations can serve multiple purposes. First, they can function as an active supply facility by maintaining a continuous supply of water into a lower zone that has no other source of supply. The pressure reducing stations that serve the 368 Weiland Zone, 366 Stetson Zone, 339 Seattle Zone, 308 Hilltop Zone, and 271 Alvord Zone are this type. Pressure reducing stations also can function as standby supply facilities that are normally inactive (no water flowing through them). The operation of this type of station is typically triggered by a decrease in water pressure on the downstream side of the station. A typical application of this function is a station that is needed to supply additional water to a lower zone during a fire flow situation only. The pressure setting of the control valve within the station allows it to remain closed during normal system operation and open only during high-demand conditions, like fire flows, to provide the additional supply needed.

Pressure sustaining stations are connections between adjacent pressure zones that allow water to flow from the higher pressure zone to the lower pressure zone, provided the pressure in the higher zone remains above a certain threshold. The City does not have any pressure sustaining stations.

Flow control stations allow water to flow from a higher pressure zone to a lower pressure zone at a regulated flow rate. The City has flow control stations at the Tacoma interties, but the valves are currently fully open.

The City's water system has a total of 18 pressure reducing stations, as shown in plan view in **Figure 2-1** and in profile view on **Figure 2-2**. A list of all pressure reducing stations and related data is contained in **Table 2-7**.

Table 2-7
Pressure Reducing Valve Station Summary

Station Name	Upper Pressure Zone	Lower Pressure Zone
218th St PRV	416 Zone	240 Zone
42nd Ave PRV	587 Zone	529 Zone
Pump Station #5 PRV	590 Zone	485 Zone
Alvord PRV	485 Zone	271 Alvord Zone
Hilltop PRV	485 Zone	308 Hilltop Zone
Seattle PRV	485 Zone	339 Seattle
Stetson PRV	485 Zone	366 Stetson Zone
Totem PRV	575 Zone	529 Zone
Weiland PRV	485 Zone	368 Weiland Zone
Woodland Way PRV	590 Zone	485 Zone
234th PRV	590 Zone	485 Zone
Park Orchard PRV	Future 640 Zone	590 Zone
Daniel PRV	Future 640 Zone	590 Zone
Millineum PRV	Future 640 Zone	590 Zone
Pump Station #4 PRV	529 Zone	354.5 Zone
RWSS POD #1 Kent Springs Tacoma Connection PRV	Tacoma RWSS	529 Zone
RWSS POD #3 KSTM Tacoma Connection PRV	Tacoma RWSS	240 Zone
RWSS POD #3 590 Tacoma Connection PRV	Tacoma RWSS	590 Zone

# WATER SYSTEM OPERATION AND CONTROL/TELEMETRY AND SUPERVISORY CONTROL SYSTEM

Successful operation of any municipal water system requires gathering and using accurate water system information. A telemetry and supervisory control system gathers information and can efficiently control a system by automatically optimizing facility operations. A telemetry and supervisory control system also provides instant alarm notification to operations personnel in the event of equipment failures, operational problems, fire, or other emergency situations.

The water system has a Headquarters telemetry control panel at the Public Works Building at 5821 South 240<sup>th</sup> Street. System facilities, including source, storage, and pumping, can be

controlled with the telemetry system. Repeaters are located on the East Hill and West Hill. Detailed, facility specific telemetry capabilities are included in **Chapter 8**.

#### WATER SYSTEM INTERTIES

Water system interties are physical connections between two adjacent water systems. Interties are normally separated by a closed isolation valve or control valve. Emergency supply interties provide water from one system to another during emergency situations only. An emergency situation may occur when a water system loses its main source of supply or a major transmission main, or during firefighting situations, and is unable to provide a sufficient quantity of water to its customers. Normal supply interties provide water from one system to another during non-emergency situations and are typically supplying water at all times. Interties between the City and adjacent purveyors are shown on **Figure 2-4**.

### **Emergency Supply Interties**

#### City of Auburn

The intertie between Auburn and the City, located near the intersection of 78<sup>th</sup> Avenue S and S 277<sup>th</sup> Street, has been active since 1991. Emergency two-way supply is provided through a 6-inch meter. The intertie capacity is 0.3 MGD and connects Auburn's 242 Pressure Zone with the City's 240 Zone. A copy of the intertie agreement is included in **Appendix B**.

#### City of Renton

The City's intertie with Renton, active since 1980, has a capacity of 2.6 MGD. Emergency two-way supply is provided through a 10-inch meter. The intertie is located near the intersection of S 180<sup>th</sup> Street and Lind Avenue SW. The intertie connects Renton's 196 Pressure Zone and the City's 240 Zone. A copy of the intertie agreement is included in **Appendix B**.

#### City of Tukwila

The City's intertie with Tukwila has been active since 1979 and provides a capacity of 3.4 MGD for emergency two-way supply and peak demands. A 10-inch meter connects Tukwila's 368 Pressure Zone with the City's 240 Zone. The intertie is located near the intersection of South Todd Boulevard and 68<sup>th</sup> Avenue South.

#### Highline Water District

The City's intertie with HWD has been active since 1995. The intertie is located near S 240<sup>th</sup> Street and I-5. The intertie's purpose is emergency two-way supply, fire flow, and supply during maintenance. A capacity of 1.5 MGD can be provided through an 8-inch meter. Water can be provided from HWD's 560 Pressure Zone to the City's 587 Zone via Pump Station #8. A copy of the intertie agreement and the 2018 long-term franchise agreement between the City and HWD are included in **Appendix B**. The 2018 long-term franchise agreement identifies the Retail Water Service Area (RWSA) boundary between the two systems.

#### Soos Creek Water and Sewer District

The City's emergency intertie with Soos Creek Water and Sewer District (SCWSD) has been active since 2001. The intertie has a capacity of 1.0 MGD, providing water from SCWSD's 627 Pressure Zone to the City's 590 Zone. The intertie is located near the intersection of

113<sup>th</sup> Avenue SE and SE 227<sup>th</sup> Place. A copy of the intertie agreement is included in **Appendix B**.

Lake Meridian Water District

Two 6-inch meters comprise the intertie with Lake Meridian Water District (LMWD), which has been active since 1962. The combined capacity of these meters is 2.0 MGD. The purpose of the intertie is emergency two-way supply, and provision of water to LMWD. The intertie connects LMWD's 590 Pressure Zone with the City's 590 Zone. The north meter is located on SE 256<sup>th</sup> Street west of 124<sup>th</sup> Avenue SE. The south meter is located near the intersection of SE 282<sup>nd</sup> Street and 124<sup>th</sup> Avenue SE.

Permanent Supply Interties

City of Tacoma

The City's permanent supply interties with Tacoma is described in the **Supply Facilities** section of this chapter.

# WATER SERVICE AGREEMENTS

#### WATER SERVICE AREA AGREEMENT

The City's retail water service area is based on the 1989 CWSP. The current retail water service area agreement is included as **Appendix B**.

SOUTH KING COUNTY REGIONAL WATER ASSOCIATION JOINT OPERATING AGREEMENT

In January 1995, the City signed a Joint Operating Agreement (JOA) with Auburn, City of Black Diamond, CWD, and LMWD. The intent of the JOA signatories was to cooperatively provide the additional facilities needed to develop a South King County Subregional Water Supply System. The JOA is included in **Appendix B**.

#### SECOND SUPPLY PROJECT PARTNERSHIP AGREEMENT

In 1933, Tacoma established a priority date for its second water right diversion from the Green River. In 1963, Tacoma initiated efforts to develop what was referred to as Pipeline-5 and is now called the Second Supply Pipeline project. In 1985, the City contracted with Tacoma Public Utilities (TPU) to purchase 7.2 MGD of summer peaking water from the proposed RWSS project.

In 1995, TPU, Seattle Public Utilities (SPU) and its purveyors, and the South King County utilities of the City, CWD, LWSD, and LMWD, began nearly 5 years of discussions and negotiations regarding the framework, conditions, and costs of project participation. Significant changes to the contractual framework of the project, including the withdrawal of LMWD, occurred in the early stages of the project, and a complex and highly technical multi-party negotiation ensued.

In October, 2002, a final agreement was reached with TPU, the City, LWSD, and CWD. The agreement and all amendments are included in **Appendix B**. In the course of that final agreement, the City's share of the RWSS was increased to 12.64 MGD after SPU determined that it would no longer participate in the project. Water supply from the RWSS project became available to the City in 2007. The percent ownership of the RWSS project is detailed in **Table 2-8**.

Table 2-8
Regional RWSS Percent Ownership

Utility Partner	Percent Ownership
Tacoma Public Utilities	41.67% (15/36ths)
City of Kent	19.44% (7/36ths)
Covington Water District	19.44% (7/36ths)
Lakehaven Water and Sewer District	19.44% (7/36ths)

The RWSS source of supply is considered critical to the City's ability to meet short- and long-term demand needs. In this regard, the City has expended substantial financial resources on the RWSS project in reliance on the Ecology-approved water right and place of use documents issued to Tacoma, and the executed contracts.

In addition to the RWSS Partnership Agreement, Water Supply Agreements were signed by RWSS project participants. These Water Supply Agreements are included in **Appendix B**.

# SATELLITE SYSTEM MANAGEMENT

A Satellite System Management Agency (SSMA) is defined as a person or entity that is certified by DOH to own or operate more than one public water system without the necessity for a physical connection between such systems. SSMAs were created to stop the proliferation of small water systems, many of which could not meet federal and state water quality and water system planning regulations. The goal of SSMAs is to ensure that the people of Washington State will receive safe and reliable water supplies in the future from professionally managed or properly operated water systems. SSMAs can provide three different levels of service:

- 1. Ownership of the satellite system;
- 2. Operations and management of the satellite system; or
- 3. Contract services only.

The service can be provided to new systems, existing systems that are no longer viable, or existing systems placed into receivership status by DOH.

The City is responsible for providing water service to all customers in the City's water service area defined in the CWSP. Much of the area surrounding the City's service area is currently being served by large, stable water systems that are unlikely to be future satellite water systems operated by the City.

The City is not a certified SSMA and has no plans to assume such responsibility. The City does provide limited technical assistance, specifically water quality testing, to one small system in the Clark Springs watershed, the Ravensdale Mobile Home Park.

# ADJACENT WATER SYSTEMS

Numerous water systems are adjacent or close to the City's water service area. **Figure 2-3** shows the regional water supply setting, including the City's and other purveyor service areas. **Table 2-9** lists details of all purveyors shown on **Figure 2-3**.

Table 2-9 Adjacent Systems

Water System Name	Approximate Location in Relation to the City's Retail Water Service Area	Approximate Number of Service Connections	Source of Supply
Cedar River Water and Sewer District	Northeast	10,026	4 interties, 1 groundwater well
City of Auburn	South	24,132	2 groundwater springs, 11 groundwater wells, 5 interties
City of Renton	North	17,400	1 groundwater spring, 13 groundwater wells, 4 intertie
City of Tukwila	North	4,036	5 interties
Covington Water District	East	18,500	12 groundwater wells, 8 interties
Highline Water District	West	27,870	5 groundwater wells, 5 interties
Lake Meridian Water District	East	5,269	7 groundwater wells, 8 interties
King County Water District 125	Northwest	6,746	5 interties
King County Water District 49	Northwest	6,902	4 interties
Lakehaven Water and Sewer District	Southwest	45,792	25 groundwater wells, 3 interties
Seattle Public Utilities	Northwest	173,833	1 intertie, 4 groundwater wells, 2 surface water source
Soos Creek Water and Sewer District	East	22,898	1 intertie

Eight major adjacent purveyors, which include Auburn, Renton, Tukwila, CWD, HWD, LWSD, SCWSD, and LMWD are described below in additional detail.

#### CITY OF AUBURN

Auburn's water service area is located to the south of the City. Auburn provides water to approximately 24,132 service connections. An intertie between the two water systems provides emergency two-way supply. Auburn is within the South King County Critical Water Supply Service Area, and thus is subject to the South King County CWSP.

#### CITY OF RENTON

Renton's water service area is located to the northeast of the City's water service area and includes a small area of the City of Kent. Renton provides water to approximately 17,400 service connections. An intertie between the two water systems provides emergency two-way supply. Renton is within the East King County Critical Water Supply Service Area, and thus is subject to the East King County CWSP.

#### CITY OF TUKWILA

Tukwila's water service area is located to the north of the City's water service area. Tukwila provides water to approximately 4,036 service connections. An intertie between the two cities provides water for emergency two-way supply and peak demands.

#### COVINGTON WATER DISTRICT

CWD is located to the east of the City's water service area, and surrounds the Kent Springs, Clark Springs, and Armstrong Springs Wells sources. While these sources and portions of the CSTM and KSTM are located in CWD's water service area, the two water service areas are not immediately adjacent. CWD provides water to approximately 18,500 service connections. CWD is a member of the Tacoma RWSS. CWD is located within the South King County Critical Water Supply Service Area; thus, it is subject to the South King County CWSP.

#### HIGHLINE WATER DISTRICT

HWD is located to the west of the City's water service area and provides water service to part of the Kent City limits on the West Hill. HWD provides water service to approximately 27,870 service connections and has an intertie with the City at Pump Station #8. The City executed an interlocal agreement in 2005 with HWD to adjust water service areas in the vicinity of the Kentview Development. A Long-Term Franchise Agreement was executed by the City and HWD in 2018. A copy is included in **Appendix B**. HWD is located within the South King County Critical Water Supply Service Area and is subject to the South King County CWSP.

#### LAKEHAVEN WATER AND SEWER DISTRICT

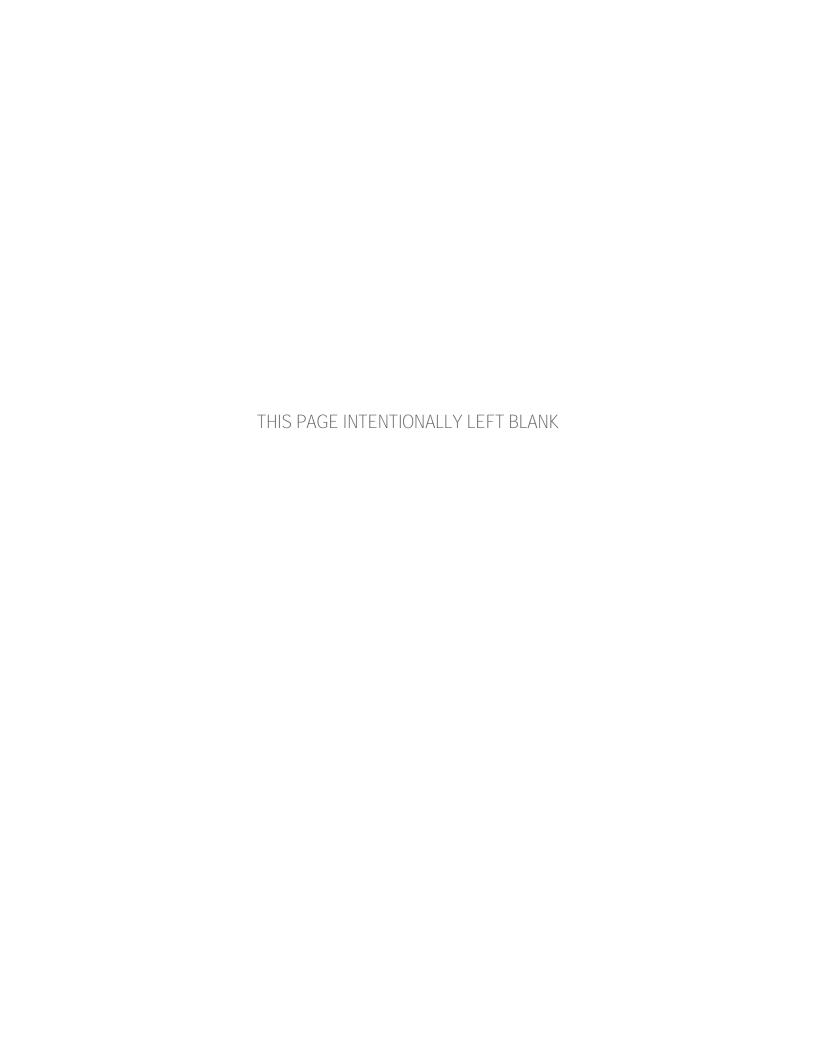
LWSD is located to the southwest of the City's water service area. Although boundaries are close, the City's and LWSD's water service areas are not immediately adjacent. LWSD provides water service to approximately 45,792 service connections.

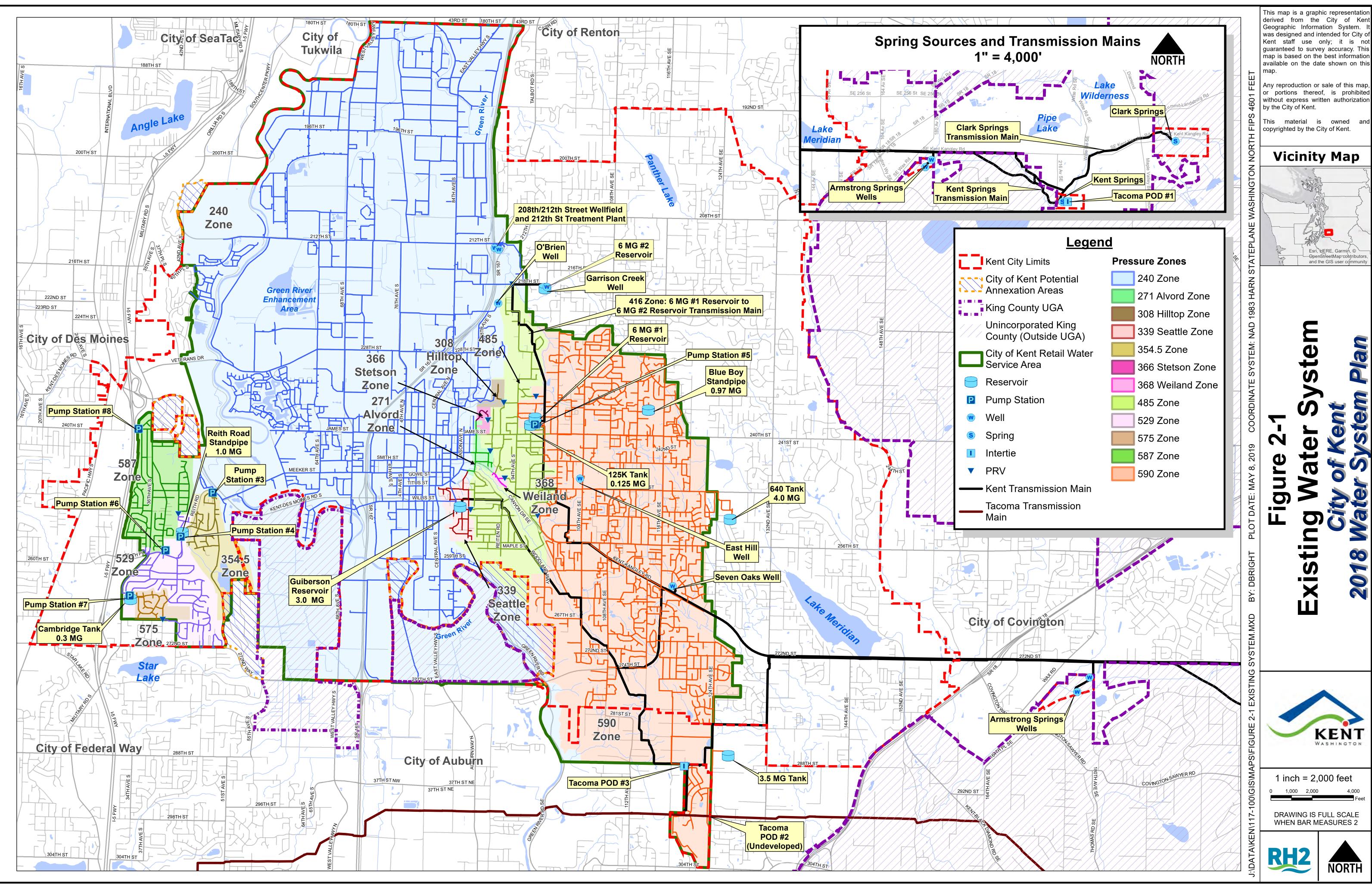
#### SOOS CREEK WATER AND SEWER DISTRICT

SCWSD is located to the east of the City's water service area and provides water service to a significant portion of the City, around Panther Lake. SCWSD has approximately 22,898 service connections, and an intertie with the City. SCWSD is located within the East King County Critical Water Supply Area, and thus is subject to the East King County CWSP.

#### LAKE MERIDIAN WATER DISTRICT

LMWD is located to the east of the City's water service area and provides water service to a significant portion of the City, around Lake Meridian. LMWD provides water service to approximately 5,269 service connections and has two interties with the City. LMWD is located within the South King County Critical Water Supply Service Area; thus, it is subject to the South King County CWSP.





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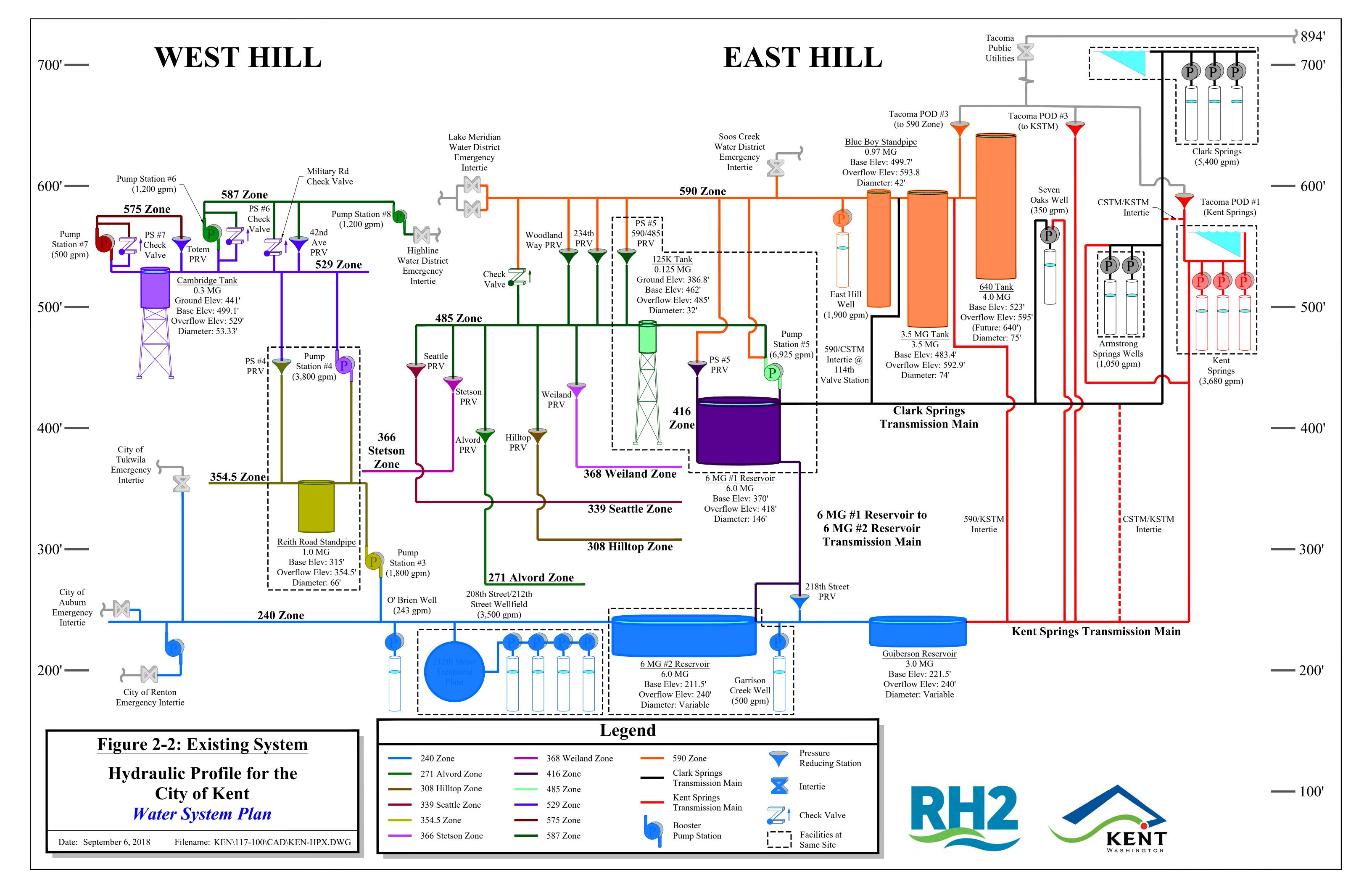


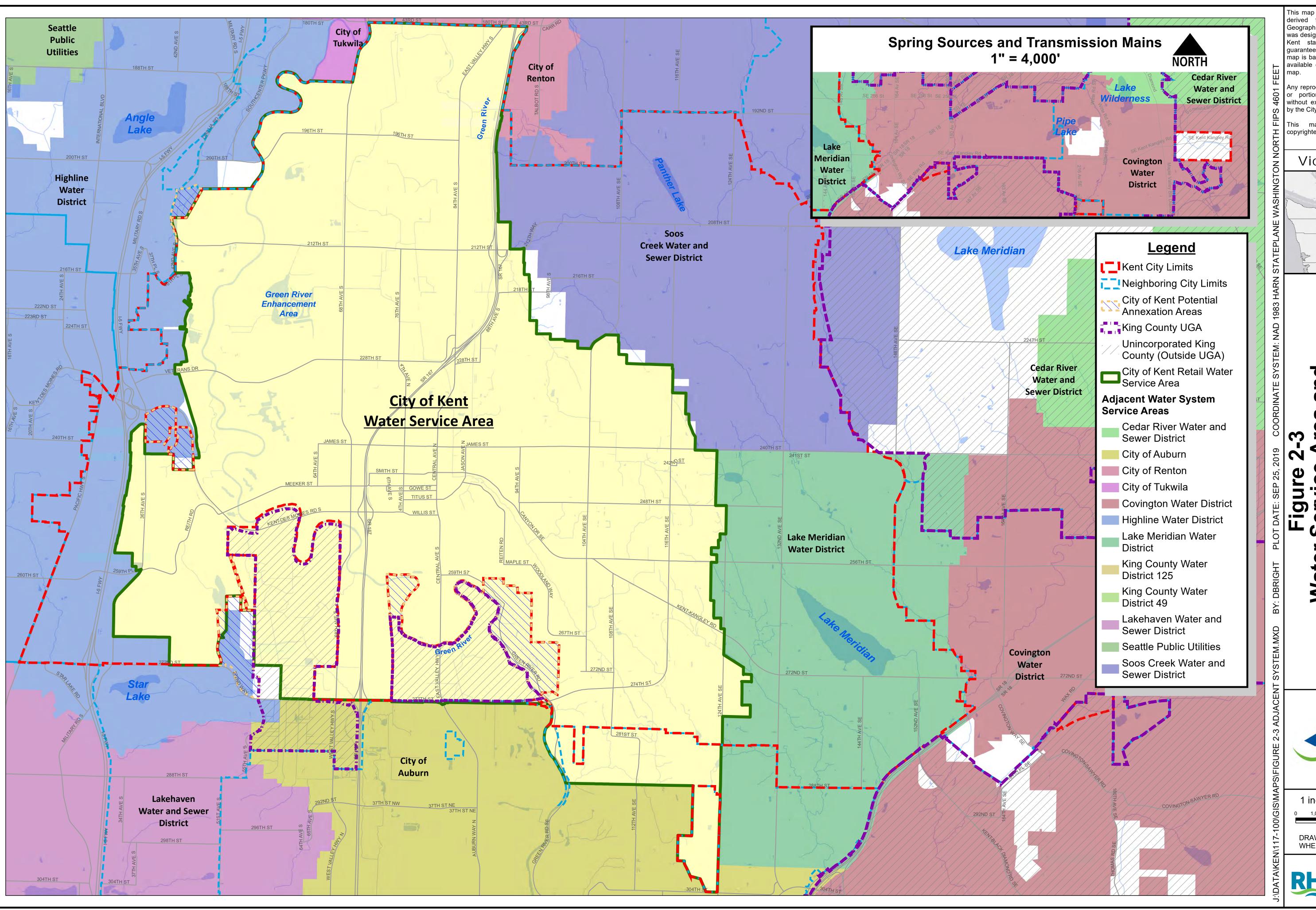




WHEN BAR MEASURES 2







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Vicinity Map



Water Service Area and Adjacent Water Systems

City of Kent



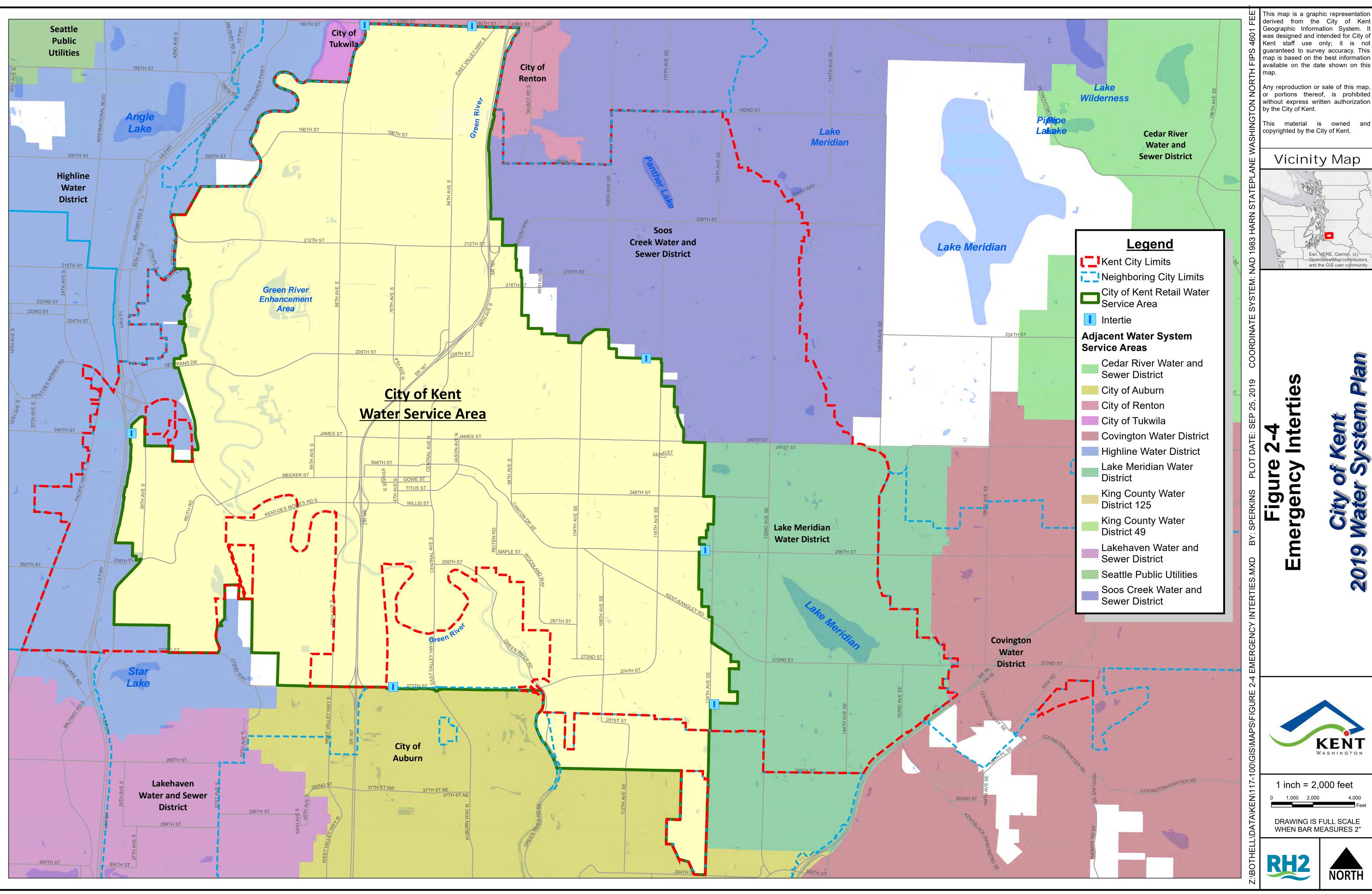
1 inch = 2,000 feet

0 1,000 2,000 4,00

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"







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Vicinity Map

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1 inch = 2,000 feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"





# 3 | LAND USE AND POPULATION

# INTRODUCTION

The State of Washington Growth Management Act (GMA) requires, among other things, consistency between land use and utility plans and their implementation. This chapter demonstrates the compatibility of the City's WSP with other plans, identifies the designated land uses within the existing and future service area, and presents population and employment projections within the City's planning area.

# COMPATIBILITY WITH OTHER PLANS AND POLICIES

To ensure that the WSP is consistent with the land use policies that guide it and other related plans, the following planning documents were examined.

- State of Washington Growth Management Act
- Puget Sound Regional Council VISION 2040 Part III: Multicounty Planning Policies
- City of Kent Comprehensive Plan
- City of Kent Midway Subarea Plan
- City of Kent Downtown Subarea Action Plan
- City of Tukwila Comprehensive Plan
- City of Auburn Comprehensive Plan
- King County Countywide Planning Policies
- King County Comprehensive Plan
- South King County Coordinated Water System Plan

#### GROWTH MANAGEMENT ACT

The State of Washington GMA of 1990 (and its multiple amendments) defined four goals relevant to this WSP:

- 1. Growth should be in urban areas;
- 2. There should be consistency between land use and utility plans and their implementation;
- 3. There should be concurrency of growth with public facilities and services; and
- 4. Critical areas should be designated and protected.

#### Urban Growth Area

The GMA requires that King County (County) designate an Urban Growth Area (UGA) where most future urban growth and development will be directed. The county-wide UGA is defined in the County's *Comprehensive Plan* and encompasses the area where this urban growth and

development is projected to occur over the 20-year planning period. The current King County UGA boundaries in the vicinity of the City are shown on **Figure 3-1**.

#### Potential Annexation Areas

A Potential Annexation Area (PAA) is an area identified by King County and a City as expected to annex into that City during the 20-year planning period. The City has five PAAs, which are shown on **Figure 3-1**. Upon annexation, the City will be expected to provide services and utilities to the annexed area.

#### Consistency

The GMA requires planning consistency from two perspectives. First, it requires consistency of plans among jurisdictions. This means that plans and policies of the City and County must be consistent per Revised Code of Washington (RCW) 36.70A.100. Second, the GMA requires the implementation of the WSP be consistent with the comprehensive plans (RCW 36.70A.120).

The 2003 Municipal Water Law also requires that water system plans are consistent with local plans and regulations. The signed Consistency Statement Checklists included in **Appendix** C from the City and King County Planning Departments document the determination that this WSP is consistent with their plans and regulations.

#### Concurrency

Concurrency means that adequate public facilities and services be provided at the time growth occurs. For example, growth should not occur where schools, roads, and other public facilities are overloaded. To achieve this objective, the GMA directs growth to areas already served or readily served by public facilities and services (RCW 36.70A.110). It also requires that when public facilities and services cannot be maintained at an acceptable level of service, the new development should be prohibited (RCW 36.70A.110).

#### Critical Areas

The GMA requires that critical areas be designated and protected. Critical areas include aquifer recharge areas, wetlands, frequently flooded areas, streams, wildlife habitat, landslide hazard areas, seismic hazard areas, and steep slopes. The City has adopted development regulations identifying and protecting critical areas as required. The City does not currently have any critical facilities located in a floodplain and does not plan to construct any new facilities within the floodplain in the future. The State Environmental Policy Act (SEPA) Checklist in **Appendix D** addresses other environmental concerns.

# PUGET SOUND REGIONAL COUNCIL VISION 2040 PART III: MULTICOUNTY PLANNING POLICIES

The Puget Sound Regional Council (PSRC) is designated by the governor of the State of Washington as the Metropolitan Planning Organization (MPO) and Regional Transportation Planning Organization (RTPO) for the central Puget Sound region, defined as King, Kitsap, Pierce, and Snohomish counties. *VISION 2040* "is a shared strategy for moving the central Puget Sound region toward a sustainable future." *Part III: Multicounty Planning Policies* contains six

major policy sections: Environment, Development Patterns, Housing, Economy, Transportation, and Public Services. Under each section, goals, policies, actions, and measures are identified. All of the City's functional plans are required to be consistent with the PSRC's *Multicounty Planning Policies*.

#### CITY OF KENT COMPREHENSIVE PLAN

The City of Kent's *Comprehensive Plan* was last updated in 2015. The plan was developed to describe the City's vision for 2035 and provide goals and policies for achieving it, as well as to meet the requirements of the GMA.

The Land Use Element of the City's *Comprehensive Plan* is the City's vision of how growth and development should occur over a 20-year horizon. While the Land Use Element goals and policies set forth general standards for locating land uses, the Land Use Plan Map (Figure LU-6), portions of which are shown in **Figure 3-1**, indicates geographically where certain types of uses may be appropriate. The Land Use Plan Map is a blueprint for development of an area, whereas the zoning map and zoning code are the regulatory means for implementing development.

The Land Use Element considers the general location of land uses, as well as the appropriate intensity and density of land uses given the current development trends. The Utilities, Transportation, and Capital Facilities Elements ensure that new development will be adequately served without compromising adopted levels of service, consistent with the principal of concurrency as defined in the GMA. The City's 2011 WSP was incorporated by reference into the Utilities Element of the *Comprehensive Plan*.

## CITY OF KENT MIDWAY SUBAREA PLAN

The City of Kent's *Midway Subarea Plan* was adopted by the Kent City Council on December 13, 2011. The Midway Subarea is located along the extreme western portion of Kent and contains the commercial spine for Kent's West Hill residents. In the near future, it is anticipated that a light rail station will be constructed in this area, near Highline Community College. The *Subarea Plan* conveys a range of actions that prepares the area for high capacity light rail transit. In conjunction with the redevelopment of the area, it is anticipated that population and employment growth in the Midway Subarea will greatly exceed PSRC projections for the area.

#### CITY OF KENT DOWNTOWN SUBARFA ACTION PLAN

The City of Kent's *Downtown Subarea Action Plan* was adopted by the Kent City Council on November 19, 2013. The *Subarea Action Plan* recognizes that suburbanization has shifted economic activity away from Downtown and seeks to support proactive planning and public improvements to maintain Downtown's vitality. Goals, policies, and actions are conveyed in the *Subarea Action Plan* as a means for Downtown to pursue a dense, mixed-use urban center that complements transit.

#### CITY OF TUKWII A COMPREHENSIVE PLAN

The City of Tukwila's (Tukwila) *Comprehensive Plan* was last amended in 2015 and presents the goals for Tukwila's growth and development in the next 20 years. Tukwila's *Comprehensive Plan* considers zoning and development of major land use types, including residential neighborhoods, the Tukwila International Boulevard District, Tukwila South, Tukwila's urban center, and the manufacturing/industrial center. Tukwila's Comprehensive Land Use Map shows current and future land use designations for these land use types. The City's water system does not serve any customers within Tukwila's city limits.

Tukwila's *Comprehensive Plan* also provides guidance for economic development, housing, natural environments, shorelines, parks, recreation, and open space, utilities, transportation, and capital facilities.

#### CITY OF AUBURN COMPREHENSIVE PLAN

The City of Auburn's (Auburn) *Comprehensive Plan* was last adopted in December 2015, with land use comprising the first Element of the plan. The Land Use Element describes existing land uses, provides criteria for assigning land use types, and outlines policies for each use of land. The Land Use Element should be used in conjunction with Auburn's Comprehensive Plan Land Use Map (Map 1.1) to geographically understand zoning and land use activities allowed in certain areas. Auburn's land uses inside the southeast portion of the City's water service area are shown in **Figure 3-1**.

In addition to the Land Use Element, Auburn's *Comprehensive Plan* also contains six other Elements, including housing, capital facilities, utilities, transportation, economic development, and parks and recreation. These Elements are planned together to ensure Auburn will be adequately supported in future growth scenarios.

#### KING COUNTY COUNTYWIDE PLANNING POLICIES

The County's 2012 Countywide Planning Policies are a series of policies that address growth management issues in King County. The current version of the policies includes amendments ratified by June 25, 2016. For consistency with the PSRC VISION 2040, the Countywide Planning Policies are also organized into the policy sections of Environment, Development Patterns, Housing, Economy, Transportation, and Public Facilities and Services. Page 47 of the Countywide Planning Policies identifies specific policies related to water supply. All of the City's functional plans are required to be consistent with the County's Countywide Planning Policies.

#### KING COUNTY COMPREHENSIVE PLAN

The current version of the King County *Comprehensive Plan* was adopted in 2016, and last amended in 2018. Chapters include the following.

- Regional Growth Management Planning
- Urban Communities
- Rural Areas and Natural Resource Lands

- Housing and Human Services
- Environment
- Shorelines
- Parks, Open Space, and Cultural Resources
- Transportation
- Services, Facilities, and Utilities
- Economic Development
- Community Service Area Subarea Planning
- Implementation, Amendments, and Evaluation

The County's plan is focused on six guiding principles, as follows.

- 1. Creating Sustainable Neighborhoods
- 2. Preserving and Maintaining Open Space and Natural Resource Lands
- 3. Directing Development Towards Existing Communities
- 4. Providing a Variety of Transportation Choices
- 5. Addressing Health, Equity and Social and Environmental Justice
- 6. Achieving Environmental Sustainability

The County's *Comprehensive Plan* guides development and designates land use in unincorporated King County. County land use inside the City's future water service area is shown in **Figure 3-1**; the *Comprehensive Plan* can be referenced for County land use outside the future water service area.

#### SOUTH KING COUNTY COORDINATED WATER SYSTEM PLAN

The South King County *Coordinated Water System Plan* (CWSP), originally dated October 1989, was developed under direction from the County's Water Utility Coordinating Committee (WUCC), the County, and Seattle Water Department. The members of the WUCC represent the collective efforts of all public water systems with more than 50 service connections that provide service within the Critical Water Supply Service Area (CWSSA). The King County Council declared South King County a CWSSA on December 15, 1985.

The purpose of the CWSP is to assist the area's water utilities in establishing an effective process for planning and developing public water systems and restricting the proliferation of small public water systems. The CWSP accomplishes this by establishing future service area boundaries, minimum design standards, service review procedures, appeals procedures, long-term regional water supply strategies, and the satellite system management program. As can be seen in the following sections of this WSP, the City has established policies, design criteria, and goals that meet or exceed the requirements and goals of the CWSP.

# LAND USE

The existing retail water service area includes portions of the City, Auburn, Tukwila, and unincorporated King County, for a total of 23.7 square miles. The water service area's land use

map, as shown in **Figure 3-1**, guides development and can be used to forecast future demands. Land use outside the City is designated by adjacent cities or the County, as shown in **Figure 3-1**.

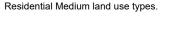
Approximately 29.2 percent of the area within the current Water Service Area is designated for single-family residential use, as indicated in **Table 3-1**. Approximately 28.9 percent is designated for industrial use; approximately 13.9 percent is designated for open space/greenbelt/public use; approximately 9.0 percent is designated for agriculture; approximately 8.9 percent is designated for commercial use; approximately 8.9 percent is designated for multi-family residential use; and approximately 1.3 percent is other or undesignated use.

Table 3-1
Land Use Inside Water Service Area

Land Use Type	Acres	% of Total
Agriculture	1,368	9.0%
Commercial <sup>1</sup>	1,348	8.9%
Industrial <sup>2</sup>	4,380	28.9%
Open Space/Greenbelt/Public <sup>3</sup>	2,100	13.9%
Single-family Residential <sup>4</sup>	4,418	29.2%
Multi-family Residential	1,344	8.9%
Other	196	1.3%
Total	15,154	100%

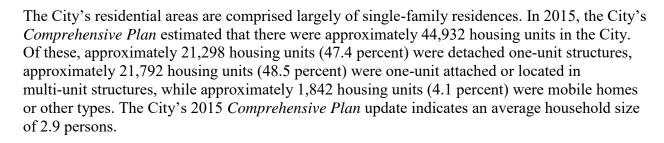
<sup>1 =</sup> Includes Mixed-use, Neighborhood Services, Transit Oriented Community, and Urban Center land use types.

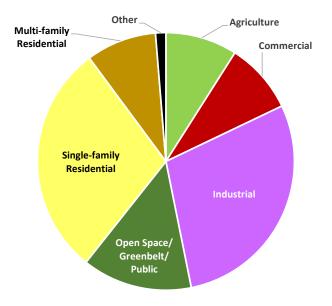
<sup>4 =</sup> Includes Mobile Home Park and King County Urban



# HOUSEHOLD TRENDS

POPULATION





<sup>2 =</sup> Includes Tukwila Valley South land use type.

<sup>3 =</sup> Includes Auburn Public Use District land use type.

#### EXISTING AND FUTURE CITY POPULATION

The City has experienced rapid population growth and extensive physical development since 2000. The population of the County increased by approximately 24 percent from 2000 to 2017, based on Washington State Office of Financial Management (OFM) estimates. The population of the City increased by approximately 60 percent during the same period. A significant portion of the City population increase is due to the 2010 annexation of the Panther Lake area into the City, which added approximately 25,458 residents. **Table 3-2** illustrates the historical population growth since 2000, with years 1990 and 1995 for reference.

Table 3-2
Population Trends within the City Limits

Voor	Donulation
Year	Population
1990	37,960
1995	47,124
2000	79,524
2005	86,967
2010	92,411
2011	118,200
2012	119,100
2013	120,500
2014	121,400
2015	122,900
2016	124,500
2017	127,100

NOTE: The historical population represents the population within the City limits. The sources of the historical population numbers are the decennial census and OFM intercensal estimates.

Projected future growth for the City is shown in **Table 3-3**. Projections are based on Puget Sound Regional Council (PSRC) estimates for years 2020, 2025, 2030, 2035, and 2040. Projections from the *Midway Subarea Plan* were considered as part of the population projections, and were determined to be approximately equivalent to the population projections based on the PSRC projections within the City's retail water service area. Projected population for intermediate years was calculated by assuming a uniform population growth rate between data points. The total City population is expected to experience an average annual growth rate of approximately 0.4 percent between 2017 and 2038 (the planning horizon of the WSP). Population projections for the City are displayed in **Chart 3-1**.

Table 3-3
Water System Population and Employment Projections

Year	City Population	Water System Population	Water System Employment
	Exi	sting	
2016	124,500	68,157	64,755
2017	127,100	69,465	65,356
	Proj	ected	
2018	127,857	69,653	65,956
2019	128,615	69,841	66,557
2020	129,372	70,029	67,157
2021	129,923	70,259	67,530
2022	130,474	70,490	67,904
2023	131,024	70,721	68,279
2024	131,575	70,952	68,655
2025	132,126	71,183	69,031
2026	132,554	71,403	69,281
2027	132,982	71,622	69,529
2028 (+ 10 years)	133,411	71,842	69,777
2029	133,839	72,061	70,025
2030	134,267	72,281	70,274
2031	134,673	72,487	71,022
2032	135,078	72,693	71,770
2033	135,484	72,899	72,517
2034	135,889	73,105	73,265
2035	136,295	73,312	74,013
2036	136,727	73,596	75,227
2037	137,158	73,881	76,440
2038 (+ 20 years)	137,590	74,166	77,653

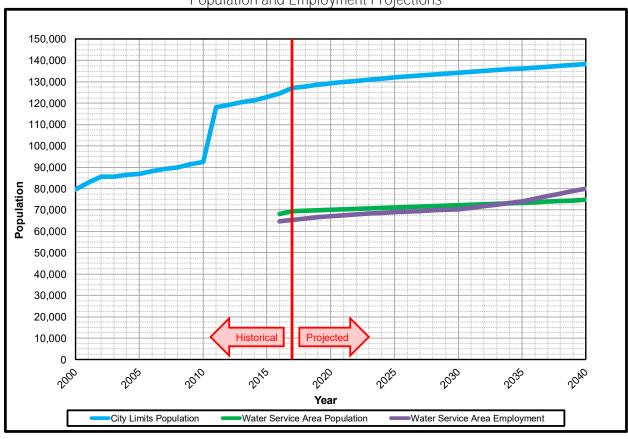


Chart 3-1
Population and Employment Projections

#### WATER SYSTEM POPULATION

The actual number of people served by the City's water system is different than the population of the City limits. The City currently serves part of the City limits, as well as small areas of Auburn, Tukwila, and unincorporated King County. There are areas within the City limits that are served by other water systems.

The existing population served by the water system, with the exception of areas of unincorporated King County, was calculated using OFM census block estimates from the Small Area Estimate Program for 2016 and 2017. Some census blocks were partially inside and partially outside the water service area boundary. To account for this, the percentage by area of these census blocks that were inside the water service area was calculated, and the total population of the census block was multiplied by this percentage. Population estimates for areas of unincorporated King County served by the water system were provided by King County. The estimated existing population served by the water system in 2016 is 68,157 and the estimated existing population served by the water system in 2017 is 69,465, as shown in **Table 3-3**.

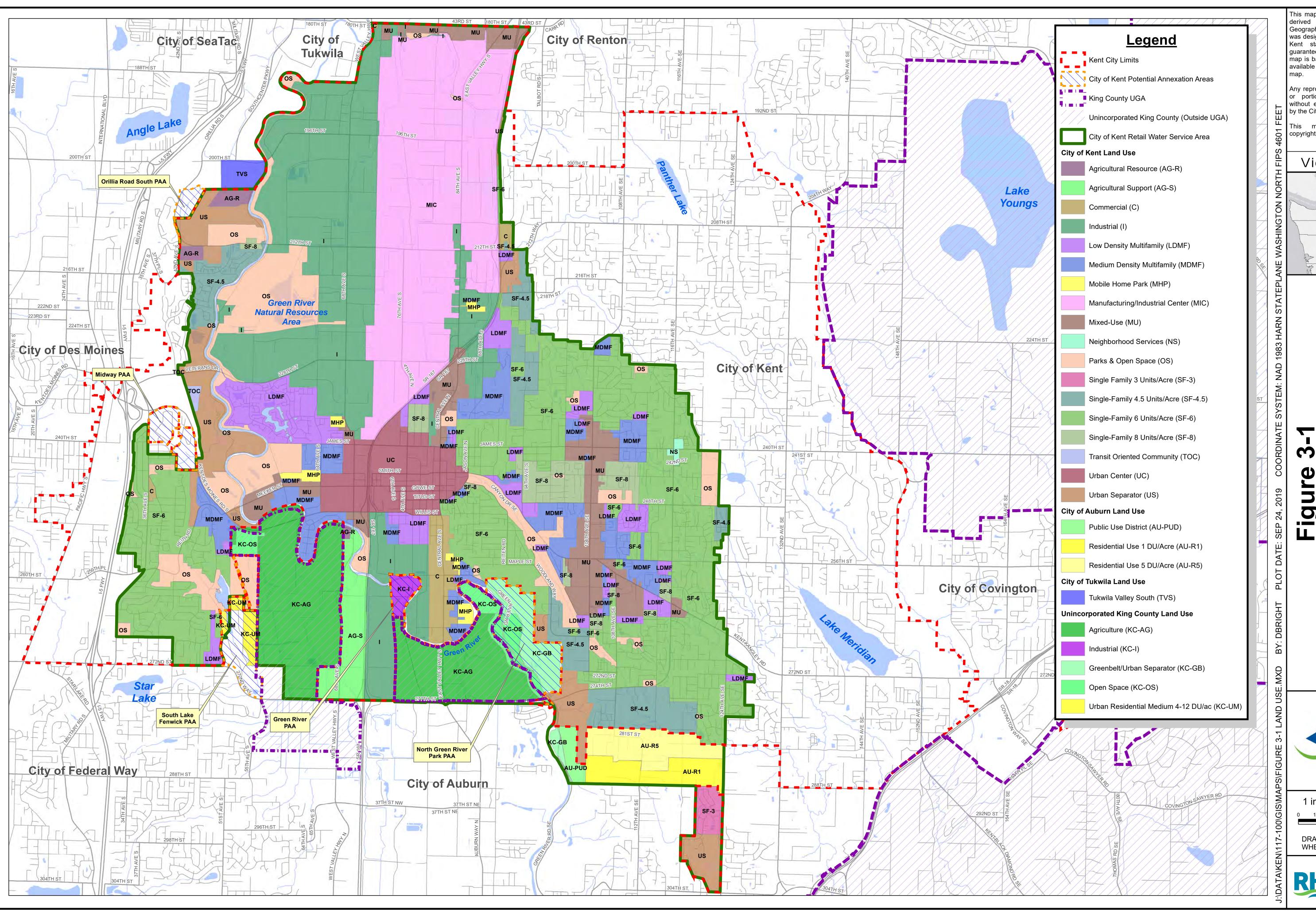
The projected future population of the water system, with the exception of areas of unincorporated King County, was calculated using Traffic Analysis Zone (TAZ) data from PSRC. As in the census block data used to calculate the existing water system population, the population of TAZs that were split by the water service area boundary were adjusted based on

the area of the TAZ within the water service area. Population projections from the *Midway Subarea Plan* were not utilized. The *Subarea Plan* identifies the potential for increased growth in the Midway Subarea above PSRC estimates. However, only approximately 3 percent of the Midway Subarea overlaps the retail water service area, so the impact of this potential increased growth on the water system population projections is expected to be minor. The City does not expect the retail water service area to increase during the 20-year planning period to contain a larger portion of the Midway Subarea.

To project the water system population forward, the estimated 2017 water system population from **Table 3-3** was utilized as a basis. PSRC TAZ population projections for 2020, 2025, 2030, 2035, and 2040 were utilized, and projected population for intermediate years was calculated by assuming a uniform population growth rate between data points. Population estimates provided by King County were used for the areas of the water system located in unincorporated King County. For the purposes of estimating demands, the population projections for the water system are presented in **Table 3-3**. The system is expected to provide service to approximately 74,166 people by 2038. Water system population projections are also shown in **Chart 3-1**.

#### WATER SYSTEM EMPLOYMENT

Because non-residential water use is a significant portion of the City's total water use, the total employment for the water system was calculated for use in demand projections. The existing and future number of employees working in the water service area, with the exception of areas of unincorporated King County, were calculated using census tract data available from PSRC. As in the calculations of water system population, the employment of census tracts that were split by the water service area boundary were adjusted based on the area of the census tract within the water service area. PSRC employment projections for 2015, 2020, 2025, 2030, 2035, and 2040 were utilized, and projected population for intermediate years was calculated by assuming a uniform employment growth rate between data points. Employment estimates for areas of unincorporated King County served by the water system were provided by King County. Employment projections from the Midway Subarea Plan were not utilized. Because only a small portion of the Midway Subarea overlaps the City's retail water service area and no expansion of the retail water service area in the Midway Subarea is anticipated during the 20-year planning period, the impact of this potential increased growth on the water system's total employment projections is expected to be minor. For the purposes of estimating demands, the employment projections for the water system are presented in Table 3-3. Employment projections are also shown in Chart 3-1.



This map is a graphic representation derived from the City of Kent Geographic Information System. It was designed and intended for City of Kent staff use only; it is not guaranteed to survey accuracy. This map is based on the best information available on the date shown on this

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Vicinity Map



Figure 3-1
Land Use
City of Kent
Water System Plan



1 inch = 2,000 feet

1,000 2,000 4,000

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"







# 4 | WATER DEMANDS

# INTRODUCTION

A detailed analysis of system demands is crucial to the planning efforts of a water supplier. A demand analysis first identifies current demands to determine if the existing system can effectively provide an adequate quantity of water to its customers under the most crucial conditions, in accordance with federal and state laws. A future demand analysis identifies projected demands to determine how much water will be needed to satisfy the water system's future growth and continue to meet federal and state laws.

The magnitude of water demands is typically based on three main factors: 1) population; 2) weather; and 3) water use classification. Population and weather have the two largest impacts on water system demands. Population growth tends to increase the annual demand, whereas high temperatures tend to increase the demand over a short period of time. Population does not solely determine demand because different user types use varying amounts of water. The use varies based on the number of users in each customer class, land use density, and irrigation practices. Water use efficiency efforts also impact demands and can be used to accommodate a portion of the system's growth without increasing a system's supply capacity.

Demands on the water system determine the size of storage reservoirs, supply facilities, water mains, and treatment facilities. Several different types of demands were analyzed and are addressed in this chapter, including average day demand, maximum day demand, peak hour demand, fire flow demand, future demands, and a demand reduction forecast based on the Water Use Efficiency program.

#### CERTIFICATE OF WATER AVAILABILITY

In accordance with the requirements of the Growth Management Act (GMA), the City of Kent (City) must identify that water is available prior to issuing a building permit. If the property requesting water service is outside of the City limits, a "No Protest of Annexation and Declaration of Covenant" may be required by the City, as identified in the City's Instructions and Checklist for Certificate of Water Availability. The requirement for providing evidence of an adequate water supply was codified in 1990 under Revised Code of Washington (RCW) 19.27.097 in the Building Code section.

# CURRENT POPULATION AND SERVICE CONNECTIONS

## WATER USE CLASSIFICATIONS

The City has divided all water customers into ten different classes for billing purposes. For planning purposes, the water customers have been combined into five different groups:
1) single-family residential; 2) multi-family residential; 3) commercial; 4) industrial; and 5) public. The public group includes City of Kent facilities, government, and schools billing classes. The demand analysis that follows will report on the water use patterns of these five user groups.

#### RESIDENTIAL AND EMPLOYMENT POPULATION SERVED

The residential population within the City limits was 124,500 in 2016, based on estimates from the Washington State Office of Financial Management (OFM). Since the City does not provide water service to all customers within the City limits, the actual population served by the City's water system is smaller. The 2016 residential population served by the City within the water service area is estimated to be approximately 68,157 in 2016, and 69,465 in 2017, as presented in **Chapter 3**.

Because non-residential water use is a significant portion of the City's total water use, the total employment for the water system was calculated to project the future water system demands. The existing and future number of employees working in the water service area were calculated using census tract data available from the Puget Sound Regional Council (PSRC) and data provided by King County. The 2016 employment population served by the City within the water service area is estimated to be approximately 64,755 in 2016, and 65,356 in 2017. The computation of the population served is discussed in **Chapter 3**, along with a more detailed discussion of the City's population and household trends.

# **EXISTING WATER DEMANDS**

#### WATER CONSUMPTION

Water consumption is the amount of water used by all customers of the system, as measured by the customer's meters. **Table 4-1** shows the historical average number of connections, average annual consumption, and average daily consumption per connection of each customer class for the City from 2011 through 2016. As shown in **Table 4-1**, the City provided water service to an average of 14,907 connections in 2016. Approximately 10,981 connections (74 percent) were single-family residential customers, 1,682 connections (11 percent) were multi-family residential customers, 1,883 connections (13 percent) were commercial customers, 98 connections (less than 1 percent) were industrial customers, and 263 connections (2 percent) were public customers.

Table 4-1
Average Annual Metered Consumption and Service Connections

			<b>Customer Class</b>			_
Year	Single-family Residential	Multi-family Residential	Commercial	Industrial	Public	 Totals
		Aver	age Number of Con	nections		
2011	10,339	1,674	1,846	97	252	14,207
2012	10,498	1,674	1,849	97	253	14,371
2013	10,631	1,678	1,859	98	253	14,518
2014	10,775	1,681	1,868	98	256	14,678
2015	10,872	1,681	1,874	98	259	14,783
2016	10,981	1,682	1,883	98	263	14,907
		Average	Annual Consumpt	ion (gallons)		
2011	591,332,522	774,421,604	705,851,696	183,370,704	95,741,008	2,350,717,53
2012	598,972,295	813,131,352	708,109,160	149,259,660	92,413,904	2,361,886,3
2013	599,690,973	806,081,452	724,312,336	148,935,776	95,972,888	2,374,993,4
2014	624,470,792	818,546,124	771,937,047	163,497,092	102,842,520	2,481,293,5
2015	642,706,284	838,680,040	809,905,976	168,551,328	115,714,852	2,575,558,4
2016	631,193,966	842,255,480	840,994,352	163,321,312	100,454,904	2,578,220,0
		Average Daily Cor	sumption Per Con	nection (gal/day/co	nn)	
2011	157	1,268	1,048	5,179	1,043	453
2012	156	1,327	1,047	4,204	1,000	449
2013	155	1,316	1,068	4,178	1,038	448
2014	159	1,334	1,129	4,571	1,102	463
2015	162	1,367	1,184	4,712	1,226	477
2016	157	1,368	1,220	4,557	1,043	474
Average	157	1,330	1,116	4,567	1,075	461

As shown in **Chart 4-1**, the single-family residential class represents approximately 74 percent of all connections, but only 24 percent of total system consumption, as shown in **Chart 4-2**. This is due to the lower consumption per connection of single-family residential customers as compared to other customer types. As shown in **Table 4-1**, single-family residential customers use an average of approximately 157 gallons per day (gpd) per connection, compared to multi-family customers that use an average of approximately 1,330 gpd per connection. Multiple units are typically served by one multi-family residential connection, resulting in additional consumption per connection compared to single-family residential connections. Multi-family residential consumption per connection is similar to the consumption of commercial and public customers that use an average of approximately 1,116 and 1,075 gpd per connection, respectively. Industrial customers use significantly more water with an average of approximately 4,567 gpd per connection. The higher consumption rate per connection of commercial, public, and industrial customers compared to single-family residential customers is expected since these customers include the system's highest individual water users.

Chart 4-1 2016 Water Connections by Customer Class

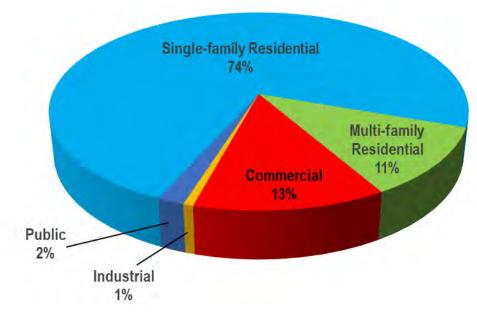
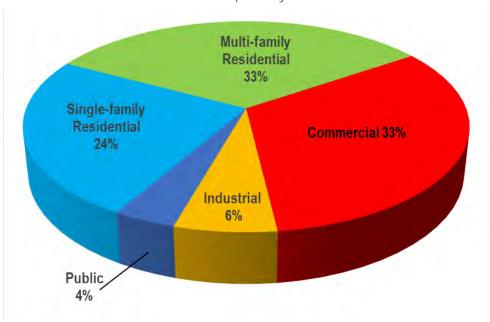


Chart 4-2 2016 Water Consumption by Customer Class



**Table 4-2** shows the largest 20 water users of the system in 2016, and their total amount of metered consumption for the year. The total water consumption of these 20 water accounts represented approximately 14.2 percent of the system's total metered consumption in 2016. The list of customer accounts in **Table 4-2** consists of water users from all customer classes except the single-family residential class, with the majority of the largest users considered commercial customers.

Table 4-2 Largest Water Users

		Total Annual Consumption
Name	Address	(gallons)
Danone Waters of North America	21608 85th Ave. S	52,190,700
Kings Command Foods, LLC	7622 S 188th St.	29,917,512
Air Gas	8008 S 222nd St.	26,700,149
Con Agra Foods	6320 S 190th St.	24,458,243
Aramark Uniform Services	7810 S 228th St.	23,679,523
King County Administration Building	401 4th Ave. N	22,599,339
Rexam Beverage Can Company	1220 2nd Ave. N	21,581,243
Mikron Industries	1136 6th Ave. N	20,869,099
Kent 228	8010 S 228th St.	16,743,603
Alsco	6906 S 204th St.	15,037,301
Northwest Center	22247 76th Ave. S	13,696,796
Oberto Sausage Company	7060 S 238th St.	12,315,895
Danone Waters of North America	21608 85th Ave. S	12,134,867
Boeing Defense and Space Group	20403 68th Ave. S	12,101,205
Smith Brothers Farms	26401 79th Ave S.	11,293,311
Northwest Center	22247 76th Ave. S	10,661,209
Hytek Finishes Co.	8127 S 216th St.	10,401,635
Oberto Snacks, Inc.	7060 S 238th St.	10,211,631
Flow International	23316 64th Ave. S	9,900,442
Hume Investments, Inc.	25246 106th Ave. SE	9,863,787
Largest Water Users Total Consumption		366,357,488
Water System Total Metered Consumption		2,578,220,014
Large Water Users Percent of Total Metered (	Consumption	14.2%

Residential demand varies throughout the year, typically peaking in the hot summer months. Other customers often peak at different times or have different peaking factors because their uses and consumption patterns differ. The demand for all customers in the City generally peaks in the summer, as shown in **Chart 4-3**. Residential and commercial consumption have the largest peaks in the summer, as shown in **Chart 4-3**. Industrial and public consumption has less pronounced peaks, but also typically peaks in the summer, as shown in **Chart 4-3**. The City reads public and industrial meters monthly, and most residential and commercial meters every two months as shown in **Chart 4-3**. A two-period moving average trendline is shown for the customer classes that are read every two months to approximate the actual 2016 monthly consumption data. The consumption data are also shown as data points in **Chart 4-3**.

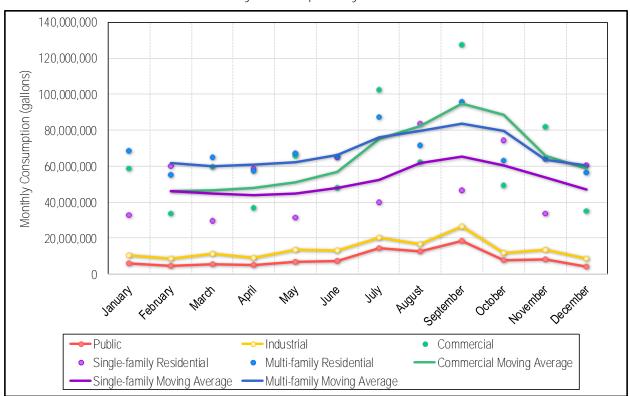


Chart 4-3 2016 Monthly Consumption by Customer Class

#### WATER SUPPLY

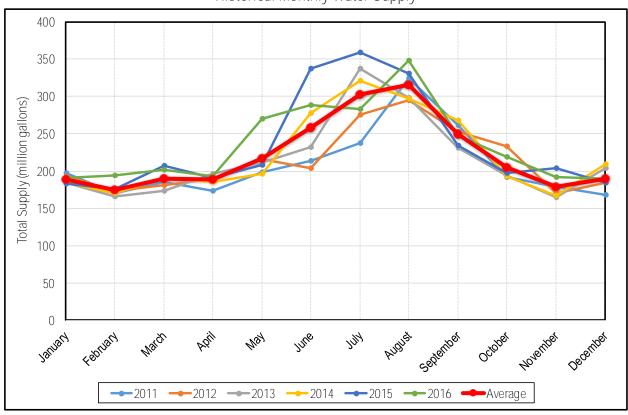
Water supply, or production, is the total amount of water supplied to the system, as measured by the meters at source of supply facilities. Water supply is different than water consumption in that water supply is the recorded amount of water put into the system and water consumption is the recorded amount of water taken out of the system. The measured amount of water supply of any system is typically larger than the measured amount of water consumption, due to non-metered water use and water loss (i.e., distribution system leakage), which will be described more in the **Distribution System Leakage** section. **Table 4-3** summarizes the total amount of water supplied to the system from 2011 through 2016.

Table 4-3
Historical Water Supply

Year	Annual Supply (gallons)
2011	2,498,178,000
2012	2,566,823,000
2013	2,593,245,000
2014	2,659,170,000
2015	2,811,692,000
2016	2,818,790,000

Like most other water systems, the City's water use varies seasonally. **Chart 4-4** shows the historical amount of water supplied to the City's system for each month from 2011 to 2016.

Chart 4-4
Historical Monthly Water Supply



As shown in **Chart 4-4**, water supply increases significantly during summer months, primarily due to irrigation. The City's highest water use typically occurs in July and August. On average, the amount of water supplied during these 2 months is approximately 23 percent of the total supply for the entire year.

Chart 4-5 shows the monthly water supply by source for 2016. In 2016, the majority of water was supplied from the Clark Springs and Kent Springs, with smaller volumes coming from the East Hill Well, and the City of Tacoma's Second Supply Pipeline (SSP) Connection

#1 (240 Zone) and SSP Connection #3 (590 Zone) sources. **Table 4-4** and **Chart 4-6** show the annual water supply by source from 2011 to 2016. In 2016, the City's two primary sources, Clark Springs and Kent Springs, supplied 68 percent of the total supply to the system. The relative volume supplied from each of the City's sources has been similar since 2011, but the volume of water consumed within the City has steadily inclined from 2011 to 2016. This is most likely the result of the 700 new service connections added to the system and the increased usage of water per connection of both commercial and multi-family residential customer classes. **Table 4-4** also presents the system-wide average day demand for 2011 through 2016.

Chart 4-5 2016 Monthly Water Supply by Source

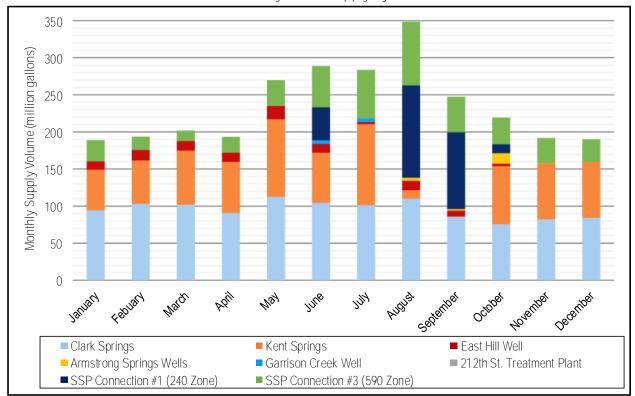


Table 4-4 Historical Supply by Source and System-wide Average Daily Demand

	Annual Supply Volume (MG)												
Year	Clark Springs	Kent Springs	East Hill Well	Armstrong Springs Wells	Seven Oaks Well	Garrison Creek Well	212th St. Treatment Plant	SSP Conn. #1 (240 Zone)	SSP Conn. #3 (240 Zone)	SSP Conn. #3 (590 Zone)	Interties	Net Supply	Average Day Demand (gpm)
2011	1,375.9	743.8	125.5	79.8	0.0	6.4	0.0	0.0	0.0	166.4	0.3	2,498.2	4,753
2012	1,340.8	728.8	228.8	39.0	0.0	0.0	0.0	11.3	0.0	217.8	0.3	2,566.8	4,870
2013	1,297.8	751.5	183.3	88.8	0.0	0.1	0.0	0.0	0.0	271.7	0.2	2,593.2	4,934
2014	1,347.3	822.8	176.2	82.5	0.0	8.1	0.0	16.1	0.0	205.8	0.4	2,659.2	5,059
2015	1,188.3	809.7	158.7	97.5	1.7	17.5	98.7	82.3	0.0	357.2	0.0	2,811.7	5,349
2016	1,146.2	776.8	106.4	21.1	0.0	9.7	0.0	284.2	1.4	472.5	0.5	2,818.8	5,348

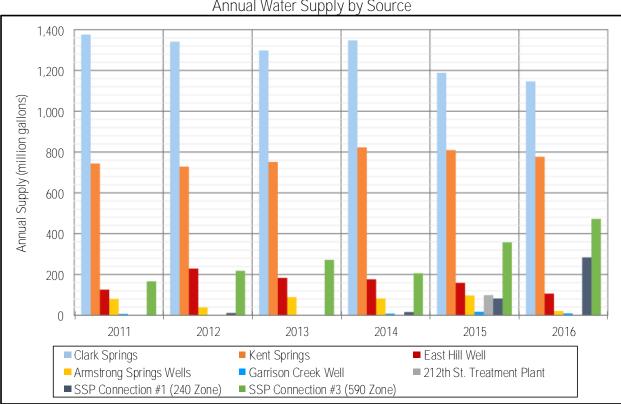


Chart 4-6 Annual Water Supply by Source

**Table 4-5** shows the 2016 demand of each of the City's 13 existing pressure zones. The demands are based on the City's 2016 individual customer meter data. The City's two largest pressure zones, the 240 and 590 Zones, account for approximately 89 percent of the total system demand. **Figure 2-1** in **Chapter 2** presents the City's pressure zones.

Table 4-5 2016 Demands by Pressure Zone

Pressure Zone	2016 Annual Supply (gallons)	Average Daily Demand (gpm)	Percent of Total Demand
240	1,618,150,124	3,070	57.4%
271 Alvord	6,166,085	12	0.2%
308 Hilltop	215,708	0	0.0%
339 Seattle	5,887,243	11	0.2%
354.5	23,848,860	45	0.8%
366 Stetson	1,283,724	2	0.0%
368 Weiland	1,694,095	3	0.1%
416	0	0	0.0%
485	97,852,402	186	3.5%
529	77,623,224	147	2.8%
575	14,531,337	28	0.5%
587	72,225,269	137	2.6%
590	899,311,928	1,706	31.9%
Total	2,818,790,000	5,348	100.0%

**Table 4-6** presents the computation of the existing system per capita demand based on 2016 data. As shown in the upper portion of the table, the residential population served by the City's water system in 2016 was approximately 68,157. This population served and the City's total residential water consumption in 2016 (total combined consumption of the single- and multi-family residential customer classes) were used to calculate the existing residential per capita demand of 65 gpd. The lower portion of the table presents the employment population served by the City's water system in 2016, which was approximately 64,755. This population served and the City's total employment water consumption in 2016 (total combined consumption of the commercial, industrial, and public customer classes) were used to calculate the existing employment per capita demand of 51 gpd.

Table 4-6 Existing Per Capita Demand

68,157
1,610,934,886
65
64,755
1,207,855,114
51

#### DISTRIBUTION SYSTEM LEAKAGE

The difference between the amount of water supply and the amount of authorized water consumption is the amount of distribution system leakage (DSL). There are many sources of DSL in a typical water system, including water system leaks, inaccurate supply metering, inaccurate customer metering, illegal water system connections or water use, fire hydrant usage, water main flushing, and malfunctioning telemetry and control equipment resulting in reservoir overflows. Several of these types of usages, such as water main flushing and fire hydrant usage, may be considered authorized uses if they are tracked and estimated. Although real losses from the distribution system, such as reservoir overflows and leaking water mains, should be tracked for accounting purposes, these losses must be considered leakage. The Water Use Efficiency (WUE) Rule establishes a DSL standard of 10 percent or less based on a rolling 3-year average.

The City has tracked water usage from flushing main lines and dead-ends since 2011, and many other authorized usage volumes. The amount of DSL in the City's system has been under 10 percent since 2011, as shown in **Table 4-7**. The City will continue to record authorized water usage and improve the reporting of additional authorized water uses. The City will also implement the WUE Program contained in **Appendix E**.

Table 4-7
Distribution System Leakage

	Sti ibution c	, 3.0 200		ear		
<b>.</b>						
Description	2011	2012	2013	2014	2015	2016
Α	uthorized Co	nsumption	(MG)			
Metered Customer Use	2,350.7	2,361.9	2,375.0	2,481.3	2,575.6	2,578.2
Public Works Hydrant Meters	31.7	31.7	31.1	62.6	50.7	43.1
Unidirectional & Dead End Flushing	1.8	1.7	3.0	2.0	1.8	1.7
Storm and Sewer Vactor Meters	0.8	0.9	1.8	1.5	1.5	1.2
Routine Maintenance	4.9	5.6	1.9	5.7	1.4	1.5
Other Operations	10.3	5.8	15.4	7.8	7.3	13.3
KSTM Leak	11.0	26.3	11.0	11.0	11.0	11.8
Total Authorized Consumption	2,411.2	2,433.9	2,439.2	2,571.9	2,649.3	2,650.8
	Total Su	upply (MG)				
Gross Supply (Finished Water)	2,498.2	2,566.8	2,593.2	2,659.2	2,811.7	2,818.8
Dis	tribution Sys	tem Leakag	je (MG)			
Total DSL Volume	87.0	132.9	154.1	87.3	162.4	168.0
Total DSL Percentage	3.5%	5.2%	5.9%	3.3%	5.8%	6.0%
Rolling 3-Year Average DSL Percentage			4.9%	4.8%	5.0%	5.0%
Adjusted DSL Percentage <sup>1</sup>	5.9%	8.0%	8.4%	6.7%	8.4%	8.5%

<sup>(1)</sup> The adjusted DSL percentage is based on the difference between metered consumption and net supply. The calculation does not include the DSL reduction associated with other authorized non-metered consumption.

The annual DSL percentages are applied to the consumption by water use classification as reported in **Table 4-1** to determine the net supply per water use classification. Supply per water use classification for 2011 through 2016 is summarized in **Table 4-8**. The net supply per water use classification is used in the equivalent residential unit (ERU) calculations to determine the number of ERUs for each customer class.

Annual Supply (gallons) Single-family Multi-family **Total Demand** Residential Residential (i.e. Net Supply) Commercial Industrial **Public** DSL Year 2011 5.9% 628.426.800 823.001.056 750.129.759 194.873.545 101.746.840 2,498,178,000 2012 8.0% 650,944,043 883,685,296 769,550,517 162,210,652 100,432,492 2,566,823,000 8.4% 654.799.968 790.873.492 162.622.327 104.792.379 2.593.245.000 2013 880.156.834 6.7% 669,237,213 877,225,218 827,274,877 175,217,704 110,214,989 2,659,170,000 2014 8.4% 915,572,284 184,004,527 126,323,874 2015 701,631,173 884,160,143 2,811,692,000 690,089,763 919,466,321 178,560,588 109,828,206 2016 8.5% 920,845,123 2,818,790,000

Table 4-8
Average Annual Supply by Customer Class

#### EXISTING EQUIVALENT RESIDENTIAL UNITS

The demand of each customer class can be expressed in terms of ERUs for demand forecasting and planning purposes. One ERU is equivalent to the amount of water used by a single-family residence. The number of ERUs represented by the demand of the other customer classes is determined from the total demand of the customer class and the unit demand per ERU from the single-family residential demand data.

**Tables 4-9A** and **4-9B** present the computed number of ERUs for each customer class from 2011 through 2016. The demands shown are based on the consumption totals of each customer class and the authorized non-revenue water consumption shown in **Table 4-8**. The average demand per ERU from 2011 through 2016 (6-year average) was 171 gpd, which is slightly less than the average single-family residential demand in the Puget Sound area, which is typically between 200 and 300 gpd.

Table 4-9A Equivalent Residential Units

	A.z. N. N. N.	Average Annual	Daniel de la EDU	T - 4 - 1
Year	Average Number of Connections	Demand (gallons)	Demand per ERU (gal/day/ERU)	Total ERUs
	Single-fa	amily Residential (ER	U Basis)	
2011	10,339	628,426,800	167	10,339
2012	10,498	650,944,043	169	10,498
2013	10,631	654,799,968	169	10,631
2014	10,775	669,237,213	170	10,775
2015	10,872	701,631,173	177	10,872
2016	10,981	690,089,763	172	10,981
	N	Iulti-family Residentia	al	_
2011	1,674	823,001,056	167	13,540
2012	1,674	883,685,296	169	14,251
2013	1,678	880,156,834	169	14,289
2014	1,681	877,225,218	170	14,124
2015	1,681	915,572,284	177	14,187
2016	1,682	920,845,123	172	14,653
		Commercial		
2011	1,846	750,129,759	167	12,341
2012	1,849	769,550,517	169	12,411
2013	1,859	790,873,492	169	12,840
2014	1,868	827,274,877	170	13,320
2015	1,874	884,160,143	177	13,700
2016	1,883	919,466,321	172	14,631

Table 4-9B Equivalent Residential Units

Year	Average Number of Connections	Average Annual Demand (gallons)	Demand per ERU (gal/day/ERU)	Total ERUs
		Industrial		
2011	97	194,873,545	167	3,206
2012	97	162,210,652	169	2,616
2013	98	162,622,327	169	2,640
2014	98	175,217,704	170	2,821
2015	98	184,004,527	177	2,851
2016	98	178,560,588	172	2,841
		Public		
2011	252	101,746,840	167	1,674
2012	253	100,432,492	169	1,620
2013	253	104,792,379	169	1,701
2014	256	110,214,989	170	1,775
2015	259	126,323,874	177	1,957
2016	263	109,828,206	172	1,748
		System-wide Totals		
2011	14,207	2,498,178,000	167	41,099
2012	14,371	2,566,823,000	169	41,396
2013	14,518	2,593,245,000	169	42,102
2014	14,678	2,659,170,000	170	42,815
2015	14,783	2,811,692,000	177	43,567
2016	14,907	2,818,790,000	172	44,854
verage 2	2011 to 2016		171	

The average demand per ERU from 2011 through 2016 of 171 gpd will be used later in this chapter to forecast ERUs in future years based on estimated future demands. This demand per ERU value will also be used to determine the capacity (in terms of ERUs) of the existing system in **Chapter 7**.

#### PEAK DEMANDS

#### Average Day Demand

Average day demand (ADD) is the total amount of water delivered to the system in a year divided by the number of days in the year. The ADD is determined from the historical water use patterns of the system and can be used to project future demands within the system. ADD data are typically 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 production records from the City's wells and spring

sources were reviewed to determine the system's ADD. The system's average day demand from 2011 through 2016 is shown in **Table 4-4**.

#### Maximum Day Demand

Maximum day demand (MDD) is the maximum amount of water used throughout the system during a 24-hour time period of a given year. MDD typically occurs on a hot summer day when lawn watering is occurring throughout much of the system. In accordance with Washington Administrative Code (WAC) 246-290-230, the distribution system shall provide fire flow at a minimum pressure of 20 pounds per square inch (psi) during MDD (i.e., peak day demand) conditions. Supply facilities (e.g., wells, springs, pump stations, interties) are typically designed to supply water at a rate that is equal to or greater than the system's MDD.

One-hour interval water production and reservoir level records from 2016 were reviewed to determine the system's MDD. The City's MDD occurred on Wednesday, August 17, 2016, when temperatures reached approximately 80 degrees Fahrenheit (°F). As shown in **Table 4-10**, the average demand of the system on August 17, 2016, or MDD, was 11,629 gallons per minute (gpm).

Table 4-10
Maximum Day Demands and Peaking Factors

Peak Demand Data										
Demand Type	Date	Demand (gpm)								
Average Day Demand (ADD)	2016	5,348								
Maximum Day Demand (MDD)	August 17, 2016	11,629								
Peak Hour Demand (PHD)	16,995									
Pe	aking Factors									
Maximum Day Demand/Average Day	Demand (MDD/ADD)	2.17								
Peak Hour Demand/Maximum Day De	1.46									
Peak Hour Demand/Average Day Der	3.18									

#### Peak Hour Demand

Peak hour demand (PHD) is the maximum amount of water used throughout the system, excluding fire flow, during a 1-hour time period of a given year. In accordance with WAC 246-290-230, 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. Equalizing storage requirements are typically based on PHD data.

The PHD, like the MDD, is typically determined from the combined flow of water into the system from all supply sources and reservoirs. One-hour interval water production and reservoir level records were reviewed to evaluate the PHD. As shown in **Table 4-10**, the City's PHD, which occurred on August 17, 2016, from 9:00 p.m. to 10:00 p.m., was 16,995 gpm.

**Table 4-10** also shows the peaking factors of the water system based on the ADD, MDD, and PHD data. The 2017 ADD was not available at the time of these analyses; therefore, the estimated 2016 ADD was used to estimate the peaking factors of the system. The MDD/ADD demand ratio of 2.17 is within the typical range of 1.2 to 2.5 for most Puget Sound area systems. The PHD/MDD ratio of 1.46 is within the typical range of 1.3 to 2.0 for most Puget Sound area systems. These peaking factors will be used later in this chapter in conjunction with projected ADDs, to project future MDDs and PHDs of the system.

#### 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 the water system because a high rate of water must be supplied over a short period of time, requiring each component of the system to be properly sized and configured to operate at its optimal condition. Adequate storage and supply are useless if the transmission or distribution system cannot deliver water at the required rate and pressure necessary to extinguish a fire.

General planning-level 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 in areas that are not fully developed. The general planning-level fire flow requirement for each land use category is shown in **Table 4-11**. The water system analyses presented in **Chapter 7** are based on an evaluation of the water system for providing sufficient fire flow in accordance with these general planning-level fire flow requirements. The fire flow requirements shown in **Table 4-11** do not necessarily equate to actual existing or future fire flow requirements for all buildings, since this is typically based on building size, construction type, and fire suppression systems provided. Improvements to increase the available fire flow to meet actual fire flow requirements greater than those shown in **Table 4-11** shall be the responsibility of the developer.

Table 4-11
General Planning-level Fire Flow Requirements

Land Use Category	Planning-level Fire Flow Requirement (gpm)	Flow Duration (hours)
Agriculture	1,000	1
Open Space/Greenbelt/Public	1,000	1
Single-Family Residential	1,500	1
Multi-Family Residential	1,500	1
Commercial <sup>1</sup>	3,500	3
Industrial <sup>2</sup>	3,250	4

<sup>1 =</sup> Includes Mixed-Use, Neighborhood Services, and Urban Center land use types.

<sup>2 =</sup> Includes King County Industrial and Manufacturing/Industrial Center land use types.

# FUTURE WATER DEMANDS

#### BASIS FOR PROJECTING DEMANDS

Future demands were calculated from the results of the future per capita demand computations shown in **Table 4-6** and the projected population data from **Chapter 3**. Future demand projections were computed with and without water savings expected from implementing WUE measures contained in the City's WUE Program in **Appendix E**.

The calculated future per capita demand of 65 gpd was used for all residential demand projections without savings from WUE measures, and the calculated future per capita demand of 51 gpd was used for all employment demand projections without savings from WUE measures. The per capita demand was reduced to reflect the WUE goals and used as the basis for future water demand projections with implementation of the WUE Program. The City's WUE Program presents goals to reduce the multi-family residential consumption by 1 percent annually and reduce the public agency consumption by 0.5 percent in June through August on an annual basis. The City also has a continued goal to maintain DSL at 6 percent or less each year.

#### DEMAND FORECASTS AND CONSERVATION

**Table 4-12** presents the projected water demand forecast for the City's water system. The actual demand data from 2016 is also shown for comparison purposes. The future ADDs were projected based on residential and employment population estimates for the given years and the estimated demand per capita values from **Table 4-6**. The future MDDs and PHDs shown were computed from the projected ADDs and the existing system peaking factors shown in **Table 4-10**. The future demand projections are also shown with and without estimated reductions in water use from achieving WUE goals.

Table 4-12
Future Water Demand Projections

								,							
	Actual							Pr	ojected						
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2038	2068
Description													(+10 yrs)	(+20 yrs)	(+50 yrs)
				W	ater Serv	ice Area	Populat	ion Data							
Residential Population	68,157	69,465	69,653	69,841	70,029	70,259	70,490	70,721	70,952	71,183	71,403	71,622	71,842	74,166	82,705
Employment Population	64,755	65,356	65,956	66,557	67,157	67,530	67,904	68,279	68,655	69,031	69,281	69,529	69,777	77,653	114,053
						asis Data									
Residential ADD without WUE	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65
Employment ADD without WUE	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51
					Averag	je Day Do	emand (d	(mar							
Demand without WUE	5,348	5,428	5,458	5,488	5,517	5,541	5,564	5,588	5,612	5,635	5,654	5,673	5,691	6,074	7,745
Demand with WUE	-,-	5,410	5,422	5,433	5,445	5,450	5,456	5,461	5,467	5,472	5,473	5,473	5,474	5,849	7,493
					Maximu	ım Day D	emand (	(gpm)							
Demand without WUE	11,629	11,803	11,867	11,932	11,997	12,048	12,099	12,150	12,202	12,253	12,294	12,334	12,375	13,208	16,841
Demand with WUE		11,764	11,789	11,814	11,839	11,851	11,863	11,875	11,886	11,898	11,899	11,900	11,901	12,718	16,292
					Daala	Harra Dar									
						Hour De									
Demand without WUE	16,995	17,249	17,343	17,438	17,532	17,607	17,681	17,757	17,832	17,907	17,966	18,026	18,085	19,302	24,612
Demand with WUE		17,191	17,228	17,265	17,302	17,319	17,336	17,354	17,371	17,388	17,390	17,391	17,393	18,586	23,810

The analysis and evaluation of the existing water system with proposed improvements, as presented in **Chapters 7** and **9**, is based on the 2038 projected demand data without WUE reductions. This ensures that the future system will be sized properly to meet all requirements, whether or not additional water use reductions are achieved. However, the City will continue to pursue reductions in water use by implementing the WUE Program contained in **Appendix E**.

**Table 4-13** presents the existing and projected ERUs of the system. The ERU forecasts are based on the projected water demands from **Table 4-12** and the 6-year rolling average demand per ERU that was computed from actual 2011 through 2016 data. The projected water demand and ERU data from **Tables 4-12** and **4-13** are also shown graphically in **Chart 4-7**. **Chart 4-7** will be used in **Chapter 7** to compare demand projections with source of supply availability.

Table 4-13
Future ERU Projections

							- )								
	Actual							Pro	ojected						
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2038	2068
Description													(+10 yrs)	(+20 yrs)	(+50 yrs)
						Dema	nd Data	(gpm)							
ADD without WUE	5,348	5,428	5,458	5,488	5,517	5,541	5,564	5,588	5,612	5,635	5,654	5,673	5,691	6,074	7,745
ADD with WUE		5,410	5,422	5,433	5,445	5,450	5,456	5,461	5,467	5,472	5,473	5,473	5,474	5,849	7,493
					ER	U Basis	Data (ga	al/day/EF	RU)						
Demand per ERU without WUE	172	171	171	171	171	171	171	171	171	171	171	171	171	171	171
Demand per ERU with	h WUE	171	171	171	171	171	171	171	171	171	171	171	171	171	171
					Equiv	alent Re	sidentia	l Units (I	ERUs)						
Total System ERUs	44,854	45,828	46,079	46,330	46,580	46,779	46,978	47,177	47,377	47,577	47,735	47,892	48,049	51,283	65,392

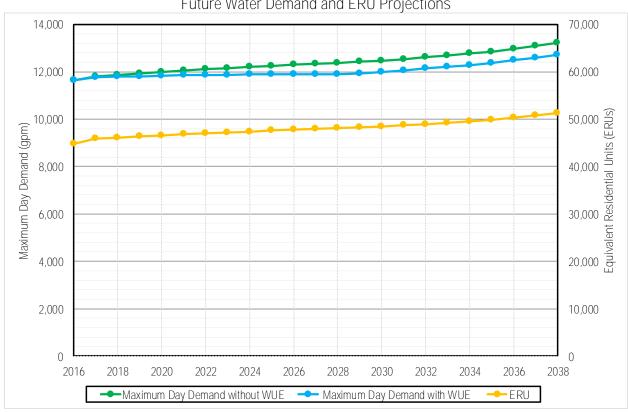


Chart 4-7
Future Water Demand and ERU Projections

# CLIMATE CHANGE IMPACTS

The City understands that projections of precipitation patterns due to long-term trends in climate conditions indicate potential impacts to the availability and reliability of drinking water supplies the ability to meet future demands. RH2 has performed a literature review to document climate change projections and estimate their impact on the City's source vulnerability and future demand projections.

#### CLIMATE CHANGE PROJECTIONS

In 2013, the University of Washington's Climate Impact Group released a report titled *Climate Change Impacts and Adaptation in Washington State*. This report is cited by the Washington State Department of Health (DOH) as a source for their own projections of climate change impacts on drinking water in Washington State.

In summary, this report projects the following major quantitative climatic changes in Washington State pertinent to water system planning.

• The average annual surface air temperature is estimated to increase between 4.3°F and 5.8°F by the end of 2060. This increase depends on projected future greenhouse gas emissions and is relative to the temperatures measured between 1950 and 1999.

- The average number of days with more than 1 inch of precipitation is estimated to increase between 6 and 20 percent by the end of 2060. This increase depends on projected future greenhouse gas emissions and is relative to precipitation records between 1971 and 2000.
- The average April 1<sup>st</sup> snowpack volume is estimated to decrease between 38 and 46 percent by the end of 2050 for low and medium greenhouse gas emission scenarios. This decrease is relative to the snowpack records between 1916 and 2006.
- The average sea level is estimated to rise between 4 inches and 56 inches by the year 2100. This increase depends on projected future greenhouse gas emissions and is relative to sea level recorded in 2000.

The report also projects the following qualitative impacts specific to water resources management.

- Decreasing summer minimum stream flows and increased potential for more frequent summer water shortages, especially in fully allocated watersheds with little management flexibility.
- Increasing average and peak stream temperatures.
- Widespread changes in streamflow timing and flood risk compared to historical trends.
- Higher rates of water-borne diseases, primarily from increased flooding.

Perhaps the most significant impacts to water purveyors from projected climatic changes would be the projected declining snowpack volume and changes in streamflow timing and summer minimum flows. Effects to streamflow timing vary from basin to basin and depend on the proportion of precipitation that falls as snow versus rain as follows.

- Rain-Dominant Basins: In watersheds with warmer winter temperatures where less than 10 percent of winter precipitation falls as snow, streamflow peaks during the winter months and atmospheric warming is projected to have minimal effect on peak streamflow timing in unregulated basins. However, changes in intensity of precipitation could alter reservoir operations and storage availability to accommodate sudden stormwater events that would fill reservoirs. Streamflows in regulated basins may become more extreme despite the availability of reservoir regulation to mitigate these extremes.
- Mixed Rain and Snow Basins: Middle elevation watersheds near the current snowline where between 10 percent and 40 percent of winter precipitation falls as snow are the most sensitive to projected atmospheric warming. In these basins, peak streamflow is projected to shift significantly earlier in the season by weeks to months, as wet season precipitation falls as rain instead of snow.
- Snow-Dominant Basins: In watersheds with cold winter temperatures where more than 40 percent of winter precipitation currently falls as snow, peak streamflow will shift earlier in the season from early summer to spring as early and late wet season precipitation falls as rain instead of snow. Permanent reduction of glacial ice volume will also affect stream flow in high altitude watersheds.

In the Green River Watershed, which supplies the City of Tacoma and serves as an emergency source for the City of Kent through its Second Supply Pipeline, winters are cool and much of the precipitation falls in the form of snow during winter months<sup>1</sup>. The watershed can most likely be generalized as a "mixed rain and snow basin" or "snow dominant basin." The City of Tacoma would have some ability to mitigate projected shift in peak streamflow timing through operation of the Eagle Creek Reservoir and is preparing for earlier and later peak streamflows. However, the dam is operated to capture extreme winter precipitation volumes, release them safely to the Green River, then drain the reservoir for the next event. If the reservoir captures and releases a greater percentage of the annual volume of precipitation to mitigate flooding, less water would be available for capture and storage for potable supply.

#### SOURCE VULNERABILITY IMPACTS

The City's water is supplied predominantly by groundwater sources recharged by annual precipitation, and the City's supply appears more resilient against changes in streamflow timing, declining snowpack, and water quality than other water systems that rely on surface water sources. The inherent slow filling, persistent storage, and slow draining characteristics of aquifer replenishment offers some degree of protection against summer water availability if the volume and location of winter precipitation still results in sufficient aquifer recharge. The relationship between precipitation and aquifer recharge is complex and local. Impacts to the City's groundwater sources depend on the precise characteristics of rainfall patterns, surface and subsurface permeability, pathways of infiltration into the aquifer, and locations and volumes of groundwater withdrawal. Urbanization and increased groundwater withdrawals from the source aquifers are significant factors partially or unrelated to changes in precipitation timing and temperature that could negatively impact the reliability of the City's groundwater sources.

It is notable that the University of Washington Climate Impact Group indicated that nearby Tacoma Water's average water supply reliability is expected to decrease (worsen) between 63 percent and 96 percent under projected low and medium greenhouse gas emission scenarios by 2080. This forecasted decrease in reliability is assumed to result from earlier snow melt and decreased summer flows. This forecast also assumes no new sources of supply and no changes to current operating procedures. A system reliability of 100 percent indicates that no water shortage exists; as reliability decreases, the probability of a water shortage occurring increases. The source study indicates Tacoma Water's supply is robust through 2030<sup>2</sup>, so the City has some time to further evaluate and mitigate its risk due to changes in surrounding watersheds. The City may consider performing a detailed hydrogeologic study to improve awareness and management of aquifer recharge and withdrawals to mitigate potential changes in rainfall patterns and recharge.

#### **DEMAND IMPACTS**

The University of Washington Climate Impact Group reports high confidence that air temperatures will increase over time, but low confidence in how precipitation amounts will

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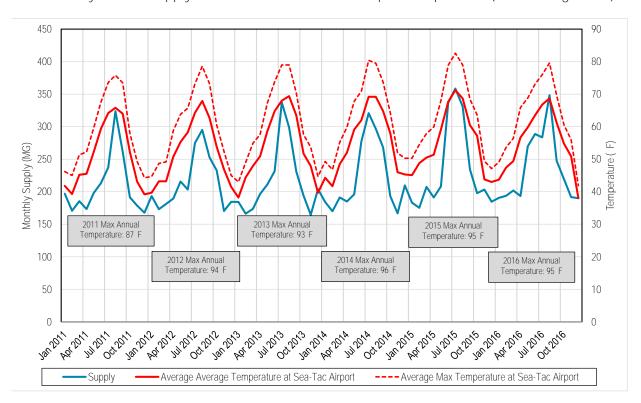
<sup>&</sup>lt;sup>1</sup> Tacoma Public Utilities. August 13, 2008. Green River Watershed Management Plan, Second Volume.

<sup>&</sup>lt;sup>2</sup>Vano, J.A., Voisin, N., Cuo, L., Hamlet, A.F., McGuire Elsner, M., Palmer, R.N., Polebitski, A., Lettenmaier, D.P. April 27, 2010. *Climate Change Impacts on Water Management in the Puget Sound Region, Washington State, USA*.

change in time and location. Natural year-to-year variations in precipitation are expected to overprint any incremental changes attributed to climate change processes. There is a clear correlation between temperature, precipitation, and water system demand, but increases in demand are assumed to be caused primarily by the lack of precipitation in the summer and corresponding need for irrigation. Temperature increases alone are expected to have a less significant effect on demand, as most commercial, industrial, and residential uses will not increase solely due to temperature (e.g., showering, laundry, cooking, etc.) As lack of sufficient precipitation is assumed to be the primary driver of summertime demand increases, but there is low confidence in how climate change will impact precipitation patterns and volumes, it is difficult to estimate how climate change could impact demand. As a comparison benchmark, the University of Washington Climate Impact Group noted that Seattle Public Utilities' water system demand is projected to increase by 1 percent in 2025, 2 percent in 2050, and 5 percent in 2075 due to climate change and warming atmospheric temperatures. This increase is relative to demands in 2000.

To predict how demand could be impacted by changes in temperature and precipitation, historic correlations between demand, temperature, and precipitation are helpful. **Chart 4-8** presents the relationship between temperature at Sea-Tac International Airport and the City's total water supplied each month from 2011 to 2016.

Chart 4-8
City of Kent Supply and Sea-Tac International Airport Temperature (2011 through 2016)



**Chart 4-8** illustrates the pattern of summertime supply peaks that correlate with increased temperatures. It should be noted that even though temperature and demand tend to peak at the same time, years with higher maximum annual temperatures do not necessarily have higher water

demands than other years. This reinforces the assumption that, while temperature and demand correlate, increased temperatures alone do not necessarily cause increased demands.

**Chart 4-9** presents the relationship between precipitation measured at Sea-Tac International Airport and the City's total water supplied between 2011 and 2016.

Chart 4-9
City of Kent Supply and Sea-Tac International Airport Precipitation 2011-2016

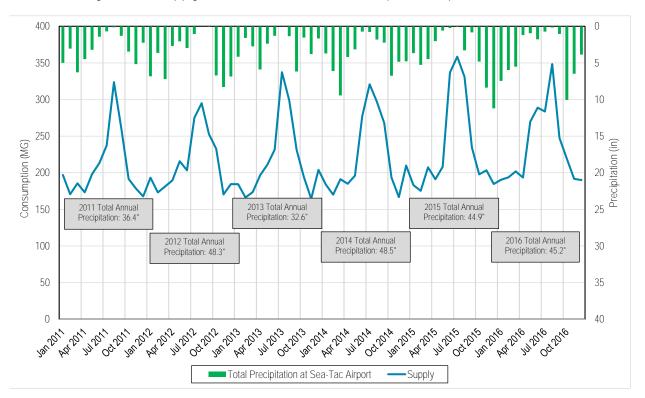


Chart 4-9 illustrates the pattern of summertime supply peaks that correlate with decreased precipitation. There is also some correlation evident year-to-year, as water demands tend to be lower in years with more precipitation and higher in years with less precipitation compared with the years immediately following and preceding (with 2016 as the only exception). Ultimately, the degree to which the City's future water demands will be impacted by climate change are a function of both expected warming and the expected change in precipitation patterns. As climate forecast models improve and changes to precipitation patterns can be forecast with more certainty, the City will further evaluate how demands are impacted by temperature and precipitation. Until that time, the City plans to use the same climate change-related increases that are projected for Seattle Public Utilities on an average day demand basis: a 1 percent increase in 2025; 2 percent in 2050; and 5 percent in 2075. The future demand projections based on these climate change-related increases are shown in Table 4-14 with the demand projections without estimated reductions in water use from achieving WUE goals or changes in irrigation habits or practices, for reference. The analysis and evaluation of the existing water system with proposed improvements, as presented in Chapters 7 and 9, is based on the 2038 projected demand data without WUE reductions and without climate change increases. However, the City will continue to evaluate the projected warming and changes in precipitation patterns and will update the demand projections to include climate change increases in the future as necessary.

Table 4-14
Future Water Demand Projections with Consideration for Climate Change

	Actual				
	2016	2028	2038	2068	
Description		(+10 yrs)	(+20 yrs)	(+50 yrs)	
Water Service Ar	ea Populatio	on Data			
Residential Population	68,157	71,842	74,166	82,705	
Employment Population	64,755	69,777	77,653	114,053	
Average Day	Demand (gp	om)			
Demand with Climate Change Increase	5,348	5,717	6,121	7,933	
Demand without WUE or Climate Change Increase		5,691	6,074	7,745	
Maximum Day	y Demand (g	pm)			
Demand with Climate Change Increase	11,629	12,430	13,309	17,249	
Demand without WUE or Climate Change Increase		12,375	13,208	16,841	
Peak Hour I	Demand (gpr	n)			
Demand with Climate Change Increase	16,995	18,166	19,450	25,208	
Demand without WUE or Climate Change Increase		18,085	19,302	24,612	

# 5 REGULATORY REQUIREMENTS AND MINIMUM DESIGN CRITERIA

Establishing realistic design criteria is required to satisfy Washington State Department of Health (DOH) planning requirements, to evaluate the existing water system's adequacy, and to plan for future water system improvements. The minimum design criteria for the City of Kent (City) water system are in accordance with the standards and requirements set forth by the U.S. Environmental Protection Agency (EPA), DOH, and the Washington State Department of Ecology (Ecology), and for the water service area outside the City limits (in unincorporated King County) in accordance with the land use and planning guidelines of King County.

These standards are consistent with the DOH Group A Public Water Systems Waterworks Standards, the South King County Coordinated Water Supply Plan (SKC CWSP) Design and Construction Standards, and King County's Rules and Regulations relating to Fire Hydrants and Water Mains as authorized under King County Ordinance 5828. In some instances, the City Standards may be more stringent and/or restrictive than the requirements of other agencies, in which case the City Standards shall apply.

Water system facilities constructed within the water service area must also be designed and constructed according to City Standards. The minimum criteria put forth herein do not replace or supersede the City's Construction Standards, Developer Extension requirements or other codes and requirements associated with development proposals and permits. The City's most current Construction Standards are contained in **Appendix G** and have been utilized in this summary of design criteria. The Construction Standards can also be found on the City's website.

The City's standards and minimum design criteria accommodate anticipated maximum daily demands (MDD), as well as the demands on the system for peak hour, fire flow and other emergency situations. Minimum design criteria are established for water supply, storage volume, distribution and transmission main capacity and water quality standards. The criteria are used to determine existing deficiencies in the water system and projected water system requirements for the planning area described previously in this document. **Chapter 7** summarizes the analyses performed on the system and identified deficiencies in meeting the needs of the current and projected customers of the system.

This Chapter also discusses the City's project review procedures for both public works and developer extension projects and describes policies and requirements for outside parties. A discussion of the City's construction standards, construction certification, and construction follow-up procedure is also provided.

# REGULATORY REQUIREMENTS

#### FEDERAL REOUIREMENTS

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Public Law 93-523, the Safe Drinking Water Act (SDWA), directs the U.S. Environmental Protection Agency (EPA) to establish minimum national drinking water standards limiting the amount of potentially harmful substances which may be present in drinking water sources. These limits are regulated by the State of Washington Department of Health and adhered to by the City of

Kent. Complete details of current regulations are contained in **Chapter 6** and the City's water quality monitoring program is provided in **Appendix I**.

Because of the listing of the Puget Sound Chinook Salmon and Bull Trout as a "threatened species," rules and regulations under the authority of the Endangered Species Act (ESA) can affect water system operations. As part of its ESA compliance program, the City operates consistent with best management practices as appropriate to protect endangered species.

#### STATE OF WASHINGTON REQUIREMENTS

The rules and regulations regarding public water supplies are a part of the Washington Administrative Code (WAC) and are adopted pursuant to the provisions in the Revised Code of Washington (RCW) 43.20.050 for the protection of public health. The rules and regulations provide the minimum standards for design, construction, operations and maintenance of public water systems and conform with the Safe Drinking Water Act of 1974 and all subsequent amendments thereto.

The Growth Management Act (GMA) of 1990 (RCW 36.70A) has a direct impact on utility system planning by requiring a complete inventory of existing system facilities and a comprehensive effort toward determining the capability of utility systems to support anticipated growth and a plan to finance capital facilities. The GMA requires cities and counties to discuss and plan for seven key elements in their comprehensive plans: (1) Land Use, (2) Housing, (3) Capital Facilities, (4) Utilities, (5) Transportation, (6) Economic Development, and (7) Parks and Recreation. A primary outcome of the growth management planning in King County is the delineation of an Urban Growth Area (UGA) boundary within which an urban level of service is required. GMA rules and regulations will be crucial to projecting future water demands. Because much of the Retail Water Service Area for the City of Kent is within the UGA, as discussed in **Chapter 3**, the pressure for growth will remain substantial. In addition, the City is required to plan for the provisions of an "urban level of service" because it serves within the UGA.

Regulations related to accounting practices for municipalities such as the City of Kent are implemented and monitored by the State of Washington Auditor. Kent maintains a long-term system inventory program utilizing computerized mapping, equipment inventory and a Geographical Information System (GIS). These programs have assisted in compliance with Government Accounting Standards Bureau statement 34 requirements and have been a key element in development of this WSP.

DOH's "Water System Design Manual" is the primary document governing the sizing and design of public water systems in the State of Washington. This publication sets forth the minimum system plan and reliability considerations. Criteria for distribution system design, water storage and daily supply requirements are summarized in this Chapter.

#### KING COUNTY REQUIREMENTS

Because a portion of the Retail Water Service Area is within unincorporated King County, the City must operate within the rules and regulations established by King County for these areas and utilize County planning data in developing growth projections for areas outside the City limits. Specifically, the King County Comprehensive Plan has a direct impact on the planning effort. King County Code Titles 13.24 (Sewer and Water Comprehensive Plans), 14, 21A, and 17.08, as well as Countywide Planning Policies and King County Comprehensive Plan Policies related to water utilities, have been utilized in the development of this document to ensure that water system operations and construction

standards are in conformance with King County requirements. The City must also operate within the terms of its current right-of-way franchise with King County.

# CONDITIONS OF WATER SERVICE

The City of Kent currently provides water service to customers within its established service area boundary. Additionally, the City maintains metered interties with the City of Renton, the City of Tukwila, Highline Water District, the City of Auburn, Lake Meridian Water District, and Soos Creek Water and Sewer District.

Service area policies such as developer extension requirements, fee payment responsibilities, design standards and related issues are governed by the Kent City Code and the City of Kent Construction Standards.

# FIRE FLOW REQUIREMENTS

The Washington Administrative Code (WAC) 246-290-230(6) states the following requirement for public water distribution systems:

"If fire flow is to be provided, the distribution system shall also provide maximum day demand (MDD) plus the required fire flow at a pressure of at least 20 psi (140 kPa) at all points throughout the distribution system, and under the condition where the designated volume of fire suppression and equalizing storage has been depleted."

In accordance with DOH requirements, the Kent City Code defines "Fire Flow" as the measure of the sustained flow of available water for fighting fire at a specific building or within a specific area at 20 psi residual pressure. The City's fire flow requirements are shown in **Table 4-11**.

# SOURCE REQUIREMENTS

#### SOURCE OUANTITY

The City will plan for at least 20 years into the future so that future water resource limitations can be handled effectively.

The City will ensure that the capacity of the system, including wells, pump stations, storage, and transmission mains, is sufficient to meet the maximum day demands of the system.

The City will participate in regional supply management and planning activities as staff resources allow.

#### WATER OUALITY STANDARDS

The City will pursue steps to meet or exceed all water quality regulations and standards.

Security of the water supply is of primary importance. The City will take all reasonable measures to protect its system and customers. Security improvements identified in vulnerability assessment reviews shall be given the highest priority.

**Chapter 6** identifies the existing water quality standards that the city's water system must comply with.

#### PERMIT EXEMPT WELLS

Those applicants within Water Resource Inventory Areas (WRIAs) 8 and 9 without constructed wells, and submitting building permits reliant on use of a permit-exempt well (RCW 90.44.050) after January 19, 2018, are subject to its terms and limitations. Such applicants shall be limited to a maximum annual average withdrawal of 950 gallons per day (gpd) per connection. This amount may be reduced to 350 gpd for indoor use only during drought conditions. The quantitative and other limitations associated with Engrossed Substitute Senate Bill 6091 shall remain in effect until a watershed restoration and enhancement plan is approved by Ecology and implementing rules are adopted.

In order to secure building permits, applicants located within the City's corporate boundaries shall be required to pay the City a fee of \$500, \$350 of which is to be transmitted to Ecology. The City is required to record relevant water use restrictions with the property title.

Ecology is recommending that local jurisdictions located within Hirst-affected basins adopt the following recording language: "Domestic water use at this property is subject to a water use limitation of a maximum annual average withdrawal of 950 gallons per day, per connection, subject to the 5,000 gallon per day limit provided in RCW 90.44.050."

### GENERAL WATER MAIN REOUIREMENTS

#### PIPELINE VELOCITIES

During normal demand conditions, the velocity of water in a water main should be less than 5 feet per second (fps).

During emergency conditions, such as a fire, and for design purposes, the velocity of water in a water main may exceed 5 fps, but may not exceed 8 fps except in existing 6- or 8-inch dead-end water main serving residential areas. New dead-end water main installed within residential areas may be approved for a maximum velocity of 10 fps on a case-by-case basis by the City.

#### WATER MAIN EXTENSIONS

- All water main extensions shall conform to the design requirements of the City and DOH.
- This WSP indicates the location and configuration of the major elements of the existing and proposed City supply mains, distribution system, interties and loops. The exact location or configuration of this system may be modified, provided the proposed system remains consistent with the overall intent of the WSP.
- Mainline extensions will be required when properties do not front on a water main or when
  the existing main is deemed inadequate for the proposed use. It is a City policy that the water
  main is extended to the far edge of the property to be serviced, regardless of where the
  service connection is to be made.

#### WATER SYSTEM DESIGN PARAMETERS

- Desirable system working pressure shall be approximately 60 to 70 psi, but not less than 35 psi under Peak Hourly Demand (PHD). The minimum pressure in the water system under fire flow conditions shall be 20 psi.
- Individual service Pressure Reducing Valves (PRVs) shall be installed and maintained on water service lines, by the property owner, when system pressures are in excess of 80 psi.

- All new mains providing fire flow will be sized to provide the required fire flow at a minimum residual pressure of 20 psi and maximum pipeline velocity of 8 fps during maximum day demand conditions. In general, new water mains that will carry fire flow in residential areas shall be a minimum of 8 inches in diameter and looped for multi-family residential developments. Exceptions in residential areas may be considered as discussed in the **Velocity** section of this chapter. New water mains in commercial, business park, industrial, and school areas shall be a minimum of 12 inches in diameter and looped.
- Connections to existing water mains shall be accomplished by "Extension," "Wet Tap" or "Cut In" when mainline valves are required on the existing main. Connection to the existing main shall be per City Standard. No direct connection to the City's existing water system will be allowed until purity and leakage tests of the new system have been performed and passed.
- Two cubes for "Pigging" shall be installed in the new water main at the initial connection and at each lateral from the new water main. The Water Division will provide the cubes, they must be picked up by the contractor at the Water Division Shop.
- Dead end mains shall be avoided whenever possible. Where dead end mains are unavoidable, a minimum two (2) inch blowoff assembly is required. Blowoff sizes for various pipe diameters are listed in the City of Kent Construction Standards.

#### WATER MAIN LOCATION

- Water mains shall be laid at least ten (10) feet horizontally from any existing or proposed sanitary sewer. The distance shall be measured edge-to-edge. Any deviation from this requirement shall meet Ecology and DOH requirements and be allowed only upon approval of the Director.
- Perpendicular water main crossings of sanitary sewers shall be laid to provide a minimum vertical distance of eighteen (18) inches above the sewer line, measured from the bottom of the water line to the top of the sewer line. Where separation between the water line and sewer line is less than eighteen (18) inches, the sewer line shall be ductile iron. All sanitary sewer lines which cross <u>above</u> a water main, regardless of the separation, shall be ductile iron as well, with no joints within a nominal ten (10) feet of the water main.
- Installation of water mains near other potential sources of contamination will require written
  approval by the Director on a case by case basis. They would include but not be limited to;
  storage ponds, land disposal sites for wastewater or industrial process water containing toxic
  materials or pathogenic organisms, solid waste disposal sites, or any other facility where
  failure of the facility would subject the water in the main to toxic chemical or pathogenic
  contamination.
- Water mains shall be located at least five (5) feet away from any other utility, including but not limited to storm drains, power, natural gas, CATV, private fire lines, etc.

# **VALVES**

Water valves are required at the following locations:

- Four hundred (400) foot maximum intervals in commercial/industrial and multi-family residential areas. Locations involving hospitals, medical clinics, and other uses determined by the City of Kent to be critical applications may be required to have intervals reduced.
- Eight hundred (800) foot maximum intervals in residential areas.

- All sides of mainline tees and crosses.
- At all water service, fire line, and hydrant connections to the City main.
- At both sides of all bridge crossings, railroad crossings and casing/bores.

Existing gate valves may be subject to replacement with a new resilient wedge gate valve or a new resilient wedge gate valve installed at the property line per City of Kent Construction Standards at the discretion of the Director.

# COMBINATION AIR/VACUUM RELEASE VALVES

Combination air/vacuum release valves shall be located at high points along the main. As a guide, valves are necessary where the difference between high and low points is two (2) feet on a gradual rise, or any abrupt rise. Actual locations should be in accordance with good engineering judgement and approved by the Director. The air inlet/discharge opening shall be thirty six (36) inches above finished grade and provided with a screened downward facing vent opening. It shall be located outside of traffic areas and installed to prevent damage to landscaping and pedestrians.

#### **BIOWOFFS**

Blowoffs shall be located at the dead end of all mains for flushing and "pigging" purposes. Blowoff assemblies must be sized and designed to achieve a minimum velocity of 2.5 fps in the water main. These velocities are to be used as a guideline and do not relieve the Contractor from assuring a clean line. Two (2) inch is the minimum blowoff size.

Where cubes for "pigging" are required in the main line installation, the blowoff size shall be four (4) inch for six (6) through eight (8) inch water mains and six (6) inch for ten (10) through twelve (12) inch water mains. Fire hydrants are preferred in lieu of blowoff devices where flows and pressures warrant a hydrant.

Using water from blowoffs requires a use permit, meter and check valve assembly issued by the Water Division. Persons using water illegally will be prosecuted.

# FIRE HYDRANTS

# HYDRANT LOCATION

Fire hydrant locations shall be reviewed and approved by the Fire Marshal prior to plan approval. In general, fire hydrants shall be installed at the following locations:

- Will generally be located at street intersections.
- Six hundred (600) foot maximum intervals in single family residential area.
- Three hundred (300) foot intervals in multi-family and commercial areas.
- Upstream of a fire line vault, if an existing public hydrant is not available at a location approved by the Fire Marshal.
- At other locations as directed by the Fire Marshal.

# HYDRANT CONNECTIONS

Connections to the existing main shall be as follows:

• Hydrant leads shall be Class 52 ductile iron.

- Hydrant leads shall not exceed fifty (50) feet in length.
- Wet tap connection with heavy-duty tapping sleeve and resilient wedge tapping valve is required.
- No service connections are allowed to hydrant leads.
- Using water from hydrants requires a use permit, meter and check valve assembly issued by the Water Division. Persons using water illegally will be prosecuted.

# HYDRANT ASSEMBLIES

Fire hydrant assemblies shall be as follows per City Standard:

- Assemblies shall be shackled on runs eighteen (18) feet or less, or restrained with an approved type of mechanical restrained joint on runs longer than eighteen (18) feet, to the mainline.
- Public fire hydrants shall be painted white.
- Private fire lines require an approved backflow protection assembly to be installed and to be located on private property.
- Private fire hydrants shall be painted yellow.

# CROSS-CONNECTION CONTROL

There shall be no cross connection whatsoever between the City water distribution system and any unapproved pipes, wells, pumps, private hydrants, tanks, non-potable fluid or any other contaminating materials that may backflow into the water system. The City's Cross-Connection Control Program is contained in **Appendix F**.

# **BACKFLOW PREVENTION**

The degree of public health protection required must be commensurate with the degree of hazard presented. In situations of known or potential physical or toxic health hazards, air gap separation and/or reduced pressure backflow assemblies shall be required. Double check valve assemblies are generally utilized where aesthetic or detrimental effects on water quality may occur. Each water system connection has unique problems arising from location, climatic conditions, service demands, and other factors. Consequently, each cross-connection shall be examined on an individual basis and the City shall make the final determination as to the degree of backflow protection required.

Backflow protection assemblies proposed for use can be found on the current list of approved assemblies by the Washington State Department of Health. All backflow assemblies are required to be tested annually by a Washington State certified backflow assembly tester. Copies of inspection reports shall be provided to the City.

The City of Kent has codified its cross connection control program requirements, which can be found in Kent City Code chapter 7.02.050 - 7.02.105. These requirements are further detailed in the City's cross connection control program.

#### PREMISE ISOI ATION

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Where the City determines protection of the public water distribution system is necessary, a Backflow Preventer shall be installed at the property line commensurate with the degree of hazard as defined in WAC 246-290-010. Installation of Air Gaps shall be approved by submitted drawings in

accordance with the latest edition of the Cross Connection Control Manual, Pacific Northwest Section AWWA and the latest edition of the Uniform Plumbing Code. Double Check Valve Assembly and Reduced Pressure Backflow Assembly installations shall be in accordance with Standard Details 3-14 through 3-18 in the City's Construction Standards.

# **IRRIGATION SYSTEM**

Cross-connection protection is required for all irrigation systems. In general, the City requires Double Check Valve Assemblies to be used. If a chemical injection irrigation system were to be installed, a Reduced Pressure Backflow Assembly would be required. Both types of installations require freeze protection.

# DEDICATED FIRE LINES

Cross-connection protection is required for all Dedicated Fire Lines. In general, the City requires Double Check Detector Assemblies be used. If chemical additive is used or there is an auxiliary water supply available to the system, a Reduced Pressure Detector Assembly is required.

# STORAGE REQUIREMENTS

Storage requirements are based on four components: Operational Storage, required to maintain sufficient storage for pump operation; Equalizing Storage, required to supplement production from water sources during periods of high demand; Standby Storage, required as a backup supply in case the largest source is out of service; and, Fire Storage, required in order to deliver fire flow for the required duration.

The minimum amount of storage required shall be the total combined amount of the operational, equalizing, standby, and fire storage. **Chapter 7** provides a complete analysis of the City's water storage requirements and capacities.

# OPERATIONAL STORAGE

Operational storage is the volume of water available to supply the system under normal operating conditions while the source is considered "off". This volume varies according to the sensitivity of the water level sensors controlling the pumps or other supply source and the configuration of the tanks designed to provide the required volume while preventing excessive cycling of the pump motor(s).

# **FOUALIZING STORAGE**

The volume of equalizing storage must be sufficient to meet hourly water system demands in excess of the rate of supply and must be at an elevation sufficient to meet these demands at a minimum delivery pressure of 30 psi.

# STANDBY STORAGE

Standby storage is required in order to augment the available supply of water during a period of restricted flow from the supply source. Restriction of flow may be caused by a pumping equipment failure, supply line failure, maintenance or repair, or other condition which causes interruption in the supply.

# FIRE FLOW STORAGE

Fire flow storage must be equal to the amount of water required to accommodate the maximum fire demand under a specified duration of time. Fire flow requirements are determined by the City Fire Marshal and **Table 4-11** puts forth the minimum fire flow requirements used for analysis purposes in this water system planning effort. Fire flow storage must be located above an elevation that yields a 20 psi service pressure to all services in the zone under maximum day demand conditions.

# DFAD STORAGE

Dead storage is the amount of water not available at the minimum design pressure to the highest elevation served by the storage facility.

# TELEMETRY SYSTEMS

Telemetry systems must be compatible with the City's existing SCADA system. The system must provide discrete status, continuous analog reporting, and control capability which is both sending and receiving. It must also have an integral backup power supply able to sustain communication for a 24-hour period.

# BACKUP POWER REQUIREMENTS

Backup power shall be provided at all sources or pumping stations which are required to be operational during power failures in order to meet system reliability requirements, or to continuously maintain a positive distribution system pressure.

# PROJECT REVIEW PROCEDURES

Depending on the project type, the City employs two different procedures to review proposed improvement projects. Project types include public works projects and developer extension projects. The review procedure for each project type is discussed in the following sections.

# PUBLIC WORKS PROJECTS

Projects that require public works contracts must be developed and reviewed as part of a water system planning effort. Public works projects must be identified based on either a water system or water quality analysis. For this planning effort, the water system analysis is described in **Chapter 7**, and the water quality requirements are discussed in **Chapter 6**. Projects that are identified based on these analyses have subsequently be assessed and prioritized relative to each as described in **Chapter 9**.

Several considerations are given to assess proposed public works projects. The following considerations are those recommended by DOH.

- Health Standards. The project must conform with and support all applicable regulations and standards.
- Land Use. The project must conform with and support applicable plans and policies.
- Quantity. The adequacy of a future water source resulting from the improvement project must be evaluated.

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- Reliability. The amount of increase to system reliability based on the improvement project should be evaluated with respect to the system's desired level of reliability.
- Costs. The project's capital costs should be evaluated along with annual operation and maintenance costs.
- Regional Benefit. The project's ability to help meet regional goals (e.g., multi-purpose benefits such as flood control and recreation), in addition to meeting local water system needs, should be reviewed.
- Environmental Effects. If the project could create detrimental environmental impacts, these impacts need to be defined. In addition, an assessment should be made to determine whether the negative impacts can be mitigated.
- Flexibility. The project's responsiveness to changed land use, water demand, and other resource management decisions should be evaluated. The potential for phased implementation should also be considered.
- Implementation. The project's potential to be publicly accepted, easily designed, constructed, and financed should be reviewed.
- Life Expectancy. The project's expected duration of operation should be estimated.
- Risk. The risks of selecting and not selecting the project for implementation should be assessed, considering health risks, economic risks, and reliability of service.
- Operation and Maintenance. The ability to operate, maintain and make connections and repairs to the facility in a cost-effective manner.

# DEVELOPER EXTENSION PROJECTS

Developer extension water projects are primarily limited to distribution main improvements. These developer-funded projects do not have to be explicitly reviewed by DOH and discussed within the context of a water system plan. They only have to be implicitly included in the water system plan by including the City design and construction standards required for these projects. These standards in included in **Appendix G**.

Any extension, addition or modification of the City water system are permitted via a Civil Construction Permit with the City. Civil Construction Permits are also required for the construction of plat improvements required by the subdivision code, construction of new streets or (excluding private service connections) within public rights-of-way or easements, or any utility installation that the City has determined must be owned and operated by the City.

Upon review of the proposed development, the Director of Public Works shall make the determination of when a mainline extension is required and the extent of improvements necessary.

The procedure to receive Development Extension Approval is as follows:

• The developer or his agent shall meet the Director of Public Works or his designated representative to verify the extent of improvements required. Compliance with the appropriate Comprehensive Plans and the procedure to complete a developer extension agreement with the City will be discussed at the meeting. Water or sewer extensions outside the City Limits, but within the City's franchise area, may require approval of the King County Boundary Review Board prior to extension. If Boundary Review Board approval is required, a meeting with the City of Kent Property Manager is necessary to discuss the procedures.

- The developer shall retain a civil engineer registered in the State of Washington to prepare the engineering plans, specifications and cost estimates for the mainline utility and/or street improvements. The engineering plans shall conform to the general criteria and standards as outlined in the Design and Construction Standards.
- Design plans are submitted to the Permit Center for review with a Civil Construction Permit Application and the appropriate review fees.
- Following review and approval of the design plans by the Director of Public Works, the developer shall secure all necessary outside agency approvals.

After all necessary permits and approvals have been secured and verified, and all documents (i.e. warranty, bonds, easements, insurance...) and fees as required by the City have been submitted, a preconstruction meeting with the appropriate Public Works staff is scheduled. Following construction completion, the following must be submitted:

- As built plans prepared by a Professional Land Surveyor registered in the State of Washington must be submitted.
- Bill of Sale.
- Addendums to the Bill of Sale.
- City Inspector's Preliminary Project Approval.
- Final walk-thru field inspection of the completed public improvements is scheduled with the City's Project Engineer, contractor, inspector and the Operations Division. A punch list is prepared and upon completion of this punch list, the contractor must notify the inspector for final acceptance of the constructed improvements.
- The Public Works Department will then schedule the project on the Council agenda for official City and Council acceptance of the public improvements. Upon acceptance by the City Council, performance bonds and other cash bonds are then released upon submittal of the required maintenance bonds as outlined in the Developer's Extension Packet.

# LATECOMERS AGREEMENTS

Any person who constructs a water, sewer, storm drainage or street extension at the direction of the City, in excess of that which is required to meet minimum standards or which meets minimum standards and will benefit properties abutting the new improvements may, with the approval of the Director of Public Works, enter into a contract with the City which will allow the Developer to be reimbursed for that portion of the construction cost that benefits the adjoining properties and/or is in excess of the minimum standard. The format for a Latecomers Agreement must be submitted for review and approval by the City prior to plan approval to be considered. The City shall be reimbursed for all costs associated with the review and approval of the Latecomers Agreements.

The developer is responsible for preparing the Latecomers Agreement for City review and approval. The City will be responsible for recording the Latecomers Agreement. The Agreement shall include a list of those properties which will benefit from the improvements, a map outlining and designating these properties, legal descriptions as required by the City, and backup data supporting the costs submitted. The City will collect the Latecomers Fee from persons wanting to connect or use said public improvements and subsequently sees that the developer receives the payment.

# UTILITY CONNECTION PERMITS

#### DUTY TO SERVE

The City has a duty to provide service to all new connections within the retail service area when the circumstances meet the following four threshold factors:

- The City has sufficient capacity to serve water in a safe and reliable manner.
- The service request is consistent with local plans and development regulations.
- The City has sufficient water rights to provide service.
- The City can provide service in a timely and reasonable manner.

The time-period starts for measuring timely and reasonable service when the water service application is first submitted to the City. The following section provides additional details regarding the City's duty to serve policies. A reasonable water service request meets the Duty to Serve requirements, is consistent with City Code Section 7, and meets the Permit Requirements outlined in the following section.

#### PERMIT REQUIREMENTS

The connection of private services to the City of Kent Utility System requires the issuance of the following permits:

- Water Meter Permits Prior to the construction of a domestic water service, the owner or authorized agent, shall obtain a Water Meter Permit from the City. Permits will not be issued for connection to a new main until the system is ready for Council acceptance (except for projects where multiple buildings are approved for phased occupancy). For large, new developments, no permits will be issued until As-builts are in, walk-thru inspections are completed and the Bill of Sale is Council ready.
- Fire Hydrant Permit Prior to the installation of a public fire hydrant, the owner/agent shall obtain a Fire Hydrant Permit from the City and approval of the location from the City Fire Marshal.
- Fire Line Connection Permit Prior to the connection of a Fire line to the City water main, the owner/agent shall obtain a Fire Line Connection Permit from the City.
- Private Fire Line Permit Prior to the installation of a private sprinkler system, private fire line and/or private fire hydrant(s), the owner/agent shall obtain a Private Fire Line Permit from the City Fire Marshal. In addition, a Backflow Assembly Permit shall be obtained if approved backflow prevention is not provided on the private fire line. Additional licenses are required by the Washington State Fire Marshal's Office for these installations.
- Outside Agency Permits In addition to the permits listed above, the developer is responsible
  for securing and abiding by the conditions imposed by permits required by outside agencies.
  These permits include County and State DOT right-of-way permits, Hydraulic Permits,
  Shoreline Permits, Corps of Engineers, Department of Fisheries Permits, etc.
- King County right-of-way permit For water extensions in King County right-of-way, the Owner shall obtain a King County right-of-way permit prior to the preconstruction meeting. Conditions and requirements set forth by the County shall comply with King County Road Standards. The City and the Contractor must schedule and attend a preconstruction meeting with King County right-of-way inspection staff prior to starting any work. Permit and

Inspection Fees charged to the City by the County will be billed to the Contractor or owner in full. All construction and restoration must be completed to the satisfaction of the County and City.

- Deduct, Water Use Only, and Backflow Assembly Permits Prior to the installation of a water use only, deduct meter and Backflow assembly the owner/agent shall obtain a Water Service Permit from the City.
- Water system capacity will be evaluated at the time of water service application. The City will use the capacity analysis contained in **Chapter 7** of this WSP to evaluate source of supply, storage, and water rights capacity available to the applicant.
- Water system capacity, pressure, and fire flow will be considered when providing water availability to applicants.
- Water availability shall expire at the time that the associated permit expires (i.e., land use, site civil, or building permit).
- Time extensions in regard to water availability shall be granted in accordance with the
  associated permit requirements. When extensions are denied, the disputes are handled
  through the rules guiding the associated permit process. Disputes can be brought to the City
  Council for discussion.

# TEMPORARY WATER SERVICE

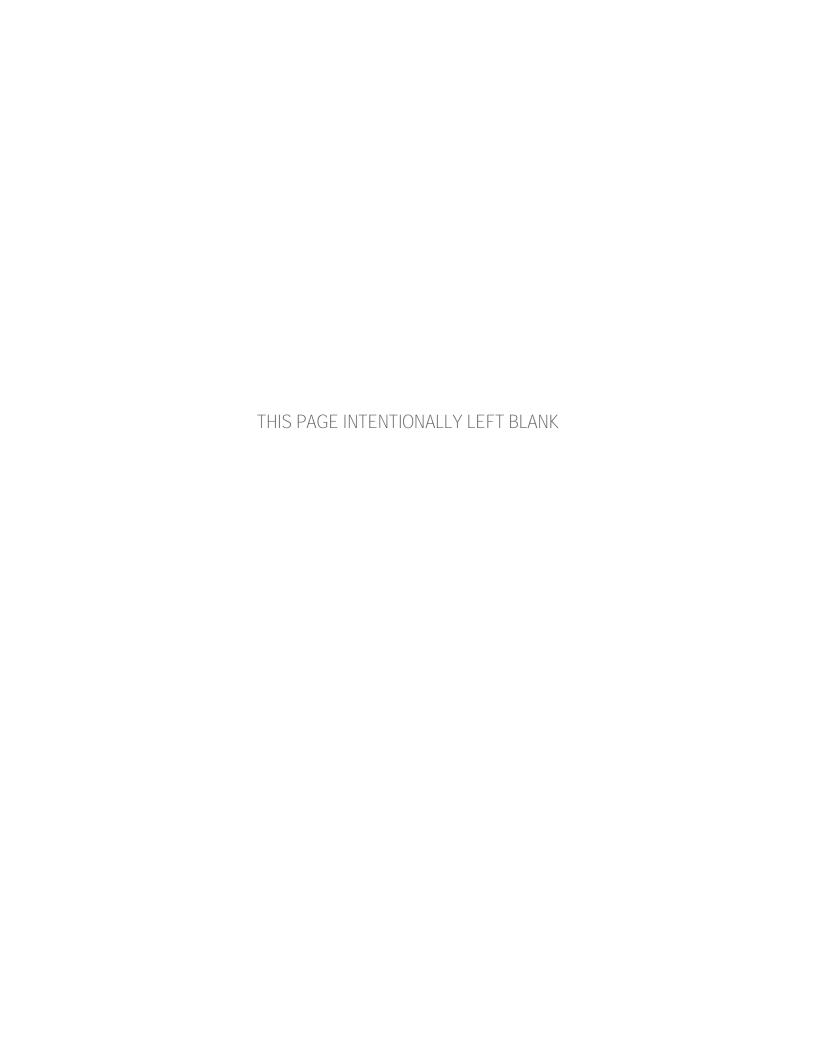
In accordance to City Code Section 7.02.180, when water service is required for a specific short-term duration, upon approval by the director of public works, a temporary water meter may be obtained from the water utility.

Such meters shall only be used for a designated project and shall be promptly returned to the water utility upon completion of the project or at the end of sixty (60) days, whichever comes first. The meters are to be returned in the same condition as when rented, and the user shall be held responsible for any damage thereto including paying all repair or replacement costs. While in the user's possession, the user shall be solely responsible for the meter and as such, should it be lost or stolen, the user shall pay the water utility the cost of its replacement.

The Director of Public Works shall require that a cash bond be deposited with the City prior to receipt of a temporary meter. The amount of the bond shall equal the replacement cost of the respective meter. Upon return of the meter, and following the payment of all outstanding charges including any meter repair or replacement costs, the cash bond shall be released back to the user.

Temporary meters may be moved from one hydrant to another within the same project; provided, the water utility is notified in advance of the proposed relocation and that hydrant wrenches are used to make all connections and disconnections.

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# 6 WATER SOURCE AND QUALITY

# INTRODUCTION

The two basic objectives of a municipal water supply system are to provide a sufficient quantity of water to meet customer usage demands and to provide high quality water. **Chapter 7** discusses the City's ability to supply a sufficient quantity of water and identifies future source requirements. This chapter discusses the City's existing water sources, water rights, water quality regulations, and water quality monitoring results.

# **EXISTING WATER SOURCES AND TREATMENT**

#### WATER SOURCES

The City is served by multiple groundwater and surface water/spring sources located within and outside its water system service area. They include Clark Springs (including Rock Creek), Kent Springs, East Hill Well(s), Garrison Creek Well, Armstrong Springs Wells, Seven Oaks (Soos Creek) Well, Summit Well, O'Brien Well, 208th Street Well, and 212th Street Wells. The groundwater sources of supply are served by aquifers that underlie the Green and Cedar River basins and fall within and outside the City's water service area and City limits. In 1985, the City contracted with Tacoma Public Utilities (TPU) and became a partner in the Tacoma Regional Water Supply System (RWSS). This project delivers water from the Green River watershed to the City's Water Service Area. At this time, these sources are responsible for meeting all of the City's existing and projected water supply demand.

# Kent Source Aguifers - Overview

The main aquifer within the Green River Valley is the recent alluvial aquifer (Qal) that occurs within the Pacific/Algona/Auburn areas, and in the Renton area. The Qal aquifers generally occur at depths of less than 100 feet, are unconfined, and are in hydraulic continuity with multiple surface water systems (White, Green, and Cedar Rivers). Aquifer recharge is from direct infiltration through the land surface, and lateral groundwater inflow from deeper aquifers in the adjacent uplands. Natural aquifer discharge is to the above-mentioned rivers. The Qal aquifer within the Renton area (6 miles north of the City) is very productive, with well yields that typically exceed 1,000 gallons per minute (gpm). The Qal aquifer within the Algona/Pacific/Auburn area (6 miles south of the City) is moderately productive, with well yields on the order of 500 gpm. Water resources in these aquifers are used by several jurisdictions, including the Cities of Pacific, Auburn, Renton, and Algona.

The Qvr aquifer occurs within the Auburn area at depths of 30 to 40 feet below ground surface to as much as 250 feet below ground surface. The aquifer is very productive given its high permeability and abundant recharge, both from the surface and the surrounding uplands. The aquifer discharges naturally to the Green River. The characteristics of the Qvr aquifer (extent, thickness, transmissivity, etc.) are well-defined from previous studies by the City of Auburn. No significant aquifers have been identified within the Green River Valley in the Kent area. The Qvr aquifer also occurs within the southeast portion of the Covington Uplands. The aquifer serves as a source of supply to the major spring sources that serve the City (Kent, Clark, and Armstrong

Springs). The aquifer is shallow and unconfined; recharge is relatively high due to the coarse-grained nature of the surficial soils and underlying geology, and the abundant precipitation that falls on the area. Natural aquifer discharge is to tributaries such as Jenkins Creek and Rock Creek, which discharge to Soos Creek and the Cedar River, respectively.

The Qva aquifer occurs primarily on the western portion of the Covington Uplands. Low-permeability glacial till overlies the aquifer and limits the amount of direct recharge from precipitation (Bauer and Mastin, 1997). Well yields are moderate to low, but the aquifer serves many domestic wells and is the source of supply for most of the wells serving Lake Meridian Water District. Natural discharge from the Qva aquifer occurs to the headwaters of Big Soos Creek.

The Qc<sub>2</sub> aquifer occurs throughout much of the Covington Uplands. In many areas it can be difficult to distinguish the Qc<sub>2</sub> aquifer stratigraphically from the overlying Qva aquifer. Glacial till overlies large portions of the aquifer, limiting the amount of natural recharge from direct precipitation. The Qc<sub>2</sub> aquifer serves as a major source of supply in the east Covington Uplands near Lake Sawyer, and appears to be in hydraulic communication with the north/northeastern end of the lake. Natural discharge from the aquifer occurs primarily to the lower reaches of Soos Creek.

The Qc<sub>3</sub> and Qc<sub>4</sub> aquifers occur within the Kent area near the valley wall and within other localized areas of the Covington Uplands (e.g., at the City's Seven Oaks Well). The aquifers are relatively productive near the City, with well yields that can exceed 1,000 gpm. These deep aquifers are confined beneath the Covington Uplands and receive their recharge as regional-scale downward leakage through the confining aquitard layers. Natural discharge from aquifers that outcrop in the major river valley walls is in the form of springs and seeps that feed the surface rivers. The deeper aquifers (at or below sea level) may discharge naturally to deep valley-filling sediments or through upward leakage across confining aquitard layers in the valley margins. Rates of leakage are usually low, giving rise to good degrees of confinement, as evidenced by artesian water levels in some of the wells located at lower elevations.

There is a general absence of deep well information within the Covington Uplands that might be expected to reveal lateral extensions of these aquifers to the east. Deeper exploratory wells (greater than 500 feet deep) that have been drilled at Kent Springs, and within the Lake Meridian Water District and Covington Water District areas, typically penetrate a thick sequence of fine-grained deposits (clays and silts) with a consistent absence of appreciable water-yielding horizons at depth. Bedrock occurs at shallower depths in the north and east parts of the Covington Uplands, limiting the potential lateral extent of any unidentified deep Qc<sub>3</sub> or Qc<sub>4</sub> aquifers.

# Kent Source Aquifers - Reliability

As noted above, five aquifer systems exist in the Covington Uplands area, all of which are presumed to be part of a larger, hydrostratigraphic unit. The City's largest groundwater sources, including Kent, Clark, and Armstrong Springs, are located in the shallower aquifer system (i.e., Qvr aquifer) situated within the Covington Uplands, which flows or discharges to both the Green and Cedar Rivers. Upstream of Clark Springs, the groundwater flows east to west; however, at Clark Springs the flow pattern splits, with groundwater discharge going to both the Green and Cedar Rivers.

The groundwater split that feeds Clark Springs has been determined by King County, the City, and Ecology to discharge to Rock Creek, which is tributary to the Cedar River. The groundwater flowing towards the Green River flows past the City's Kent Springs and Armstrong Springs wells. This same water flows toward Lake Sawyer, which discharges into Covington Creek, which in turn discharges into Soos Creek, which is tributary to the Green River. Kent Springs also has been determined to flow at times into Jenkins Creek, which also flows into Covington Creek and the Green River.

With the exception of one seasonal water right (irrigation of River Bend Golf Course), all of the City's water rights authorize continuous, annual withdrawals of its authorized quantities.

# Clark Springs

The Clark Springs Water Supply System is located off of Kent-Kangley Road in a protected, partially fenced, greater than 320-acre section of the Rock Creek watershed (RM 1.8). This property, which is geographically separate from the City of Kent proper, was annexed to the City in 1958 for municipal water supply purposes. The balance of the area falling outside of the City's annexed property is bounded and regulated by the City of Maple Valley on the west, and unincorporated King County to the north, south, and east. Substantial development activity with related increases in impervious surface area and installation of over 300 exempt wells have been allowed to occur within the Rock Creek watershed over the past 30 years. Nevertheless, that portion of the watershed falling within the City's property remains largely in pristine condition.

The Clark Springs Water System is used on a continuous basis throughout the year and is comprised of three separate, but conjunctively managed sources: Clark Springs Trench; Rock Creek Surface Water Diversion; and Clark Springs Wells. Each of these sources draw upon the same shallow aquifer source (Qvr) and are in hydraulic continuity with each other.

The City's Clark Springs Trench is located near Kent-Kangley Road, east of the Maple Valley-Black Diamond Road. Rock Creek flows through the property in a westerly-northwesterly direction and is tributary to the Cedar River. Water is collected in the infiltration gallery, which is constructed of approximately 500 feet of perforated steel pipe placed perpendicular to Rock Creek, across a narrow valley of glacial till, and extending under the streambed.

The collection system and the transmission line were constructed in 1957. Water collected by the gallery system has been determined by the City's hydrogeologic studies to come from the Qvr aquifer, which is the same aquifer source used by the City's Clark Springs Wells and the Kent Springs Water System, as well as the Armstrong Springs Wells at a lower hydraulic gradient.

The design of the Trench infiltration gallery allows the simultaneous withdrawal of water under the Trench water right and the Rock Creek surface water right. This design also allows the City, when appropriate, to limit diversions allowed under its Rock Creek surface water rights (although use of this right is not subject to minimum in-stream flow conditions). In such circumstances, the production of instantaneous and annual quantities authorized under the Rock Creek water right may be voluntarily reduced and shifted to the Trench. This conjunctive management approach assists the City in meeting system demands in a reliable and continuous manner, while protecting in-stream flow conditions in Rock Creek.

Given the close hydraulic connections among the Clark Springs sources, the City has found it most effective from a production and environmental protection standpoint to operate these sources in a conjunctive manner, whereby the instantaneous and annual withdrawals of the system are limited to the cumulative totals allowed under the combined Clark Springs System surface water, springs, and groundwater rights (i.e., 5,400 gpm – Qi, and 8,710 acre-feet per year (afy) – Qa). Current and future operation and management of the Clark Springs Wells, water rights, and overall water supply system facilities are required to occur consistent with the City's Habitat Conservation Plan, Incidental Take Permit, and related Habitat Conservation Plan Implementation Agreement.

Due to the close proximity of the Clark Springs sources to the Landsburg Mine Site (Site), the City has advised Ecology of the City's serious concerns regarding the adequacy of the agency's environmental oversight of the Site, and the risk of a contamination event originating from the Site that results in the temporary or permanent loss of the Clark Springs Water Supply System. To this end, the City has submitted to Ecology comments in opposition to its cleanup action plan for the Site, seeking further investigation/action at the Site and a cleanup action plan more protective of area groundwater, including the Clark Springs source aquifers. The City also has implemented various activities to increase monitoring and sampling at and near Clark Springs.

# Kent Springs

The Kent Springs source is located near Black Diamond. The City owns approximately 75 acres at this site. This property has been annexed into the City for municipal purposes. The site is segregated by Cran-Mar Creek, which flows through the property in a westerly direction. Prior to the incorporation of Maple Valley in 1997, and recent annexations by the City of Black Diamond, the Kent Springs Water System property was surrounded by unincorporated King County. Today, Kent Springs is bounded by Maple Valley to the north and east, Black Diamond to the south, and unincorporated King County to the west. Because the City does not regulate land use outside of its Kent Springs Water System property, the City's ability to affect land uses potentially affecting the recharge area for these wells, has been and remains limited.

The Kent Springs Water System is comprised of three wells and a spring fed infiltration gallery. Both sources withdraw supply from the same shallow Qvr aquifer, identified by hydrogeologic studies as the aquifer that also serves the Clark Springs System at a higher hydraulic gradient. Due to their close hydraulic connection, the Kent Springs Wells/spring sources are operated in a conjunctive manner to maximize instantaneous and annual withdrawal capacity.

### **Armstrong Springs**

The Armstrong Springs Wells are located at State Route 516 (Kent-Kangley Road), and east of Wax Road. Both wells withdraw water downstream from the same shallow Qvr aquifer system that serves the Clark and Kent Springs Systems. During its 1998 Phase 1 wellhead protection program study, the City determined that water not captured by the Clark and Kent Springs Systems flows to the Armstrong Springs sources; therefore, the three sources are considered hydraulically connected.

# North Kent Wellfield

The water rights originally issued for the 208<sup>th</sup> Street, 212<sup>th</sup> Street, and Garrison Creek Wells were changed by the City several years ago to allow for that water to be pumped from any of

those wells (the wells are recognized as all tapping the same body of public groundwater). Consequently, from a practical operational and regulatory standpoint, the well sources operate as a wellfield.

These wells draw water from a confined aquifer that originates beneath the Covington Uplands to the east and extends beneath the Green River Valley to the west.

The 208<sup>th</sup> Street and 212<sup>th</sup> Street Wells are flowing artesian in nature. They have an artesian shut-in pressure of approximately 15 to 20 pounds per square inch during the off-season. The 208<sup>th</sup> Street, 212<sup>th</sup> Street, and Garrison Creek Wells are hydraulically connected, as pumping of one well will result in a drop in static artesian pressure of the others. Also, the water quality (i.e., manganese and iron) conditions are somewhat similar in all wells.

#### East Hill

The East Hill Wells, both the 104<sup>th</sup> and 108<sup>th</sup> Avenue SE sites, are located along the eastern rim of the Kent Valley. The aquifer shows seasonal water level fluctuations, with the lowest static water levels occurring in the summer and fall months. These fluctuations can reduce the production available from the current active well.

# Remaining Sites

The remaining City well sites are all within the City limits on the Covington Uplands, east of the Green River Valley. The exception being the River Bend Golf Course irrigation wells, which are drilled in the Green River Valley near the western valley margin.

Additional information on each of the City's existing potable sources is presented in Chapter 2.

# ROCK CREEK PROTECTION/CLARK SPRINGS WATER SUPPLY SYSTEM

Rock Creek is considered an important spawning ground for the Cedar River sockeye salmon, a stock that is recognized as depressed (Washington Department of Fish and Wildlife, et al., 1994). The extent of historic use of Rock Creek by Chinook salmon is uncertain, and recent use has been infrequent and unlikely to include any actual spawning. Rock Creek is used by Coho salmon for spawning.

Because of Rock Creek's outstanding natural habitat and its role in supporting the Clark Springs Water System, the City has a substantial and ongoing interest in preserving the health and vitality of the Rock Creek watershed. To that end, in 1997, the City installed a streamflow augmentation system that, depending on the aquifer levels, can supply up to 900 gpm (2.0 cubic feet per second (cfs)) of water to be discharged into Rock Creek (Figure 1-3) during low flow periods when listed salmonid species are spawning.

The flow augmentation system operates by pumping water from the clearwell in the Clark Springs System, from which it is then discharged to Rock Creek after aeration. The water available for flow discharge is subject to hydrologic conditions affecting the infiltration gallery. This system is operated periodically, especially when streamflows fall below 3 cfs during the October, November, and December salmonid spawning periods. Augmentation reduces the instantaneous amount of water available for the municipal water supply by the amount pumped to the stream.

The flow augmentation project described above was just one of the resource protection measures the Public Works Department implemented both prior and subsequent to the City's 2002 Water System Plan Update. Those measures include: 1) promoting responsible resource protection measures by governmental agencies and private parties within the Rock Creek basin; 2) sustained and effective monitoring of flow and aquatic habitat conditions; 3) improving flow and aquatic habitat conditions in Rock Creek; and 4) substantially minimizing/avoiding adverse operational effects upon listed species and aquatic habitat.

The listings of salmon and trout stocks in the Puget Sound Region (1998) under the Endangered Species Act (ESA) resulted in a decision by the Kent City Council on January 8, 2001, to notify the National Marine Fisheries Service (NMFS) and US Fish and Wildlife Service (USFWS) of the City's intent to voluntarily formalize its conservation activities under a Habitat Conservation Plan, and in so doing, obtain an Incidental Take Permit under Section 10(a)(1)(B) of the ESA for the operation of its Clark Springs Water Supply System (CSWSS) located adjacent to Rock Creek.

# CLARK SPRINGS HABITAT CONSERVATION PLAN

In 2001, the City undertook efforts to prepare a Habitat Conservation Plan (HCP) in support of the City's application for an Incidental Take Permit (ITP) in conformance with Section 10(a)(2)(A) of the ESA.

The text of the HCP, which required over 6 years of studying and planning to prepare, was completed by the City in December 2010. The HCP was the product of a collaborative effort between the City and the federal fishery Services (Services), including the US Fish and Wildlife Service and the National Marine Fisheries Service, to meet the requirements of the ESA, domestic, industrial, and commercial water supply demands, fire flow requirements, and other related public safety needs of the City.

In more specific terms, the accomplishment of the HCP represents a long-term commitment by the City to protect important fish resources that may be impacted by future operations of the Clark Springs System and to mitigate those potential impacts to the maximum extent practicable.

With the HCP's completion, the City formalized its voluntary efforts to conserve and enhance important fish and wildlife habitat on the site and elsewhere in the Rock Creek basin. The final Environmental Impact Statement (EIS) for the HCP was prepared by the Services in spring of 2011.

On September 6, 2011, NMFS issued an ITP to the City, which shall be in effect until September 25, 2061. The ITP allows the City to operate its existing and proposed water supply operations in a lawful manner without threat of prosecution for incidental take that may occur to species covered by the ITP. An HCP Implementation Agreement was executed by USFWS, NMFS, and the City on September 26, 2011.

Implementing the HCP consistent with the ITP shall ensure that City activities to provide municipal water supply within its service area will include measures that benefit fish resources, in particular ESA-listed species such as bull trout and Chinook salmon, over both the short- and long-term. To this end, The City is currently in the process of designing, permitting, and constructing Habitat Conservation Measures (HCMs) outlined in the HCP.

# WATER TREATMENT

All City water sources are chlorinated and fluoridated. In 2015, the Tacoma Green River filtration facility was completed, allowing for less-constrained use of the Tacoma supply. Aeration and sodium hydroxide pH adjustment are used at the Guiberson Reservoir site to treat blended Kent Springs and Tacoma RWSS water. The City also uses pH adjustment at the 212<sup>th</sup> Street Treatment Plant, Pump Station #5, and the East Hill (104<sup>th</sup> Avenue SE) Well.

# WATER RIGHTS

# EXISTING POTABLE WATER RIGHTS AND INTERTIES

The City currently holds 23 water rights that provide its potable and non-potable municipal water supply. In total, the City's water rights authorize a total instantaneous withdrawal rate (Qi) of 23,458 gpm or 33.8 million gallons per day (MGD), and a total annual withdrawal volume (Qa) of 19,885.6 afy (17.75 MGD). Within that total number of rights, the City holds one (1) water right claim and twenty-two (22) water right certificates.

In addition, the City has water available from the City of Tacoma RWSS. A summary of the water rights and water sources is presented in **Table 6-1**, and the principal water right documents are contained in **Appendix H**.

Table 6-1
Existing Water Rights and Interties

Water Right	Priority Date	Document	Use	Source Location	Instantaneous Rate (gpm)		Annual Volume (afy)	
				Source Location	Additive	Non-additive	Additive	Non-additive
SWC 7232	10/14/1931	Cert	Municipal	Clark Springs	2,244	0	3,600	0
GWC 3107-A	2/18/1957	Cert	Municipal	Clark Springs	2,250	0	1,350	0
GWC 7660-A	2/4/1969	Cert	Municipal	Clark Springs	906	4,494	3,760	4,950
G1-123225CL	5/1/1909	L.F. Claim	Municipal	Kent Springs	4,488	0	965	0
G1-22956C	9/2/1977	Cert	Municipal	Kent Springs	3,690	0	5,904	0
G1-24189C	10/6/1982	Cert	Municipal	Armstrong Springs	1,300	0	0	500
G1-23614C	6/4/1980	Sup. Cert	Municipal	North Kent Wellfield	500	0	0	800
G1-24190C	10/6/1982	Sup. Cert	Municipal	North Kent Wellfield	2,700	0	0	1,400
G1-24404C	8/24/1983	Sup. Cert	Municipal	North Kent Wellfield	1,200	0	0	600
GWC 42-D	9/1/1923	Cert	Municipal	East Hill (104th)	60	0	90	0
GWC 44-A	9/12/1945	Cert	Municipal	East Hill (104th)	90	0	135	0
GWC 2890-A	9/12/1956	Cert	Municipal	East Hill (104th)	120	0	146	0
G1-23285C	1/4/1979	Cert	Municipal	East Hill (104th)	1,900	0	3,040	0
GWC 651-A	3/23/1948	Cert	Municipal	East Hill (108th)	60	0	42	0
GWC 2428-A	2/25/1953	Sup. Cert	Municipal	East Hill (108th)	120	0	78.4	0
GWC 767-A	1/18/1951	Sup. Cert	Municipal	O'Brien	243	0	45	0
G1-24073C	4/26/1982	Cert	Municipal	Soos Creek (Seven Oaks)	900	0	0	864
GWC 1116-A	6/17/1950	Cert	Municipal	Summit	200	0	320	0
GWC 494-A	7/29/1947	Cert	Municipal	Hamilton Road	38	0	30	0
GWC 4534-A	5/4/1962	Cert	Municipal	Hamilton Road	12	0	19.2	0
G1-23713C	10/15/1980	Cert	Municipal	High Meadows	7	0	11	0
GWC 1957-A	3/24/1952	Cert	Dom & Irr	Chappelear	140	0	60	0
G1-25204C	3/25/1988	Cert	Muni Irr	River Bend Golf Course	290	0	290	0

Total City Water Rights	23,458	19,885.6
Total Tacoma RWSS	8,778	14,159
Combined Total	32,236	34,044.6

The City's water rights and water sources will be discussed based on location. All water rights divert or withdraw water from Water Resource Inventory Area (WRIA) 9 – Duwamish-Green, except for those water rights associated with the Clark Springs site, which is located in WRIA 8 – Cedar-Sammamish.

Ecology issued metering order DE 02WRNR-3754 dated April 1, 2002 to the City (**Appendix H**). This administrative order requires the City to install and maintain an approved measuring device on all points of diversion or withdrawal under almost all of its water rights. The two water rights that were not explicitly included were GWC 767-A (O'Brien) and GWC 1957-A (Chappelear). The meters need to be read weekly with the data submitted to Ecology on an annual basis (by January 31 of the following year).

# Clark Springs

There are three water rights (Surface Water Certificate (SWC) 7232, Ground Water Certificate (GWC) 3107-A, and GWC 7660-A) authorizing one surface water diversion, one infiltration trench, and three wells associated with the Clark Springs site. Combined, these three water rights total 5,400 gpm and 8,710 afy, as limited by the most recently issued water right (GWC 7660-A). This site is the City's only site located in WRIA 8 with Clark Springs draining into Rock Creek, which then drains into the Cedar River.

Contrary to how these water rights have been depicted in the water right record and older water system plans, with the older two water rights being shown as being non-additive on both an instantaneous and annual basis, it is believed that the more accurate and proper way to display these water rights is shown in **Table 6-1**. This interpretation does not change the overall instantaneous rate or annual volume that can be withdrawn or diverted from any particular source at the Clark Springs site, but it more accurately represents the history of the water rights with the most junior water right placing an overall limit on both the instantaneous rate and annual volume that can be withdrawn.

GWC 7660-A contains minimum instream flow limitations for a control point located where Rock Creek crosses the Kent-Kangley Road at the downstream edge of the site. The flow in Rock Creek must be at or above the minimum levels as measured at that location, or else withdrawal of water under this water right must be stopped. The minimum instream flow levels for Rock Creek throughout the year are 15 cfs from January 1 through May 1, then decreasing arithmetically to 2 cfs by July 1, remaining at 2 cfs through October 31<sup>st</sup>, then 15 cfs from November 1<sup>st</sup> through December 31<sup>st</sup>. Diversion and withdrawal under the two older water rights (SWC 7232 and GWC 3107-A) are not subject to these minimum instream flow restrictions.

The City monitors stream conditions for the purposes of protecting fish and related aquatic habitat consistent with the HCP, in order to minimize/avoid potential adverse operational effects. During low flow events or seasonal conditions, the City may meet its current demand requirements by shifting its withdrawal of authorized, and required, quantities to its infiltration trench system.

Current and future operations and management of the Clark Springs site are required to occur consistent with the City's HCP, ITP, and related HCP Implementation Agreement.

Surface Water Certificate SWC 7232

SWC 7232, with a priority date of October 14, 1931, authorizes the diversion of a total of 5 cfs (4,488 gpm) for year round domestic supply from Rock Creek in the S ½ Section 26, Township 22 North, Range 6 East W.M., in WRIA 8. No annual volume limitation was specified, which was common practice at the time. The original certificate was issued to the City of Kent in July 1958. No changes have been made to this certificate since it was issued.

Pursuant to beneficial use of the water consistent with RCW 90.03.015, SWC 7232 qualifies as for municipal water supply purposes.

Ground Water Certificate GWC 3107-A

GWC 3107-A, with a priority date of February 18, 1957, authorizes the withdrawal of a total of 2,250 gpm and 1,350 afy for year round municipal supply from an infiltration trench located in

the S ½ Section 26, Township 22 North, Range 6 East W.M., in WRIA 8. The original certificate was issued to the City of Kent in July 1958. No changes have been made to this certificate since it was issued.

#### Ground Water Certificate GWC 7660-A

GWC 7660-A, with a priority date of February 4, 1969, authorizes the withdrawal of a total of 5,400 gpm and 8,710 afy under all of the City's Clark Springs site water rights, for year round municipal supply. This water right specifically authorizes withdrawal of water from three wells located in the S ½ Section 26, Township 22 North, Range 6 East W.M., in WRIA 8. This water right was granted subject to minimum instream flows for Rock Creek as measured at a point on the downstream side of the site. The original certificate was issued to the City of Kent in March 1972. No changes have been made to this certificate since it was issued.

#### Kent Springs

There are two water rights (Ground Water Claim G1-123225CL and certificate G1-22956C) authorizing diversion from the springs (infiltration gallery/trench) under the claim and three active wells under the certificate associated with the Kent Springs site. Combined, these water rights total 8,178 gpm and 6,869 afy. As will be discussed later, a Showing of Compliance with RCW 90.44.100(3) form was filed recently with Ecology to get Kent Springs Well #3 (completed in April 2001 with Unique Well ID AEC886) authorized under the water right certificate.

#### Ground Water Claim G1-123225CL

This ground water claim was filed on a long-form. G1-123225CL, with a claimed first date of use of May 1, 1909, claims a withdrawal of 10 cfs (4,448 gpm) and 965 afy for year round municipal supply from a spring located in the SE ½ SW ½ and SW ½ SE ½ Section 33, Township 22 North, Range 6 East W.M., in WRIA 9. The claim was filed by the City of Kent in June 1974. No changes have been made to this claim since it was filed.

# Ground Water Certificate G1-22956C

G1-22956C, with a priority date of September 2, 1977, authorizes the withdrawal of a total of 3,690 gpm and 5,904 afy for year round municipal supply from two wells located in the SE ¼ SW ¼ Section 33, Township 22 North, Range 6 East W.M., in WRIA 9. The original certificate was issued to the City of Kent in February 1979. No changes have been made to this claim since it was filed.

# **Armstrong Springs**

There is one ground water certificate (G1-24189C) and two active wells associated with the Armstrong Springs site. The water right is for 1,300 gpm and 500 afy with the annual volume being non-additive to other City water rights. The well names have changed over time and what was originally referred to as Wells #A-4 and #A-5, are now referred to as Armstrong Wells #1 and #2, respectively. These two wells at this site have been recognized as a wellfield by DOH.

Ground Water Certificate G1-24189C

G1-24189C, with a priority date of October 6, 1982, authorizes the withdrawal of 1,300 gpm and 500 afy (non-additive) for year round municipal supply from two wells located in the E ½ NE ¼ Section 36, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to the City of Kent in January 1986. No changes have been made to this certificate since it was issued.

North Kent Wellfield (208th Street, 212th Street, and Garrison Creek)

There are three water right certificates (G1-23614C, G1-24190C, and G1-24404C) and six wells associated with this area that make beneficial use of these water rights. Originally, each well location in this area was covered by a single water right. In 2003, Ecology approved changes to each water right such that now each well location is included as an authorized point of withdrawal under each water right. During the 2003 changes, all three water rights were authorized to use the 208th Street Well, 212th Street Wells #1 and #2, and the Garrison Creek Well #1. These changes provide the City with flexibility when it comes to operating these wells. Combined, these water rights total 4,400 gpm and 2,800 afy with the annual volume being non-additive to other City water rights.

There is currently 1 well (active) at the 208<sup>th</sup> Street location, 3 wells (all active) at the 212<sup>th</sup> Street location, and 2 wells (1 active and 1 inactive) at the Garrison Creek location. As will be discussed later, Showing of Compliance with RCW 90.44.100(3) forms were filed recently with Ecology to get 212<sup>th</sup> Street Well #3 (completed in May 2001 with Unique Well ID AFR915) and Garrison Creek Well #2 (completed in February 2004 with Unique Well ID AFT320) authorized under all three water rights.

The Garrison Creek Well #1 was damaged in the 2001 Nisqually Earthquake, an attempt was made to redevelop the well in 2003, but that effort failed. The failure of Garrison Creek Well #1 is what drove construction of Garrison Creek Well #2.

Ground Water Certificate G1-23614C

G1-23614C, with a priority date of June 4, 1980, authorizes the withdrawal of 500 gpm and 800 afy (non-additive) for year round municipal supply from four wells located in the NE ¼ SE ¼ and SE ¼ NW ¼ Section 7 and the SE ¼ SW ¼ Section 6, Township 22 North, Range 5 East W.M., in WRIA 9. A superseding certificate was issued to the City of Kent in September 2013, subsequent to Ecology's approval of a water right change application. The original certificate had been issued to the City of Kent in May 1983 for municipal supply from Garrison Creek Well #1.

Ground Water Certificate G1-24190C

G1-24190C, with a priority date of October 6, 1982, authorizes the withdrawal of 2,700 gpm and 1,400 afy (non-additive) for year round municipal supply from four wells located in the NE ¼ SE ¼ and SE ¼ NW ¼ Section 7 and the SE ¼ SW ¼ Section 6, Township 22 North, Range 5 East W.M., in WRIA 9. A superseding certificate was issued to the City of Kent in September 2013, subsequent to Ecology's approval of a water right change application. The original certificate had been issued to the City of Kent in April 1993 for municipal supply from 212th Street Wells #1 and #2.

#### Ground Water Certificate G1-24404C

G1-24404C, with a priority date of August 24, 1983, authorizes the withdrawal of 1,200 gpm and 600 afy (non-additive) for year round municipal supply from four wells located in the NE ¼ SE ¼ and SE ¼ NW ¼ Section 7 and the SE ¼ SW ¼ Section 6, Township 22 North, Range 5 East W.M., in WRIA 9. A superseding certificate was issued to the City of Kent in September 2013, subsequent to Ecology's approval of a water right change application. The original certificate had been issued to the City of Kent in April 1993 for municipal supply from the 208<sup>th</sup> Street Well.

# East Hill (104th Avenue SE)

The East Hill (104<sup>th</sup> Avenue SE) site consists of four ground water certificates (GWC 42-D, GWC 44-A, GWC 2890-A, and G1-23285C). The combined total authorized by these water rights is 2,170 gpm and 3,411 afy.

The City acquired the water system and East Hill (104<sup>th</sup> Avenue SE) wells water rights from the original owner in 1978 during annexation of the area into the City. When acquired, the East Hill (104<sup>th</sup> Avenue SE) water rights were used to supply a water system that was serving more than 15 residential connections. Subsequent to their acquisition, these water rights have been beneficially used for City water supply, consistently documented in the City's water system plans, and expressly denoted in the City's water rights portfolio and listing of the City's water rights. Based on the definitions in the municipal water law (RCW 90.03.015), these water rights qualify as being for municipal water supply purposes.

There are currently 5 wells (1 active, 1 unequipped, and 3 inactive) at the East Hill (104<sup>th</sup> Avenue SE) site. The active well is the East Hill Well #1 (originally authorized as a point of withdrawal under G1-23285C). The unequipped well is East Hill Well #2 (Unique Well ID AFT321) that was completed in June 2004, but has yet to be equipped and connected to the City's distribution system. The three inactive wells were the original points of withdrawal under GWC 42-D, GWC 44-A, and GWC 2890-A. As will be discussed later, Showing of Compliance with RCW 90.44.100(3) forms were filed recently to get the wells added to GWC 42-D, GWC 44-A, and G1-23285C.

The specifics of each water right will be discussed in this section.

#### Ground Water Certificate 42-D

GWC 42-D, with a priority date of September 1, 1923, authorizes the withdrawal of 60 gpm and 90 afy for year round domestic supply and watering livestock for community from a well located in Tract 20 of R.O. Smith Orchard Tracts, in Section 20, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to the East Hill Community Well Company in March 1946. No changes have been made to this certificate since it was issued.

#### Ground Water Certificate 44-A

GWC 44-A, with a priority date of September 12, 1945, authorizes the withdrawal of 90 gpm and 135 afy for year round municipal supply from a well located in Tract 20 Smith's Orchard Tracts, Section 20, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to the East Hill Community Well Company in April 1947. No changes have been made to this certificate since it was issued.

#### Ground Water Certificate 2890-A

GWC 2890-A, with a priority date of September 12, 1956, authorizes the withdrawal of 120 gpm and 146 afy for year round community domestic supply from a well located in Lot 1 of R.J. Bower's Addition to King County of Section 20, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to the East Hill Community Well Company in August 1957. No changes have been made to this certificate since it was issued.

There is currently no active well at the location specified, and the City has been making beneficial use of this water right from the East Hill Well #1 located in Tract 20 of R.O. Smith Orchard Tracts, in Section 20, Township 22 North, Range 5 East W.M., through a *de facto* change.

#### Ground Water Certificate G1-23285C

G1-23285C, with a priority date of January 4, 1979, authorizes the withdrawal of 1,900 gpm and 3,040 afy for year round municipal supply from a well located in Block 20 R.O. Smith Orchard Tracts of Section 20, Township 22 North, Range 5 East W.M., in WRIA 9. This well is referred to as the East Hill Well #1. The original certificate was issued to the City of Kent in February 1982. No changes have been made to this certificate since it was issued.

# East Hill (108th Avenue SE)

The East Hill (108<sup>th</sup> Avenue SE) site consists of two ground water certificates (GWC 651-A, and GWC 2428-A). The combined total authorized by these two water right certificates is 180 gpm and 120.4 afy.

There were historically 3 wells at the East Hills (108<sup>th</sup> Avenue SE) site (1 active and 2 inactive). As will be discussed later, a water right change will be filed on GWC 651-A to include the active well as an authorized point of withdrawal.

The City acquired the water system and East Hill (108<sup>th</sup> Avenue SE) site water rights from the original owner in 1964 during annexation of the area into the City. When acquired, the East Hill water rights were used to supply a water system that was serving more than 15 residential connections. Subsequent to their acquisition, these water rights have been beneficially used for City water supply, consistently documented in the City's water system plans, and expressly denoted the City's water rights portfolio and listing of the City's water rights. Based on the definitions in the municipal water law (RCW 90.03.015), these water rights qualify as being for municipal water supply purposes.

The well is currently operable, is run monthly to exercise the equipment, and serves as a back-up/standby water source that is not physically connected to the City's water distribution system. In the event of a large-scale natural disaster that compromises the City's water system, the well motor and pump can be operated with an on-site generator and can be used to pump water such that customers could travel to the site to receive potable water.

The specifics of each water right will be discussed in this section.

#### Ground Water Certificate 651-A

GWC 651-A, with a priority date of March 23, 1948, authorizes the withdrawal of 60 gpm and 42 afy for year round community water supply from a well located in the NE ½ NW ½ Section

29, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to the East Hill Water Co., Inc. in June 1951. No changes have been made to this certificated right since it was issued.

There is currently no active well at the location specified and the City has been making beneficial use of this water right from the East Hill Well #1 located in Section 20, Township 22 North, Range 5 East W.M., and from the 108<sup>th</sup> Avenue Well located in Section 29, Township 22 North, Range 5 East W.M. through a *de facto* change.

#### Ground Water Certificate 2428-A

GWC 2428-A, with a priority date of February 25, 1953, authorizes the withdrawal of 120 gpm and 78.4 afy for year round municipal supply from the 108<sup>th</sup> Avenue Well located in the NW ¼ NW ¼ NE ¼ Section 29, Township 22 North, Range 5 East W.M., in WRIA 9. A superseding certificate was issued to the City of Kent in July 2015 after the City requested that Ecology conform the water right to recognize it as being for municipal water supply purposes. The original certificate had been issued to the East Hill Water Co., Inc. in December 1955 for domestic supply for community.

#### Ground Water Claim G1-123227CL

In addition to the ground water certificates, there is a ground water claim in the City's name for this site as well. That claim is G1-123227CL. The claimed rate is 150 gpm and the claimed annual volume is 241 afy. The date of first use is identified as October 1964. Since October 1964 is after Chapter 90.44 RCW was established, it is assumed that this claim does not represent a vested right. For this reason, it is not included in the City's water rights total.

#### O'Brien

There is one ground water certificate (GWC 767-A) for the O'Brien site, which has two (1 active and 1 inactive) wells. As will be discussed later, a Showing of Compliance with RCW 90.44.100(3) form was filed recently with Ecology to get the O'Brien Well #2 (Unique Well ID AEJ475) completed in September 1999, authorized under the water right.

#### Ground Water Certificate 767-A

GWC 767-A, with a priority date of January 18, 1951, authorizes the withdrawal of 243 gpm and 45 afy for year round municipal supply from one well located within Tract 27 of Shinn's Cloverdale Addition to Kent Section 7, Township 22 North, Range 5 East W.M., in WRIA 9. A superseding certificate was issued to the City in July 2015 after the City requested that Ecology conform the water right to recognize it as being for municipal water supply purposes. The original certificate had been issued to the O'Brien Water Users Association, Inc. in September 1951 for domestic supply of community.

# Ground Water Claim G1-123226CL

In addition to the ground water certificate, there is a ground water claim in the City's name for this site. That claim is G1-123226CL. The claimed rate is 60 gpm and the claimed annual volume is 96.5 afy. The date of first use is identified as February 1959. Since February 1959 is after Chapter 90.44 RCW was established, it is assumed that this claim does not represent a vested right. For this reason, it is not included in the City's water rights total.

# Soos Creek (Seven Oaks)

There is one ground water certificate (G1-24703C) and one active well associated with the Soos Creek (Seven Oaks) site.

#### Ground Water Certificate G1-24073C

G1-24073C, with a priority date of April 26, 1982, authorizes the withdrawal of 900 gpm and 864 afy (non-additive) for year round municipal supply from one well located within SW ½ NW ½ Section 28, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to the City of Kent in November 1984. No changes have been made to this certificate since it was issued.

#### Summit

There is one ground water certificate (GWC 1116-A) and one active well associated with the Summit site. The active well has been redeveloped to correct a sanding issue. The well is currently operable, is run monthly to exercise the equipment, and serves as a back-up/standby water source that is not physically connected to the City's water distribution system. In the event of a large-scale natural disaster that compromises the City's water system, the well motor and pump can be operated with an on-site generator and can be used to pump water such that customers could come to the site to receive potable water.

#### Ground Water Certificate 1116-A

GWC 1116-A, with a priority date of June 17, 1950, authorizes the withdrawal of 200 gpm and 320 afy for year round municipal supply from one well located within Lot 11, Block 4 of City View Addition to Kent, Section 19, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to the City of Kent in July 1952. No changes have been made to this certificate since it was issued.

#### Hamilton Road

There are two ground water certificates (GWC 494-A and GWC 4534-A) and two wells associated with the Hamilton Road site. Combined, these two water rights total 50 gpm and 49.2 afy. The City acquired the water system and water rights from the original owner in 1967 during annexation of the area into the City. When acquired, the water rights were used to supply a water system that was serving more than 15 residential connections. Subsequent to their acquisition, these water rights have been consistently documented in the City's water system plans, denoted within the City's water rights portfolio . Based on the definitions in the municipal water law (RCW 90.03.015), these water rights qualify as being for municipal water supply purposes.

These water rights are being retained and managed by the City to meet future municipal demand.

#### Ground Water Certificate GWC 494-A

GWC 494-A, with a priority date of July 29, 1947, authorizes the withdrawal of 38 gpm and 30 afy for year round domestic supply for community from one well located within the NW ½ SE ½ Section 18, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate

was issued to the Hamilton Road Community Water Company in November 1950. No changes have been made to this certificate since it was issued.

### Ground Water Certificate GWC 4534-A

GWC 4534-A, with a priority date of May 4, 1962, authorizes the withdrawal of 12 gpm and 19.2 afy for year round community domestic supply from one well located within the N ½ NE ¼ NW ¼ SE ¼ Section 18, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to the Hamilton Road Community Water Company in June 1963. No changes have been made to this certificate since it was issued.

# High Meadows

There is currently one ground water certificate (G1-23713C) and one well associated with the High Meadows site. This water right is being retained and managed by the City to meet future municipal demand.

#### Ground Water Certificate G1-23713C

G1-23713C, with a priority date of October 15, 1980, authorizes the withdrawal of 7 gpm and 11 afy for year round municipal supply from one well located within the NE ¼ SW ¼ NW ¼ Section 17, Township 22 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to the City of Kent in November 1984. No changes have been made to this certificate since it was issued.

# Chappelear

There is one ground water certificate (GWC 1957-A) and one well at the Chappelear site. This water right is maintained as a standby water supply source for the City. This water right is being retained by the City to meet future municipal demand.

#### Ground Water Certificate GWC 1957-A

GWC 1957-A, with a priority date of March 24, 1952, authorizes the withdrawal of 140 gpm and 60 afy for year round domestic supply and irrigation of 30 acres from one well located in the NE ¼ SW ¼ Section 4, Township 21 North, Range 5 East W.M., in WRIA 9. The original certificate was issued to Harry M. Chappelear in August 1954. No changes have been made to this certificate since it was issued.

# Tacoma Regional Water Supply System

The City is authorized to take up to 12.64 million gallons per day (MGD) (equal to 8,778 gpm and 14,159 afy) from Tacoma's RWSS as a partner. The water right utilized by the City of Tacoma for this water supply is surface water permit S1-00726P. S1-00726P is classified as an interruptible water right as it contains a provision requiring that diversion can only occur when minimum instream flows are met in the Green River at USGS gage 12106700. The minimum instream flows for normal and critical years are outlined in the permit as well as in WAC 173-509-030.

Over the past several years, the City has evaluated how Tacoma RWSS water could be used to provide source water for a proposed aquifer storage and recovery well at Lakehaven's

Optimization of Aquifer Storage for Increased Supply (OASIS) project. Water stored during the winter would be used to meet summer peaking and emergency standby/reliability standard requirements.

#### PENDING POTABLE WATER RIGHT APPLICATIONS

The City has two water right applications for additional municipal potable water supply pending before Ecology.

Potable Applications

Ground Water Application G1-27619A

G1-27619A, with a priority date of May 22, 1995, requests the withdrawal of 1,200 gpm and 500 afy for year round municipal supply from two wells located within the E ½ SW ¼ Section 4, Township 21 North, Range 5 East W.M., in WRIA 9. This application remains pending in Ecology's water right application processing queue.

Ground Water Application G1-27620A

G1-27620A, with a priority date of May 22, 1995, requests the withdrawal of 7,000 gpm and 6,496 afy for year round municipal supply from three wells located within the SE ¼ SE ¼ Section 7 and SW ¼ SW ¼ Section 8, Township 21 North, Range 5 East W.M., in WRIA 9. This application proposed to take water from wells in close proximity to the Green River during high flows for placement in storage and later use during high demand periods. This application remains pending in Ecology's water right application processing queue.

# NON-POTABLE WATER RIGHTS HELD BY THE CITY

The City holds one ground water certificate (G1-25204C) that is for purposes other than potable water supply. This water right is mentioned here due to its ownership by the City but is not included in any of the calculations when comparing the City's water supply available to meet existing or future potable municipal demands.

#### River Bend Golf Course

The River Bend Golf Course is owned and operated by the City and the City has one water right and two wells (1 active and 1 inactive) at this location. Since this water right was issued to the City and is for a governmental or governmental proprietary purpose (irrigation of a golf course), under RCW 90.03.015(4)(b), the water right is considered to be for municipal water supply purposes. This water right is used exclusively for irrigation of the golf course and is not physically connected to the City's potable water distribution system.

As will be discussed later, a Showing of Compliance with RCW 90.44.100(3) form was filed recently with Ecology to get the River Bend Golf Course Well #2 (completed in August 2016 with Unique Well ID APP320) authorized under the water right.

Ground Water Certificate G1-25204C

G1-25204C, with a priority date of March 25, 1988, authorizes the withdrawal of 290 gpm and 290 afy for seasonal irrigation of 145 acres of the River Bend Golf Course from one well located

within the NE ¼ SE ¼ Section 22, Township 22 North, Range 4 East W.M., in WRIA 9. The original certificate was issued to the City of Kent Parks and Recreation Department in May 1990. No changes have been made to this certificate since it was issued.

# NON-POTABLE AND NON-CONSUMPTIVE WATER RIGHT APPLICATIONS HELD BY THE CITY

The City has submitted three ground water applications (G1-27608A, G1-27778A, and G1-27914A) for non-consumptive streamflow augmentation of Mill Creek. These water right applications are included in this water system plan for completeness but are not included in any of the calculations when looking at the City's water supply available to meet existing or future potable municipal demands.

#### Mill Creek Streamflow Augmentation

The goal of the proposed Mill Creek Streamflow Augmentation Project is to increase critically low summer base flows in Mill Creek by pumping shallow ground water and then aerating it prior to discharge into the stream. Mill Creek is one of the City's major streams and experiences extremely low base flows (approximately 0.5 to 2.0 cfs) during the summer months. Primary benefits desired are to improved salmonid habitat by enhancing water quality and increasing available habitat by roughly doubling summertime streamflows.

# Ground Water Application G1-27608A

G1-27608A, with a priority date of April 25, 1995, requests the withdrawal of 200 gpm and 100 afy for streamflow augmentation of Mill Creek during the low-flow season from one well located within the NW ¼ Section 19, Township 22 North, Range 5 East W.M., in WRIA 9. This application remains pending in Ecology's water right application processing queue.

# Ground Water Application G1-27778A

G1-27778A, with a priority date of November 7, 1996, requests the withdrawal of 750 gpm and 400 afy for streamflow augmentation of Mill Creek during the low-flow season from four wells located within the S ½ Section 11, Township 22 North, Range 4 East W.M., in WRIA 9. This application remains pending in Ecology's water right application processing queue.

# Ground Water Application G1-27914A

G1-27914A, with a priority date of May 1, 1998, requests the withdrawal of 100 gpm and 80 afy for streamflow augmentation of Mill Creek during the low-flow season from one well located within the SE ½ SW ½ Section 1, Township 22 North, Range 4 East W.M., in WRIA 9. This application remains pending in Ecology's water right application processing queue.

# PERMIT EXEMPT WELLS

In 2016, the Washington State Supreme Court issued its decision in the case of Whatcom County v. Western Washington Growth Management Hearings Board, 186 Wn.2d 648 (2016) (often referred to as the "Hirst" decision). In the Hirst case, the court determined that counties and cities could not issue building permits reliant on permit exempt wells in 15 Puget Sound basins if beneficial use of the proposed well could impact senior minimum flows and/or closed surface

waters - irrespective of whether an adopted instream flow rule allows such use. The City is located within WRIA 8 (Cedar – Sammamish) and WRIA 9 (Duwamish-Green), both of which are affected basins.

As a consequence of the Hirst decision, local governments, including the City, were compelled to advise building permit applicants that the use of an exempt well to serve as a domestic water source may be subject to seasonal variations, curtailment, or other restrictions by Ecology, other agencies, or a court of law.

In 2018, the Washington State Legislature passed ESSB 6091, which allows permit exempt wells constructed in Hirst affected basins prior to the Act's effective date (January 19, 2018) to serve as proof of adequate domestic supply for a building permit. Such prior-Act wells constructed in these basins, including WRIA 15, in compliance with Chapter 18.04 RCW, are not subject to the new restrictions, limitations, and fees imposed by the Act. This is regardless of whether the well was put to beneficial use prior to January 19, 2018. Projects using permit exempt wells for non-domestic purposes are also not affected by the Act.

Under the new law, those applicants within WRIAs 8 and 9 without constructed wells, and submitting building permits reliant on use of a permit exempt well (RCW 90.44.050) after January 19, 2018, are subject to its terms and limitations. Such applicants shall be limited to a maximum annual average withdrawal of 950 gallons per day (gpd) per connection. This amount may be reduced to 350 gpd for indoor use only during drought conditions. The quantitative and other limitations associated with ESSB 6091 shall remain in effect until a watershed restoration and enhancement plan is approved by Ecology and implementing rules are adopted.

In order to secure building permits, applicants located within the City's corporate boundaries shall be required to pay the City a fee of \$500, \$350 of which is to be transmitted to Ecology. The City is required to record relevant water use restrictions with the property title.

Ecology is recommending that local jurisdictions located within Hirst affected basins adopt the following recording language:

"Domestic water use at this property is subject to a water use limitation of a maximum annual average withdrawal of 950 gallons per day, per connection, subject to the 5,000 gallon per day limit provided in RCW 90.44.050."

# WATER SUPPLY EVALUATION

An evaluation of the City's combined existing potable water rights (excluding the Riverbend Golf Course Municipal Irrigation Water Right G1-25204C) and Tacoma RWSS contract was performed to determine the sufficiency of the water rights to meet both existing and future water demands. **Table 6-2** compares the combined maximum instantaneous water right/contract rates of the sources with the maximum day demand of the system, and the combined maximum annual water right/contract volume of the sources with the average day demand of the system. As shown in the table, the City has sufficient water rights (both instantaneous and annual amounts) to meet the demands of its existing customers.

Table 6-2
Existing Water Rights Evaluation

	Instantaneous Rights / Maximum Day Demand	Annual Rights / Average Day Demand	
Description	(gpm)	(afy)	(gpm)
Potable Water Rights	31,946	33,755	20,926
Existing (2016) Water Demand	11,629	8,627	5,348
Surplus (or Deficient) Rights	20,317	25,128	15,578

**Table 6-3** summarizes the results of the future water rights evaluation, which compares the water rights and contracts of the existing sources with the system's future 10-year, 20-year, and 50-year demand projections. The analyses considered future demand projections with and without water use reductions from the City's planned water use efficiency efforts, as shown in the table. The results of the future water rights evaluation indicate the City has sufficient water rights to meet the demands through the year 2066.

Table 6-3
Future Water Rights Evaluation

	Instantaneous Rights / Maximum Day Demand		Annual Rights / Average Day Demand	
Description	(gpm)	(acre-feet)	(gpm)	
Year	2026 (+10 years) Without Conservation			
Potable Water Rights	31,946	33,755	20,926	
Projected Water Demand	12,375	9,180	5,691	
Surplus (or Deficient) Rights	19,571	24,574	15,235	
Year	2036 (+20 years) Without Conservation			
Potable Water Rights	31,946	33,755	20,926	
Projected Water Demand	13,208	9,798	6,074	
Surplus (or Deficient) Rights	18,738	23,957	14,852	
Year	2066 (+50 years) Without Conservation			
Potable Water Rights	31,946	33,755	20,926	
Projected Water Demand	16,841	12,494	7,745	
Surplus (or Deficient) Rights	15,105	21,261	13,181	
Yea	ar 2026 (+10 years) With Conservation			
Potable Water Rights	31,946	33,755	20,926	
Projected Water Demand	11,899	8,827	5,473	
Surplus (or Deficient) Rights	20,047	24,927	15,454	
Yea	ar 2036 (+20 years) With Conservation			
Potable Water Rights	31,946	33,755	20,926	
Projected Water Demand	12,716	9,433	5,848	
Surplus (or Deficient) Rights	19,230	24,322	15,078	
Yea	ar 2066 (+50 years) With Conservation			
Potable Water Rights	31,946	33,755	20,926	
Projected Water Demand	16,289	12,084	7,491	
Surplus (or Deficient) Rights	15,657	21,671	13,435	

# RECENT WATER RIGHT ACTIONS

Through the water system planning process, it was discovered that newer wells drilled at existing sites had not been added to the appropriate water rights as points of withdrawal. To rectify this problem, the City has submitted Showing of Compliance with RCW 90.44.100(3) forms for the wells and water rights located at the sites identified in the following sections.

# Kent Springs

Water right G1-22956C authorizes withdrawal from two wells (Kent Springs Wells #1 and #2). The public notice identified the wells as being located in the SE ½ SW ½ Section 33, Township

22 North, Range 6 East W.M. There has been one additional well drilled at this site that is not currently referenced in the water right record as an authorized point of withdrawal. This well is referred to as Kent Springs Well #3 (Well ID Tag AEC866) and was completed in April 2001. The following action was taken to get Kent Springs Well #3 authorized as a point of withdrawal under this water right:

• Submitted a Showing of Compliance with RCW 90.44.100(3) form to identify Kent Springs Well #3 (Well ID Tag AEC866) as an additional point of withdrawal under G1-22956C.

North Kent Wellfield (208th, 212th, and Garrison Creek)

Water rights G1-23614C, G1-24190C, and G1-24404C all went through a water right change application process in 2003 to have the authorized points of withdrawal include wells located at the 208<sup>th</sup> Street (208<sup>th</sup> Street Well), 212<sup>th</sup> Street (212<sup>th</sup> Street Wells #1 and #2), and Garrison Creek Well sites (Garrison Creek Well #1). The public notice identified the wells as being located in the SE ½ SW ½ Section 6 (208<sup>th</sup>), SE ½ NW ½ Section 7 (212th), and NE ½ SE ½ Section 7 (Garrison Creek), all in Township 22 North, Range 5 East W.M. There have been two additional wells drilled at these sites that are not currently referenced on the water rights as authorized points of withdrawal. These wells include the 212<sup>th</sup> Street Well #3 (Well ID Tag AFR915) completed in May 2001 and Garrison Creek Well #2 (Well ID Tag AFT320) completed in February 2004. The following actions were taken to get these two wells included as authorized points of withdrawal under these three water rights:

- Submitted Showing of Compliance with RCW 90.44.100(3) forms to identify the 212<sup>th</sup> Street Well #3 and Garrison Creek Well #2 as additional points of withdrawal under G1-23614C.
- Submitted Showing of Compliance with RCW 90.44.100(3) forms to identify the 212<sup>th</sup> Street Well #3 and Garrison Creek Well #2 as additional points of withdrawal under G1-24190C.
- Submitted Showing of Compliance with RCW 90.44.100(3) forms to identify the 212<sup>th</sup> Street Well #3 and Garrison Creek Well #2 as additional points of withdrawal under G1-24404C.

East Hill (104th Avenue SE)

Currently, there are five wells (3 inactive, 1 active, and 1 unequipped) at the East Hill (104<sup>th</sup> Avenue SE) site. Four water rights are associated with the site. The site is bisected by an administrative boundary, which complicates things slightly from a water right perspective. The public notice legal description for the wells under three of the water rights (GWC 42-D, GWC 44-A, and G1-23285C) is Block 20 R.O. Smith Orchard Tracts of Section 20, Township 22 North, Range 5 East W.M. The active well and unequipped well are both located within the published well legal description of GWC 42-D, GWC 44-A, and G1-23285C. The active well (East Hill Well #1) is only currently authorized under one water right (G1-23285C). The unequipped well is referred to as East Hill Well #2 (Well ID Tag AFT321) completed in June 2004, is not currently associated with any water right. The following actions were taken to get both wells included as authorized points of withdrawal under these four East Hill (104<sup>th</sup> Avenue SE) water rights:

- Submitted Showing of Compliance with RCW 90.44.100(3) forms to identify East Hill Well #1 as a replacement point of withdrawal under GWC 42-D and GWC 44-A.
- Submitted Showing of Compliance with RCW 90.44.100(3) forms to identify the East Hill Well #2 (Unique Well ID AFT321) as an additional point of withdrawal under GWC 42-D, GWC 44-A, and G1-23285C.

#### O'Brien

Water right GWC 767-A authorizes withdrawal from the original O'Brien Well (O'Brien Well #1). The public notice identified the well as being located in Tract 27 of Shinn's Cloverdale Addition to Kent, Washington, Section 7, Township 22 North, Range 5 East W.M. There has been one additional well drilled at this site that is not currently referenced on the water right as an authorized point of withdrawal. This well is referred to as O'Brien Well #2 (Well ID Tag AEJ475) and was completed in September 1999. The following action was taken to get O'Brien Well #2 authorized as a point of withdrawal under this water right:

• Submitted a Showing of Compliance with RCW 90.44.100(3) form to identify O'Brien Well #2 (Well ID Tag AEJ475) as an additional point of withdrawal under GWC 767-A.

# River Bend Golf Course

Water right G1-25204C authorizes withdrawal from the original River Bend Golf Course Well. The original River Bend Golf Course Well experienced decreased production and could not be rehabilitated. The public notice identified the well as being located in the NE ½ SE ½ Section 22, Township 22 North, Range 4 East W.M. There has been one additional well drilled at this site that is not currently referenced on the water right as an authorized point of withdrawal. This well is referred to as River Bend Golf Course Well #2 (Well ID Tag APP320) and was completed in August 2016. The following action was taken to get the River Bend Golf Course Well #2 authorized as a point of withdrawal under this water right:

• Submitted a Showing of Compliance with RCW 90.44.100(3) form to identify River Bend Golf Course Well #2 (Well ID Tag APP320) as an additional point of withdrawal under G1-25204C.

# LONG-TERM WATER SUPPLY PLANNING

Although the City has sufficient water rights to supply the water system through 2066 and beyond, some facility improvements are necessary to fully utilize the City's existing water rights.

The existing sources of supply for the City's water system are a mixture of City owned and operated spring and ground water sources in both WRIA 8 and WRIA 9 authorized under City-held water rights, combined with receipt of treated water from the City of Tacoma's regional water supply system. As the City moves forward, its intention is to rehabilitate and upgrade its facilities to allow for full utilization of its City-owned sources up to the water right limits, as opposed to pursuit of new water rights.

#### FEASIBILITY OF OBTAINING NEW WATER RIGHTS

When considering supply redundancy, one option to investigate is the ability to obtain new water rights for municipal purposes. The City's current water sources and municipal boundary fall within both WRIA 8 – Cedar-Sammamish (Clark Springs site) and WRIA 9 – Green-Duwamish (majority of the City). Both WRIAs have administrative rules that establish the requirements that must be met before there can be an issuance of new water rights.

The Green River and Cedar Rivers are subject to minimum instream flow rules and/or agreements that effectively preclude all new surface water withdrawals beyond those occurring during high flow winter months. Since the City of Tacoma secured a flow-restricted, seasonal water right on the Green River for its Second Supply/P-5 project in the 1980's, no further surface water applications have been approved by Ecology due to ongoing concerns relating to flow levels, cumulative impacts, and tribal treaty rights. Moreover, because streams tributary to the Green and Cedar Rivers have been closed by administrative rule to further appropriation, Ecology has not seriously entertained the issuance of new primary rights for these surface waters for several years. Due to the foregoing factors, and the advent of the Endangered Species Act, development of new additive surface water rights is not considered a viable supply alternative.

# Application for Emergency Source Water Right

As a result of the contamination risk posed by the Landsburg Mine Site to its Clark Springs Water Supply System (CSWSS) and Rock Creek, the City intends to undertake the studies and analysis necessary to submit an emergency source water right application to Ecology. The City's goal in this regard is to secure an emergency supply source in close proximity to the existing CSWSS with the capacity to replace as much of the CSWSS supply as possible. The emergency source application process, which will be undertaken consistent with the permit requirements cited in Ecology Water Resources Program Policy POL-1045, will include a request for a pre-application meeting with Ecology, a request for a preliminary permit approval to undertake appropriate source testing, and consultations with the Muckleshoot Indian Tribe.

#### FFASIBILITY OF TRANSFERRING EXISTING WATER RIGHTS

Changing attributes of existing City-owned water rights is dependent on passing the statutory tests outlined in Chapters 90.03 and 90.44 RCW and as clarified in case law.

#### North Kent Wellfield Expansion to Include O'Brien Site

Water right changes include a variety of options, including changes in place of use, purpose of use, and to the point of diversion or withdrawal of water, as well as the addition of points of diversion or withdrawals to allow groundwater production in a wellfield configuration. As noted earlier, the City has secured approval to operate its 208<sup>th</sup> Street, 212<sup>th</sup> Street, and Garrison Creek Wells in a wellfield configuration under its water rights to restore the production capacity affected by the Nisqually Earthquake. Due to the close physical proximity and hydrogeologic relationship of this wellfield to the O'Brien site (Cert. No. 767-A), the City intends to submit water right change applications to include the O'Brien site Well #2 as an additional point of withdrawal to the existing North Kent Wellfield water rights (G1-23614C, G1-24190C, and G1-24404C) and to include the North Kent Wellfield wells as additional points of withdrawal under GWC 767-A.

# DRINKING WATER REGULATIONS

# **OVERVIEW**

The quality of drinking water in the United States is regulated by the Environmental Protection Agency (EPA). Under provisions of the Safe Drinking Water Act (SDWA), the EPA is allowed to delegate primary enforcement responsibility for water quality control to each state. In the State of Washington, DOH is the agency responsible for implementing and enforcing the drinking water regulations. 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. In meeting these requirements, the State, in cooperation with the EPA, has published drinking water regulations that are contained in Chapter 246-290 WAC.

# **EXISTING REGULATIONS**

The Federal SDWA was enacted in 1974, as a result of public concern about water quality. The SDWA sets standards for the quality of drinking water and requires water treatment, if these standards are not met. The SDWA also sets water testing schedules and methods that water systems must follow. In 1986, the SDWA was amended as a result of additional public concern and frequent contamination of groundwater from industrial solvents and pesticides. The 1986 Amendments require water systems to monitor and treat for a continuously increasing number of water contaminants identified in the new federal regulations. The EPA regulated approximately 20 contaminants between 1974 and 1986. The 1986 Amendments identified 83 contaminants that EPA was required to regulate by 1989. Implementation of the new regulations has been marginally successful due to the complexity of the regulations and the associated high costs. To rectify the slow implementation of the new regulations, the SDWA was amended again and re-authorized in August of 1996.

In response to the 1986 SDWA Amendments, EPA established six rules, known as the Phase I Rule, Phase II and IIb Rules, Phase V Rule, Surface Water Treatment Rule, Total Coliform Rule, and Lead and Copper Rule. The EPA regulates most chemical contaminants through the Phase I, II, IIb, and V Rules. The City's active sources are affected by many of these rules.

The EPA set two limits for each contaminant that is regulated under the rules. The first limit is a health goal, referred to as the Maximum Contaminant Level Goal (MCLG). The MCLG is zero for many contaminants, especially known cancer-causing agents (carcinogens). The second limit is a legal limit, referred to as the Maximum Contaminant Level (MCL). The MCLs are equal to or higher than the MCLGs; however, most MCLs and MCLGs are the same, except for contaminants that are regulated as carcinogens. The health goals (MCLGs) for carcinogens are typically zero, because they cause cancer and it is assumed that any amount of exposure may pose some risk of cancer. A summary of each rule follows.

To fully understand the discussion that follows, a brief definition of several key terms is provided below.

 Organic Chemicals – Animal or plant produced substances containing carbon and other elements such as hydrogen and oxygen.

- Synthetic Organic Chemicals (SOCs) Man-made organic substances, including herbicides, pesticides, and various industrial chemicals and solvents.
- Volatile Organic Chemicals (VOCs) Chemicals, as liquids, that evaporate easily into the air.
- Inorganic Chemicals (IOCs) Chemicals of mineral origin that are naturally occurring elements. These include metals such as lead and cadmium.

#### Phase I Rule

The Phase I Rule, which was the EPA's first response to the 1986 Amendments, provided limits for eight VOCs that may be present in drinking water. VOCs are used by industries in the manufacturing of rubber, pesticides, deodorants, solvents, plastics, and other chemicals. VOCs are found in everyday items such as gasoline, paints, thinners, lighter fluid, mothballs, and glue, and are typically encountered at dry cleaners, automotive service stations, and elsewhere in industrial processes. The City currently complies with all contaminant monitoring requirements under this rule.

#### Phase II and IIb Rules

The Phase II and IIb Rules updates and creates limits for 38 contaminants (organics and inorganics). Some of the contaminants are frequently applied agricultural chemicals (nitrate), while others are more obscure industrial chemicals. The City currently complies with all contaminant monitoring requirements under this rule.

#### Phase V Rule

The Phase V Rule sets standards for 23 additional contaminants, of which 18 are organic chemicals (mostly pesticides and herbicides) and 5 are IOCs (such as cyanide). The City currently complies with all contaminant monitoring requirements under this rule.

#### Surface Water Treatment Rule

Surface water sources, such as rivers, lakes, and reservoirs (which are open to the atmosphere and subject to surface runoff), and GWI sources are governed by the Surface Water Treatment Rule. The SWTR seeks to prevent waterborne diseases caused by the microbes *Cryptosporidium*, *Legionella*, and *Giardia lamblia*, which are present in most surface waters. The rule requires disinfection of all surface water and GWI sources. All surface water and GWI sources must also be filtered, unless a filtration waiver is granted. A filtration waiver may be granted to systems with pristine sources that continuously meet stringent source water quality and protection requirements. The City's water supply is classified as groundwater at all sources except for the Tacoma Regional Water Supply. Tacoma Public Utilities is responsible for monitoring and satisfying the water quality requirements for the Tacoma Second Supply Pipeline Source.

#### Interim Enhanced Surface Water Treatment Rule

The Interim Enhanced Surface Water Treatment Rule (IESWTR) became effective concurrent with the Stage 1 Disinfectants/Disinfection Byproducts Rule. The rule primarily applies to public water systems that serve 10,000 or more people and use surface water or GWI sources. The rule also requires primacy agencies (i.e., DOH in Washington State) to conduct sanitary surveys of all

surface water and GWI systems, regardless of size. The rule is the first to directly regulate the protozoan *Cryptosporidium* and has set the MCLG for *Cryptosporidium* at zero. The City's water supply is classified as groundwater at all sources except for the Tacoma Regional Water Supply. Tacoma Public Utilities is responsible for monitoring and satisfying the water quality requirements for the Tacoma Second Supply Pipeline Source.

# Long Term 1 Enhanced Surface Water Treatment Rule

The Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) addresses water systems using surface water or GWI sources serving fewer than 10,000 people. The rule extends protections against *Cryptosporidium* for smaller water systems. The City's water supply is classified as groundwater at all sources except for the Tacoma Regional Water Supply. Tacoma Public Utilities is responsible for monitoring and satisfying the water quality requirements for the Tacoma Second Supply Pipeline Source.

### Revised Total Coliform Rule

The Revised Total Coliform Rule sets an MCL for *Escherichia Coli* (*E. coli*) and specifies the frequency and timing of coliform testing based on population served, public water system type, and source water type. When total coliform is detected, it is a treatment technique trigger. The water system must conduct an assessment of their water system facilities and operations and fix any sanitary defects. For confirmed *E. coli* incidents, known as an *E. coli* MCL violation, the water system must perform a Level 2 assessment and provide public notice within 24 hours. If a positive sample is collected on a consecutive system, the City will also need to collect source samples.

Coliform is a group of bacteria, some of which live in the digestive tract of humans and many animals, and are excreted in large numbers with feces. Coliform can be found in sewage, soils, surface waters, and vegetation. The presence of any coliform in drinking water indicates a potential health risk and potential waterborne disease outbreak, which may include gastroenteric infections, dysentery, hepatitis, typhoid fever, cholera, and other infectious diseases. *E. coli* is a member of the coliform group which is almost exclusively of fecal origin, and their presence can lead to increased health risks.

A copy of the City's Water Quality Monitoring Plan, including the coliform monitoring program and *E. coli* response plan, is contained in **Appendix I**.

### Lead and Copper Rule

The Lead and Copper Rule identifies action levels for both lead and copper. An action level is different than an MCL. An MCL is a legal limit for a contaminant, and an action level is a trigger for additional prevention or removal steps. The action level for lead is greater than 0.015 milligrams per liter (mg/L). The action level for copper is greater than 1.3 mg/L. 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 below the action levels. The rule requires systems that exceed the lead level to educate the affected public about reducing its lead intake. Systems that continue to exceed the lead action level after implementing corrosion control and source water treatment may be required to replace piping in the system that contains lead sources. Corrosion control is typically accomplished by increasing the pH of the water to

make it less corrosive, which reduces its ability to break down water pipes and absorb lead or copper.

Lead is a common metal found throughout the environment in lead-based paint, air, soil, household dust, food, certain types of pottery, porcelain, pewter, brass, and water. Lead can pose a significant health risk if too much of it enters the body. Lead builds up in the body over many years and can cause damage to the brain, red blood cells, and kidneys. The greatest risk is to young children and pregnant women. Lead can slow normal mental and physical development of growing bodies.

Copper is a common, natural, and useful metal found in our environment. It is also a trace element needed in most human diets. The primary impact of elevated copper levels in water systems is stained plumbing fixtures. At certain levels (well above the action levels), copper may cause nausea, vomiting, and diarrhea. It can also lead to serious health problems in people with Wilson's disease. Long-term exposure to elevated levels of copper in drinking water could also increase the risk of liver and kidney damage. The City currently complies with all contaminant monitoring and treatment requirements under this rule.

#### Radionuclides Rule

The EPA established interim drinking water regulations for radionuclides in 1976 under the SDWA. MCLs were established for alpha, beta, and photon emitters, and radium 226/228. Radionuclides are elements that undergo a process of natural decay and emit radiation in the form of alpha or beta particles and gamma photons. The radiation can cause various kinds of cancers, depending on the type of radionuclide exposure from drinking water. The regulations address both man-made and naturally occurring radionuclides in drinking water.

The 1986 Amendments to the SDWA finalized the regulations for radionuclides by eliminating the term "interim." The amendments also directed the EPA to promulgate health-based MCLGs, as well as MCLs. The EPA failed to meet the statutory schedules for promulgating the radionuclide regulations, which resulted in a lawsuit. In 1991, the EPA proposed revisions to the regulations, but a final regulation based on the proposal was never promulgated. The 1996 Amendments to the SDWA directed the EPA to revise a portion of the earlier proposed revisions, adopt a schedule, and review and revise the regulations every 6 years, as appropriate, to maintain or improve public health protection. Subsequent to the 1996 Amendments, a 1996 court order required the EPA to either finalize the 1991 proposal for radionuclides or to ratify the existing standards by November 2000.

The final rule was published in the Federal Register on December 7, 2000, and became effective on December 8, 2003. The rule established an MCLG of zero for the four regulated contaminates and MCLs of 5 picocuries per liter (pCi/L) for combined radium-226 and radium-228, 15 pCi/L for gross alpha (excluding radon and uranium), 4 millirems per year (mrem/year) for beta particle and photon radioactivity, and 30 micrograms per liter (µg/L) for uranium. The City currently complies with all contaminant monitoring requirements under this rule.

### Wellhead Protection Program

Section 1428 of the 1986 SDWA Amendments mandates that each state develops a wellhead protection program. The Washington State mandate for wellhead protection, and the required elements of a wellhead protection program, is contained in WAC 246-290-135, Source

Protection, which became effective in July of 1994. In Washington State, DOH is the lead agency for the development and administration of the State's wellhead protection program.

A wellhead protection program is a proactive and ongoing effort of a water purveyor to protect the health of its customers by preventing contamination of the groundwater that it supplies for drinking water. All federally defined Group A public water systems that use groundwater as their source are required to develop and implement a wellhead protection program. All required elements of a local wellhead protection program must be documented and included in either the Water System Plan (applicable to the City) or a Small Water System Management Program document (not applicable to the City). A copy of the City's Wellhead Protection Program is contained in **Appendix J**.

### Consumer Confidence Report

The CCR is the centerpiece of the right-to-know provisions of the 1996 Amendments to the SDWA. The annual report must be updated and re-issued to all customers by July 1<sup>st</sup> of each year thereafter.

The CCR is a report on the quality of water that was delivered to the water users during the previous calendar year. The reports must contain certain specific elements, but may also contain other information that the purveyor deems appropriate for public education. Some, but not all, of the information that is required in the reports includes the source and type of the drinking water, type of treatment, contaminants that have been detected in the water, potential health effects of the contaminants, identification of the likely source of contamination, violations of monitoring and reporting, and variances or exemptions to the drinking water regulations. A copy of the City's most recent CCR is contained in **Appendix K**.

### Stage 1 Disinfectants/Disinfection Byproducts Rule

Disinfection byproducts (DBPs) are formed when free chlorine reacts with organic substances, most of which occur naturally. These organic substances (called precursors) are a complex and variable mixture of compounds. The DBPs themselves may pose health risks. Trihalomethanes (THM) are a category of DBPs that had been regulated previous to this rule. However, systems with groundwater sources that serve a population of less than 10,000 were not previously required to monitor for THM.

The rule applies to the City and most other water systems, including systems serving fewer than 10,000 people that add a chemical disinfectant to the drinking water during any part of the treatment process. The rule reduced the MCL for total THM, which are a composite measure of four individual THM, from the previous interim level of 0.10 mg/L to 0.08 mg/L. The rule established MCLs and requires monitoring of three additional categories of DBPs (0.06 mg/L for five haloacetic acids (HAA5), 0.01 mg/L for bromate, and 1.0 mg/L for chlorite). The rule established maximum residual disinfectant levels for chlorine (4.0 mg/L), chloramines (4.0 mg/L), and chlorine dioxide (0.8 mg/L). The rule also requires systems using surface water or groundwater directly influenced by surface water to implement enhanced coagulation or softening to remove DBP precursors, unless alternative criteria are met. The City currently complies with all contaminant monitoring requirements under this rule.

## **Unregulated Contaminant Monitoring Regulation**

The EPA established the Unregulated Contaminant Monitoring Regulation (UCMR) to generate data on contaminants that are being considered for inclusion in new drinking water standards. The information collected by select public water systems will ensure that future regulations established by the EPA are based on sound science.

Three separate lists of unregulated contaminants are maintained under the UCMR: List 1, List 2, and List 3. Contaminants are organized on the tiered lists based on the availability of standard testing procedures and the known occurrence of each contaminant, with List 1 containing contaminants that have established standard testing procedures and some, but insufficient, information on their occurrence in drinking water. Monitoring for contaminants on the three lists is limited to a maximum of 30 contaminants within a 5-year monitoring cycle, and the EPA is required to publish new contaminant monitoring lists every 5 years. As new lists are published, contaminants will be moved up in the lists if adequate information is found to support additional monitoring. All public water systems serving more than 10,000 people and a randomly selected group of smaller water systems are required to monitor for contaminants. The City currently monitors for some unregulated contaminants.

#### Arsenic

Arsenic is highly toxic, affects the skin and nervous system, and may cause cancer. The Arsenic Rule sets the MCLG of arsenic at zero and reduces the MCL from the previous standard of 0.05 mg/L to 0.01 mg/L. Arsenic's monitoring requirements will be consistent with the existing requirements for other inorganic contaminants. The City complies with this rule since its surface and groundwater sources have naturally low levels of arsenic that are below the MCL.

# Filter Backwash Recycling Rule

Public water systems using surface water or groundwater under the direct influence of surface water that utilize filtration processes and recycling must comply with the Filter Backwash Recycling Rule. The rule aims to reduce risks associated with recycling contaminants removed during filtration.

The rule requires filter backwash water be returned to a location that allows complete treatment. In addition, filtration systems must provide detailed information regarding the treatment and recycling process to the state. The City's water supply is classified as groundwater at all sources except for the Tacoma Regional Water Supply. Tacoma Public Utilities is responsible for monitoring and satisfying the water quality requirements for the Tacoma Second Supply Pipeline Source.

# Stage 2 Disinfectants/Disinfection Byproducts Rule

The EPA implemented the Stage 2 Disinfectants/Disinfection Byproducts Rule simultaneously with the Long Term 2 Enhanced Surface Water Treatment Rule.

Similar to the Stage 1 D/DBPR, this rule applies to most water systems that add a disinfectant to the drinking water other than ultraviolet light or those systems that deliver such water. The Stage 2 D/DBPR changes the calculation procedure requirement of the MCLs for two groups of disinfection byproducts, total THM (TTHM) and HAA5. The rule requires each sampling location to determine compliance with MCLs based on their individual annual average DBP

levels (termed the Locational Running Annual Average), rather than utilizing a system-wide annual average. The rule also proposes new MCLGs for chloroform (0.07 mg/L), trichloroacetic acid (0.02 mg/L), and monochloroacetic acid (0.03 mg/L).

Additionally, the rule requires systems to document peak DBP levels and prepare an Initial Distribution System Evaluation (IDSE) to identify Stage 2 D/DBPR compliance monitoring sites. IDSEs require each water system to prepare a separate IDSE plan and report, with the exception of those systems who obtain a 40/30 Certification or a Very Small System Waiver. In order to qualify for the 40/30 Certification, all samples collected during Stage 1 monitoring must have TTHM and HAA5 levels less than or equal to 0.040 mg/L and 0.030 mg/L, respectively. The City currently complies with all contaminant monitoring requirements under this rule and has qualified for 40/30 Certification and does not require IDSE plan.

## Long Term 2 Enhanced Surface Water Treatment Rule

Following the publishing of the IESWTR, the EPA introduced the LT1ESWTR to supplement the preceding regulations. The second part of the regulations of the LT1ESWTR are mandated in the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). The final rule was implemented simultaneously with the Stage 2 D/DBPR described in the previous section. This rule applies to all systems that use surface water or GWI sources.

This rule establishes treatment technique requirements for filtered systems based on their risk level for contamination, calculated from the system's average *Cryptosporidium* concentration. Requirements include up to 2.5-log *Cryptosporidium* treatment, in addition to existing requirements under the IESWTR and LT1ESWTR. Filtered systems that demonstrate low levels of risk will not be required to provide additional treatment. Unfiltered systems under this rule must achieve at least a 2-log inactivation of *Cryptosporidium* if the mean level in the source water remains below 0.01 oocysts/L. If an unfiltered system's mean level of *Cryptosporidium* exceeds 0.01 oocysts/L, the LT2ESWTR requires the system to provide a minimum 3-log inactivation of *Cryptosporidium*. All unfiltered systems are also required to utilize a minimum of two disinfectants in their treatment process.

The LT2ESWTR also addresses systems with unfinished water storage facilities. Under this rule, systems must either cover their storage facilities or achieve inactivation and/or removal of 4-log virus, 3-log *Giardia lamblia*, and 2-log *Cryptosporidium* on a state-approved schedule. Lastly, the rule extends the requirement of the disinfection profiles mandated under the LT1ESWTR to the proposed Stage 2 D/DBPR. The City's water supply is classified as groundwater at all sources except for the Tacoma Regional Water Supply. Tacoma Public Utilities is responsible for monitoring and satisfying the water quality requirements for the Tacoma Second Supply Pipeline Source.

#### Groundwater Rule

The EPA promulgated the Groundwater Rule (GWR) to reduce the risk of exposure to fecal contamination that may be present in public water systems that use groundwater sources. The GWR also specifies when corrective action (which may include disinfection) is required to protect consumers who receive water from groundwater systems from bacteria and viruses. The GWR applies to public water systems that use groundwater and to any system that mixes surface

and ground waters if the groundwater is added directly to the distribution system and provided to consumers without treatment equivalent to surface water treatment.

The rule targets risks through an approach that relies on the four following major components.

- 1. Periodic sanitary surveys of groundwater systems that require the evaluation of eight critical elements and the identification of significant deficiencies (such as a well located near a leaking septic system). DOH conducted its most recent sanitary survey of the City's water system on December 8, 2016, under the state's existing sanitary survey program.
- 2. Source water monitoring to test for the presence of *E. coli*, enterococci, or coliphage in the sample. There are two monitoring provisions.
  - O Triggered monitoring for systems that do not already provide treatment that achieves at least 99.99-percent (4-log) inactivation or removal of viruses and that have a total coliform positive routine sample under the Revised Total Coliform Rule sampling in the distribution system.
  - Assessment monitoring is a complement to triggered monitoring. A state has the option to require systems to conduct source water assessment monitoring at any time to help identify high risk systems.
- 3. Corrective actions required for any system with a significant deficiency or source water fecal contamination. The system must implement one or more of the following corrective action options: correct all significant deficiencies; eliminate the source of contamination; provide an alternate source of water; or provide treatment that reliably achieves 99.99-percent inactivation or removal of viruses.
- 4. Compliance monitoring to ensure that treatment technology installed to treat drinking water reliably achieves at least 99.99-percent inactivation or removal of viruses.

The City's last sanitary survey was completed in December 2016. The City is currently addressing minor deficiencies identified in this sanitary survey and complies with all other requirements of the rule.

### **FUTURE REGULATIONS**

Drinking water regulations are continuously changing in an effort to provide higher quality and safer drinking water. Modifications to the existing rules described above and implementation of new rules are planned for the near future. A summary of upcoming drinking water regulations that will most likely affect the City is presented in the following sections.

#### Radon

In July of 1991, the EPA proposed a regulation for radon, as well as three other radionuclides. The 1996 SDWA Amendments required the EPA to withdraw the 1991 proposal due to several concerns that were raised during the comment period. A new proposed regulation was published in the Federal Register on November 2, 1999. Comments on the proposed rule were due to the EPA by February 4, 2000. Final federal requirements for addressing radon were delayed until 2008 but have not yet been published. The rule proposes a 300 pCi/L MCL for community water systems that use groundwater or an alternative, less stringent MCL of 4,000 pCi/L for water systems where their state implements an EPA-approved program to reduce radon risks in

household indoor air and tap water. It is not currently known when or what a radon regulation may require as adopted by the EPA or what the implementation schedule for the rule will be. Because the final radon rule requirements are uncertain, the impact of this rule on the City is unknown at this time.

Unregulated Contaminant Monitoring Regulation Revisions

In accordance with the original UCMR and the SDWA, once every 5 years the EPA will issue a new list of no more than 30 unregulated contaminants to be monitored by public water systems. The fourth UCMR was proposed on December 11, 2015, and includes a list of 30 chemicals that will be monitored during the 2017 through 2021 monitoring cycle, and approves several new testing methods to conduct the monitoring. For this upcoming cycle, all systems serving more than 10,000 people and a larger representative sample of smaller water systems will be required to monitor for contaminants. The rule also requires additional water system data to be reported with the monitoring results, establishes a procedure for determining minimum reporting levels, and proposes several revisions to the implementation of the monitoring program.

# SOURCE WATER OUALITY

This section presents the current water quality standards for groundwater sources and the results of the City's recent source water quality monitoring efforts. A discussion of the water quality requirements and monitoring results for the City's distribution system is presented in the section that follows.

### DRINKING WATER STANDARDS

Drinking water quality is regulated at the federal level by the EPA and at the State level by DOH. Drinking water standards have been established to maintain high-quality drinking water by limiting the levels of specific contaminants (i.e., regulated contaminants) that can adversely affect public health and are known or likely to occur in public water systems. Non-regulated contaminants do not have established water quality standards and are generally monitored at the discretion of the water purveyor and in the interest of customers.

The regulated contaminants are grouped into two categories of standards – primary and secondary. Primary standards are drinking water standards for contaminants that could affect health. Water purveyors are required by law to monitor and comply with these standards and notify the public if water quality does not meet any one of the standards. Secondary standards are drinking water standards for contaminants that have aesthetic effects, such as unpleasant taste, odor, or color (staining). The national secondary standards are unenforceable federal guidelines or goals where federal law does not require water systems to comply with them. However, states may adopt their own enforceable regulations governing these contaminants. The State of Washington has adopted regulations that require compliance with some of the secondary standards. Water purveyors are not required to notify the public if their water quality does not meet the secondary standards.

### SOURCE MONITORING REQUIREMENTS AND WAIVERS

The City is required to perform water quality monitoring at each of its active sources for inorganic chemical and physical substances, organic chemicals, and radionuclides. The

monitoring requirements that the City must comply with are specified in WAC 246-290-300. A description of the source water quality monitoring requirements and procedures for each group of substances is contained in the City's Water Quality Monitoring Plan, which is included as **Appendix I**.

DOH has developed the Susceptibility Assessment Survey Form for water purveyors to complete for use in determining a drinking water source's potential for contamination. The results of the susceptibility assessment may provide monitoring waivers that allow reduced source water quality monitoring. Based on the results of the susceptibility assessment survey for each source, DOH assigned high susceptibility ratings to Clark Springs and the North Kent Wellfield, a moderate susceptibility rating to Kent Springs and Armstrong Wells #1 and #2, and a low susceptibility rating to East Hill Well #1, Seven Oaks Well, Obrien Well, and Garrison Creek Well #2.

### SOURCE MONITORING RESULTS

The City's sources maintain a high level of water quality and have met or exceeded all drinking water standards within the last 6 years, with the exception of 4 discrete detections of coliform in November 2016, September 2016, October 2014, and June 2012. Repeat coliform samples were not positive; therefore, these samples can be disregarded as outliers. Kent Springs and Clark Springs were last monitored for IOCs and VOCs in July of 2016. These sources have waivers for IOCs, VOCS, pesticides, soil fumigants, and radionuclides which are valid through December of 2019, and a waiver for herbicides valid through December of 2022. Both spring sources are also sampled annually for nitrates.

Similar to the City's spring sources, the East Hill Well #1, Seven Oaks Well, N Kent Wellfield, O'Brien Well, Garrison Well #1, and Armstrong Wells #1 and #2 sources are tested annually for nitrates, have waivers for IOCs, VOCs, pesticides, soil fumigants, and radionuclides valid through December of 2019, and a waiver for herbicides through December 2022. Additionally, the Seven Oaks Well, N Kent Wellfield, O'Brien Well, and Garrison Creek Well #2 are required to sample for manganese once every 3 years, with the next round of samples being due during the summer of 2019.

The results of inorganic chemical (including nitrate) and VOC monitoring for the City's sources indicate that all primary and secondary standards were met.

Due to the close proximity of the Clark Springs site to the Landsburg Mine site, the City has advised Ecology of the City's concerns about a contamination event originating from the site that results in the temporary or permanent loss of the City's Clark Springs source. In recent years, the City has submitted to Ecology comments in opposition to Ecology's cleanup action plan for the site, seeking further investigative/action at the site and seeking a cleanup action plan more protective of area groundwater including the Clark Springs source aquifers. The City has implemented various activities to increase monitoring and sampling at and near Clark Springs.

### GROUNDWATER PROTECTION/RELIABILITY STUDIES

The geology and hydrogeology of southwestern King County, encompassing the City's area, has been summarized in a series of reports, including Luzier (1969) and Woodward, et al. (1995), the *South King County Ground Water Management Plan* (1989), and local area Wellhead Protection Plans (Covington Water District, 1995; Lake Meridian Water District, 1996; and the City of

Kent, 1996). In November 1997, the City authorized Hart Crowser to conduct a Phase 1 wellfield evaluation of its Clark Springs and Kent Springs groundwater systems. This study, which was completed in June 1998, included evaluating the maximum well field yield using the MODFLOW groundwater flow model developed for the Kent Wellhead Protection Study.

In September of 2006, the City retained Robinson, Noble & Saltbush to conduct a reliability study of its in-town water sources, with a project goal of determining the 98-percent reliable firm yield for these sources. The end result of the study should provide the City with the firm yield for each of these wells and well sites, such that the City knows how much water is available to be developed through existing wells and potential future wells at each of its existing well sites.

In January 2008, the City retained Aspect Consulting to undertake a Phase 2 comprehensive wellhead protection study addressing all wells and source aquifers not addressed in the 2008 Phase 1 wellhead protection study. The first task of this study, which was completed in May 2008, involved compiling the delineated wellhead protection areas (WHPA) for each of the City's nine groundwater supply sources. Additional tasks included:

- Preparing an inventory of potential sources of groundwater contamination for the each of the nine groundwater supply sources;
- Ranking each of the contaminant sources identified within each WHPA with respect to its potential risk for contamination of the City's well source;
- Refining the management strategies identified in the existing WHPP, and development of new management strategies as appropriate; and
- Updating the existing Monitoring Plan, Contingency Plan, and Spill Response Plan to address all groundwater supply sources.

Although there are no new potential sources of contamination outlined in the Aspect Consulting study, there are many new confirmed and suspected sites that were not listed in the Hart Crowser study (1996). All of these locations were notified in 2009, and again in 2018, about the wellhead protection area.

As a general operational matter, the City monitors groundwater levels in its well sources to monitor the sources, and as required by Ecology and related water right authorizations.

# DISTRIBUTION SYSTEM WATER QUALITY

## MONITORING REQUIREMENTS AND RESULTS

The City is required to perform water quality monitoring within the distribution system for coliform bacteria, disinfectant (chlorine) residual concentration, DBPs, lead and copper, and asbestos in accordance with Chapter 246-290 WAC. A description of the distribution system water quality monitoring requirements and procedures are contained in the City's Water Quality Monitoring Plan that is included in **Appendix I**.

The City has been in compliance with all monitoring requirements for the past several years, except for some coliform violations that are described in the following section. A summary of the results of the distribution system water quality monitoring within the City's system is also presented.

## Coliform Monitoring

From 2012 to 2018, coliform monitoring met regulations since samples did not test positive in more than 5 percent of the routine samples taken each month. Positive samples were found in September and November of 2016, October of 2014, and June of 2012. All follow-up repeat samples were negative. The positive samples were likely due to error. Based on the City's current population, a minimum of 80 coliform samples per month from different locations throughout the system are required to be collected. A description of coliform monitoring protocol and sample locations is described in the City's Coliform Monitoring Program, which is included in **Appendix I**.

# Disinfectant Residual Concentration Monitoring

Disinfection requirements applicable to the City are contained in WAC 246-290-310, which states that a disinfectant residual concentration of 0.2 mg/L shall be detectable in all active parts of the distribution system and that the maximum residual disinfectant level shall be 4.0 mg/L for chlorine and chloramines. Handheld chlorine residuals are recorded each time a coliform sample is collected; therefore, the City collects a minimum of 80 samples each month in addition to its online chlorine analyzers. The City's chlorination targets are to maintain a 0.5 mg/L residual at the furthest reaches of the distribution system; therefore, water is dosed at the entry point to meet that target. The City typically doses within the range of 0.8 and 1.0 mg/L; however, water coming from Tacoma enters the distribution system with a 1.2 to 1.6 mg/L concentration. In 2018 and January through March 18, 2019, free chlorine readings ranged between 0.30 and 1.93 mg/L and averaged 0.84 mg/L throughout the distribution system. The results of residual disinfectant concentration tests indicate that the City is in compliance with the regulations.

# Disinfectants/Disinfection Byproducts Monitoring

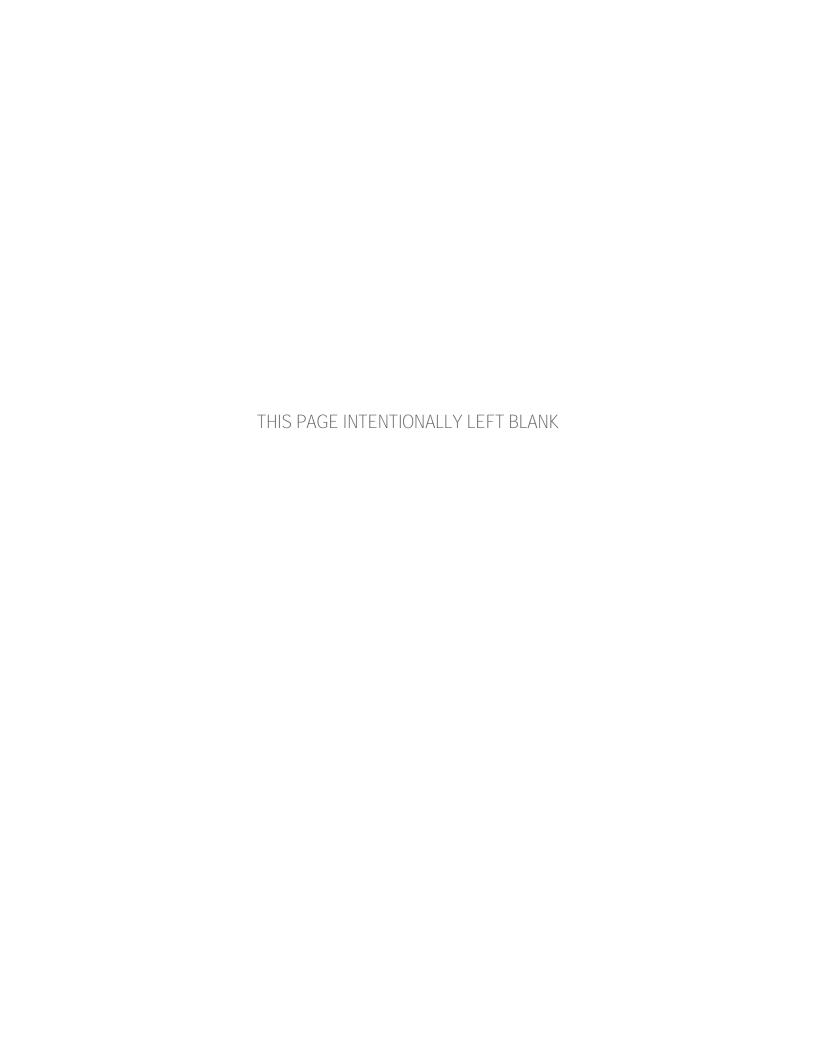
THM and HAA5 are DBPs that are formed when free chlorine reacts with organic substances (i.e., precursors), most of which occur naturally. Formation of THM and HAA5 are dependent on such factors as amount and type of chlorine used, water temperature, concentration of precursors, pH, and chlorine contact time. THM have been found to cause cancer in laboratory animals and are suspected to be human carcinogens. In response to the Stage 1 and Stage 2 D/DBPR, the City expanded its distribution system monitoring to include THM and HAA5. The City is required to collect four THM and four HAA5 samples on a quarterly basis. All recent samples show concentrations below both substances MCLs. Therefore, the City is in compliance with this regulation. A copy of the City's Stage 2 D/DBP Monitoring Plan is provided in **Appendix I**. The City was granted 40/30 Certification based on historical water quality data, and was therefore not required to perform an IDSE.

### Lead and Copper Monitoring

The Lead and Copper Rule identifies the action level for lead as being greater than 0.015 mg/L, and the action level for copper as being greater than 1.3 mg/L. The City is required to collect 30 samples every 3 years. The latest tests occurred in September of 2018, which yielded a range of 0.001 to 0.0012 mg/L for lead and a range of 0.02 to 0.29 mg/L for copper. These results have all been satisfactory, since the 90<sup>th</sup> percentile concentration of either lead or copper from each group of samples has not exceeded the action levels.

### **Asbestos**

Asbestos monitoring is required if the sources are vulnerable to asbestos contamination or if the distribution system contains more than 10 percent of asbestos cement (AC) pipe. The City has a 9-year waiver with DOH for asbestos monitoring that will expire in December 2019. The last time an asbestos sample was taken was in December 1998. This sample yielded a concentration of 0.196 million fibers per liter, whereas the current MCL for asbestos is 7 million fibers per liter and greater than 10 microns in length. Should the City ever recommence asbestos monitoring, it must be accomplished during the first 3-year compliance period of each 9-year compliance cycle. The water sample must be taken at a tap that is served by an asbestos cement pipe under conditions where asbestos contamination is most likely to occur.



# 7 | WATER SYSTEM ANALYSIS

# INTRODUCTION

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

# PRESSURE ZONES

The ideal static pressure of water supplied to customers is between 40 and 80 pounds per square inch (psi). Pressures within a water distribution system are commonly as high as 120 psi, requiring pressure reducing valves (PRVs) on individual service lines to reduce the pressure to 80 psi or less. It is difficult for the City's water system (and most others) to maintain distribution pressures between 40 and 80 psi, primarily due to the topography of the water service area.

**Table 7-1** lists each of the City's 11 pressure zones (the north and south sections of the 240 Zone and 360 Zone are evaluated separately), 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 with no demand). While this table presents the results of the pressure evaluations based on the adequacy of the pressure zones under static conditions, the hydraulic analysis section later in this chapter presents the results of the pressure evaluations based on the adequacy of the water mains under dynamic conditions.

Table 7-1
Minimum and Maximum Distribution System Static Pressures

<u>-</u>	Highest Ele	evation Served	Lowest Ele	evation Served
Pressure Zone	Elevation (feet)	Static Pressure (psi)	Elevation (feet)	Static Pressure (psi)
		Existing System		
240 Zone	135	46	20	95
271 Alvord Zone	183	38	79	83
308 Hilltop Zone <sup>1</sup>	133	86	119	92
339 Seattle Zone	268	31	74	115
354.5 Zone	272	36	94	113
366 Stetson Zone	234	57	174	83
368 Weiland Zone	219	65	106	114
416 Zone <sup>2</sup>	312	45	83	144
485 Zone	397	38	154	143
529 Zone	434	41	277	109
575 Zone	445	56	408	73
587 Zone	454	58	327	112
590 Zone	504	37	286	132
	Projected 20-y	ear System with Impr	ovements	
240 Zone	135	46	20	95
271 Alvord Zone	183	38	79	83
308 Hilltop Zone <sup>1</sup>	133	86	119	92
339 Seattle Zone	268	31	74	115
354.5 Zone	272	36	94	113
366 Stetson Zone	234	57	174	83
368 Weiland Zone	219	65	106	114
416 Zone <sup>2</sup>	312	45	83	144
485 Zone	397	38	154	143
529 Zone	434	41	277	109
575 Zone		Converted to		
587 Zone	454	58	327	112
590 Zone	471	51	286	132
640 Zone	504	59	383	111

<sup>(1)</sup> Hydraulic grade line of the 308 Hilltop Zone measured as 332 feet in November 2017.

The City is currently providing water at pressures of at least 40 psi to services in each zone except for the 271 Alvord, 339 Seattle, 354.5, 485, and 590 Zones, as shown in **Table 7-1**. The low pressures in the 339 Seattle Zone occur in the Carter Place cul-de-sac, just east of Van De Vanter Avenue. The low pressures in the 354.5 Zone occur near the intersection of Reith Road and S 253<sup>rd</sup> Street, and near the intersection of S 254<sup>th</sup> Street and 45<sup>th</sup> Avenue S. The low pressures in the 590 Zone occur within and adjacent to SE 248<sup>th</sup> Street, including portions of

<sup>(2)</sup> No direct service connections exist in the 416 Zone, but the zone was included to identify pressures within the 416 Zone infrastructure.

121<sup>st</sup> Place SE and 120<sup>th</sup> Avenue SE near their intersections with SE 248<sup>th</sup> Street. The low pressure areas in the 590 Zone will be converted to the 640 Zone in the future, as described in **Chapter 9**.

Pressures over 120 psi occur in the 416, 485, and 590 Zones. The 416 Zone does not have any direct service connections, but the high pressures in the zone occur near the intersection of 93<sup>rd</sup> Avenue S and S 218<sup>th</sup> Street in the 16-inch-diameter transmission main between the 6 Million Gallon (MG) #1 Reservoir and the 6 MG #2 Reservoir. The high pressures in the 590 Zone occur within 100<sup>th</sup> Avenue SE, between SE 227<sup>th</sup> Street and SE 225<sup>th</sup> Place.

The proposed 20-year planning period static pressures are shown in the bottom section of **Table 7-1**. These static pressures assume that the pressure zone improvement projects described in **Chapter 9** are completed, and that services located on or near the boundary of two pressure zones are connected to the pressure zone that provides more suitable pressures.

# SOURCE CAPACITY EVALUATION

This section evaluates the combined capability of the City's existing sources to determine if they have sufficient capacity to meet the overall demands of the water service area based on existing and future water demands. The section that follows will address the evaluation of the individual facilities to determine if they have sufficient capacity to meet the existing and future demands of the individual zone, or zones, that they supply.

### ANALYSIS CRITERIA

Supply facilities must be capable of adequately and reliably supplying high-quality water to the system. In addition, supply facilities must provide a sufficient quantity of water at pressures that meet the requirements of Washington Administrative Code (WAC) 246-290-230. The evaluation of the combined capacity of the sources in this section is based on the criteria that they provide supply to the system at a rate that is equal to or greater than the maximum day demand (MDD) of the system.

### SOURCE CAPACITY ANALYSIS RESULTS

The combined capability of the City's active sources to meet both existing and future demand requirements, based on existing pumping capacities of the individual supply facilities, is presented in **Table 7-2**. The demands used in the evaluation for 2028 and 2038 are future demand projections without reductions from water use efficiency efforts, as shown in **Table 4-12** of **Chapter 4**. Therefore, if additional reductions in water use are achieved through water use efficiency efforts, the total source capacity required in the future will be less than that shown in **Table 7-2**.

Table 7-2
Water Source Capacity Evaluation

	Base Year	Existing	Proje	ected
			2028	2038
Description	2016	2018	(+10 years)	(+20 years)
Re	quired Supply (	gpm)		
Maximum Day Demand	11,629	11,867	12,375	13,208
Availab	le Source Capac	city (apm)		
208th Street/212th Street Wellfield	3,500	3,500	3,500	3,500
Armstrong Springs Wells	1,050	1,050	1,050	1,050
Clark Springs	5,400	5,400	5,400	5,400
East Hill Well	1,900	1,900	1,900	1,900
Garrison Creek Well	500	500	500	500
Kent Springs	3,680	3,680	3,680	3,680
O'Brien Well <sup>1</sup>	0	0	0	0
Seven Oaks Well	350	350	350	350
Regional Water Supply System	8,778	8,778	8,778	8,778
Total Source Capacity	25,158	25,158	25,158	25,158
Surplus or De	eficient Source	Capacity (g <sub>l</sub>	om)	
Surplus or Deficiency	13,529	13,291	12,783	11,950

<sup>(1)</sup> Currently not utilized for water quality purposes, but is equipped with pumping equipment capable of providing up to 243 gpm to the system.

The results of the analysis indicate that the City has approximately 13,530 gallons per minute (gpm) of surplus source capacity to meet existing (year 2018) demands. **Chart 7-1** shows the relationship between future projected supply and demands.

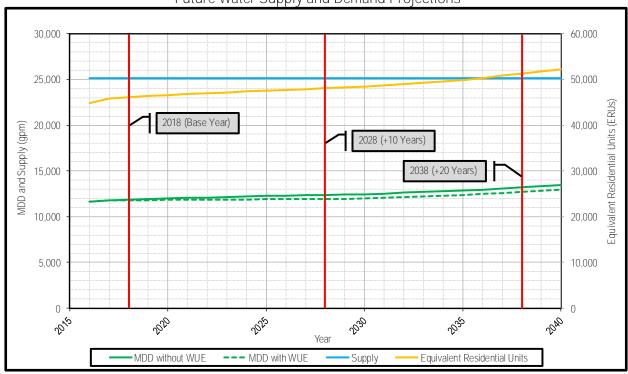


Chart 7-1
Future Water Supply and Demand Projections

# WATER SUPPLY FACILITIES EVALUATION

This section evaluates the existing supply facilities to determine if they have sufficient capacity to provide water supply at a rate that meets the existing and future demands of each of the zones that they supply. Figures 2-1 and 2-2 in Chapter 2 display the pressure zones described within this section. This section also identifies deficiencies that are not related to the capacity of the supply facilities.

# **ANALYSIS CRITERIA**

The evaluation to determine if supply facilities have adequate capacity is based on one of two criteria, as follows: 1) if the pressure zone that the facility provides supply into has water storage, then the amount of supply required is equal to the MDD of the zone; or 2) if the pressure zone that the facility provides supply into does not have water storage, then the amount of supply required is equal to the peak hour demand (PHD) of the zone. The higher supply requirement of the latter criteria is compensating for the lack of equalizing storage that is typically utilized to provide short-term supply during times of peak system demands.

The available supply to each pressure zone is based on the maximum pumping capacity of each facility with all pumping units operating, per the requirements of WAC 246-290-230. The

Washington State Department of Health (DOH) *Water System Design Manual* recommends that additional capacity or redundancy be considered, and that new pumping facilities be designed to provide the average day demand (ADD) of the zone with the largest pumping unit out of service. Calculations were performed for each pressure zone based on each criterion, with a description of the results provided for each pressure zone in the following sections.

### SUPPLY ANALYSIS RESULTS

Valley Operating Area

240 Zone

All the City's sources are capable of directly or indirectly supplying the 240 Zone, with indirect supply from Clark Springs and the East Hill Well capable of being transferred to the 240 Zone via interties with the Kent Springs Transmission Main that supplies the 240 Zone's Guiberson Reservoir. Additionally, multiple sources, including the Armstrong Springs Wells, Seven Oaks Well, and the City's Regional Water Supply System (RWSS) Point of Delivery (POD) #3 supply either the 240 Zone via the Kent Springs Transmission Main or the East Hill operating area. For the purposes of the supply analysis, supply from the Armstrong Springs Wells and the Seven Oaks Well were assumed to be entirely available to the 240 Zone as they are not needed to meet the East Hill operating area supply requirements during normal operations. The majority of the City's total RWSS supply has historically been to the 590 Zone, with approximately 67 percent supplied to the 590 Zone in 2016 compared to approximately 33 percent supplied to the 240 Zone in 2016. The 2016 RWSS supply percentages have been assumed to be applicable for the 2018, 2028, and 2038 planning periods.

**Table 7-3** summarizes the current and future supply requirements of the 240 Zone based on existing and projected water demands for the operating area. **Table 7-3** also summarizes the amount of water supply available to the 240 Zone, assuming supply from Clark Springs and the East Hill Well is exclusively conveyed to other zones and is not available to the 240 Zone. The results of the analyses indicate that the existing and proposed configurations and capacities of the 240 Zone facilities are sufficient to meet both existing and future demands. In the event that the 240 Zone's largest source (Kent Springs) is out of service, the remaining facilities have sufficient capacity to meet projected MDD of the 240 Zone beyond the 10-year planning period. If the O'Brien Well is considered available to the system, the City's supply facilities have sufficient capacity to meet projected MDD of the 240 Zone through the 20-year planning period in the event that Kent Springs is out of service.

Table 7-3 240 Zone Supply Evaluation

	Base Year	Existing	Proje	ected
			2028	2038
Description	2016	2018	(+10 years)	(+20 years
Po.	guired Supply (	anm)		
	quired Supply (	· ,	7.000	7.005
240 Zone MDD	6,676	6,813	7,069	7,685
Other Zones MDD <sup>1</sup>	777	792	831	847
Total Required Supply	7,452	7,605	7,900	8,532
Availab	le Supply Capac	city (gpm)		
208th Street/212th Street Wellfield	3,500	3,500	3,500	3,500
Armstrong Springs Wells <sup>2</sup>	1,050	1,050	1,050	1,050
Garrison Creek Well	500	500	500	500
Kent Springs	3,680	3,680	3,680	3,680
O'Brien Well <sup>3</sup>	0	0	0	0
Seven Oaks Well <sup>2</sup>	350	350	350	350
Regional Water Supply System <sup>4</sup>	2,926	2,926	2,926	2,926
Total Supply Capacity	12,006	12,006	12,006	12,006

### Surplus or Deficient Supply Capacity (gpm)

Surplus or Deficiency 4,554 4,401 4,106 3,474
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<sup>(1)</sup> The MDD of the West Hill zones is included in the 240 Zone supply evaluation. Demands in excess of these zone's MDD (i.e., PHD or fire flow) are supplied by the 240 Zone Reservoirs.

- (2) Supply from these facilities also can be conveyed to the Clark Springs Transmission Main.
- (3) Currently not utilized for water quality purposes but is equipped with pumping equipment capable of providing up to 243 gpm to the system.
- (4) The City's portion of the available RWSS capacity is 12.64 MGD (8,778 gpm), with water being supplied to the 240 Zone (via the Kent Springs Transmission Main) or the 590 Zone. RWSS supply is provided at two delivery points; POD #1, which conveys supply directly to the 240 Zone; and POD #3, which can supply either the 240 Zone or the 590 Zone. The majority of the City's total RWSS supply historically has been to the 590 Zone. In 2016, approximately 67 percent of the City's RWSS supply was conveyed to the 590 Zone, with approximately 33 percent of the RWSS supply conveyed to the 240 Zone. For the purposes of these analyses, 67 percent of the City's RWSS capacity was assumed to be available in the 590 Zone, with the remaining 33 percent available in the 240 Zone.

# West Hill Operating Area

All water supply to the West Hill operating area currently is provided by Pump Station #3. It is expected that a future booster pump station (BPS) adjacent to S 228<sup>th</sup> Street just east of the Green River will be constructed by 2028 and will provide additional redundancy and an additional 1,000 gpm of firm capacity to the West Hill operating area. This alone is more than sufficient

capacity to meet the projected 20-year MDD of the West Hill operating area. The future BPS is anticipated to pump 240 Zone water to the 587 Zone, and is expected to be the West Hill operating area's primary supply in the future. The proposed West Hill operating area supply improvements are described in additional detail in **Chapter 9**.

354.5 Zone

All water supply to the West Hill operating area is currently provided by Pump Station #3, which pumps 240 Zone water directly to the 354.5 Zone. Pump Station #3 is currently required to supply the MDD of the 354.5 Zone, as well as the MDD of the 529, 575, and 587 Zones, which are supplied via subsequent pump stations downstream of the 354.5 Zone. It is anticipated that additional supply will be available to the 354.5 Zone in future planning periods following completion of a future West Hill BPS via pressure reducing valves from other West Hill operating area zones. Table 7-4 summarizes the current and future supply requirements of the 354.5 Zone based on existing and projected water demands for the operating area. **Table 7-4** also summarizes the amount of water supply available to the 354.5 Zone. The results of the analyses indicate that the existing and proposed configurations and capacities of the 354.5 Zone facilities are sufficient to meet both existing and future demands. In the event that one of the Pump Station #3 pumps is out of service, the remaining pump has sufficient capacity to meet the 2016 and 2018 MDD of the operating area. Following completion of the proposed West Hill BPS, the available supply capacity to the 354.5 Zone will be sufficient to meet the projected 20-year MDD of the operating area in the event that either Pump Station #3 or the proposed West Hill BPS are out of service.

Table 7-4 354.5 Supply Evaluation

	Base Year	Existing	Proje	ected
			2028	2038
Description	2016	2018	(+10 years)	(+20 years)
	Required Supply (	gpm)		
354.5 Zone MDD	98	100	117	120
Other Zones MDD <sup>1,2</sup>	678	692	0	0
Total Required Supply	777	792	117	120
Ava	ailable Supply Capac	city (gpm)		
Pump Station #3 - Pump 1	900	900	900	900
Pump Station #3 - Pump 2	900	900	900	900
529 to 354.5 Zone PRVs <sup>3</sup>	0	0	286	273
Total Supply Capacity	1,800	1,800	2,086	2,073

Surplus or Deficient Supply Capacity (gpm)

Surplus or Deficiency 1,023 1,008 1,969 1,953

- (2) The proposed West Hill BPS will supply the other West Hill pressure zones in 2028 and 2038; therefore, these zones will not require supply to be conveyed via the 354.5 Zone and Pump Station #3.
- (3) The 2028 and 2038 supply capacity available via PRVs is the difference between the proposed 1,000 gpm West Hill BPS firm capacity and the MDD of the 529 and 587 Zones.

### 529 Zone

The 529 Zone currently is supplied exclusively by Pump Station #4, which pumps 354.5 Zone water to the 529 Zone. Pump Station #4 currently is required to supply the MDD of the 529 Zone, as well as the MDD of the 575 and 587 Zones, which are supplied via subsequent pump stations that pump out of the 529 Zone. It is anticipated that additional supply will be available to the 529 Zone in future planning periods following completion of a future West Hill BPS via PRVs from the 587 Zone. **Table 7-5** summarizes the current and future supply requirements of the 529 Zone based on existing and projected water demands for the operating area. **Table 7-5** also summarizes the amount of water supply available to the 529 Zone. The results of the analyses indicate that the existing and proposed configurations and capacities of the 529 Zone facilities are sufficient to meet both existing and future demands. However, sufficient fire flow is not available throughout the existing 529 Zone, as presented in the **Storage Analysis Results** section of this chapter. The proposed West Hill operating area supply improvements described in additional detail in **Chapter 9** will resolve the existing zone-wide fire flow supply deficiency in the 529 Zone.

<sup>(1)</sup> The MDD of the 529, 575, and 587 Zones is included in the 2016 and 2018 supply evaluation for the 354.5 Zone. Demands in excess of these zone's MDD (i.e., PHD or fire flow) are supplied by the Reith Road Standpipe.

Table 7-5
529 Supply Evaluation

	Base Year	Existing	Proje	ected
			2028	2038
Description	2016	2018	(+10 years)	(+20 years)
	Required Supply (	gpm)		
529 Zone MDD	320	327	336	342
Other Zones MDD <sup>1,2</sup>	358	365	117	120
Total Required Supply	678	692	454	462
Ava	ailable Supply Capac	ity (gpm)		
Pump Station #4 - Pump 1	900	900	900	900
Pump Station #4 - Pump 2	900	900	900	900
Pump Station #4 - Pump 3	2,000	2,000	2,000	2,000
587 to 529 Zone PRVs <sup>3</sup>	0	0	622	615
Total Supply Capacity	3,800	3,800	4,422	4,415
Surplus	or Deficient Supply (	Capacity (gp	om)	
Surplus or Deficiency	3,122	3,108	3,969	3,953

- (1) The MDD of the 575 and 587 Zones is included in the 529 Zone supply evaluation for 2016 and 2018. Demands in excess of the 575 and 587 Zone's MDD (i.e., PHD or fire flow) are supplied by the Cambridge Tank.
- (2) The MDD of the 354.5 Zone is included in the 529 Zone supply evaluation for 2028 and 2038. Following construction of the proposed West Hill BPS, the primary supply to the 354.5 Zone will be from PRVs between the 529 and 354.5 Zones.
- (3) The 2028 and 2038 supply capacity available via PRVs is the difference between the proposed 1,000 gpm West Hill BPS firm capacity and the MDD of the 587 Zone.

In the event that any of the Pump Station #4 pumps are out of service, the remaining pumps have sufficient capacity to meet the 2016 and 2018 MDD of the operating area. Following completion of the proposed West Hill BPS, the available supply capacity to the 529 Zone will be sufficient to meet the projected 20-year MDD of the operating area in the event that either Pump Station #4 or the proposed West Hill BPS are out of service.

#### 575 Zone

The 575 Zone is a closed pressure zone currently provided normal supply by Pump Station #7, which pumps 529 Zone water to the 575 Zone. During fire or emergency events wherein Pump Station #7 pumps more than 450 gpm for 3 minutes, Pump Station #7 shuts down and the 575 Zone converts to the 529 Zone, with supply conveyed to the 575 Zone customers from the 529 Zone via a check valve in Pump Station #7. **Table 7-6** summarizes the current and future supply requirements of the 575 Zone based on existing and projected water demands for the operating area. **Table 7-6** also summarizes the amount of water supply available to the 575 Zone. The results of the analyses indicate that the existing and proposed configurations and capacities

of the 575 Zone facilities are sufficient to meet both existing and future PHDs. However, sufficient fire flow is not available throughout the existing 575 Zone, as presented in the **Storage Analysis Results** section of this chapter. It is anticipated that the 575 Zone will be converted to the 587 Zone in future planning periods and will be supplied directly by a future West Hill Reservoir. The supply evaluation presented in **Table 7-6** is based on the 575 Zone remaining a closed zone (and not being converted to the 587 Zone), for conservatism, and in the event that the conversion to the 587 Zone is delayed. The proposed West Hill operating area supply improvements described in additional detail in **Chapter 9** will resolve the existing fire flow supply deficiency in the 575 Zone.

Table 7-6 575 Supply Evaluation

	Base Year	Existing	Proje	ected
			2028	2038
Description	2016	2018	(+10 years)	(+20 years)
R	equired Supply (	gpm)		
575 Zone PHD	88	89	94	97
575 Zone Maximum Fire Flow <sup>1</sup>				
Total Required Supply	88	89	94	97
Availa	ble Supply Capac	city (gpm)		
Pump Station #7 - Pump 1 <sup>2</sup>	0	0	0	0
Pump Station #7 - Pump 2	250	250	250	250
Pump Station #7 - Pump 3	250	250	250	250
Largest Pump Out of Service <sup>3</sup>	(250)	(250)	(250)	(250)
Total Supply Capacity	250	250	250	250

	Surplus or Deficient Supp	ly Capacity (	gpm)	
Surplus or Deficiency	162	161	156	153

<sup>(1)</sup> Fire flow is currently provided by the 529 Zone; therefore, it is not included in the 575 Zone supply evaluation. Fire flow in future planning periods will be provided by a future West Hill BPS and reservoir in the 587 Zone; therefore, it is not included in the 575 Zone supply

#### 587 Zone

The 587 Zone currently is a closed pressure zone provided normal supply by Pump Station #6, which pumps 529 Zone water to the 587 Zone. During fire or emergency events wherein Pump Station #6 pumps more than 1,220 gpm for 2 minutes, Pump Station #6 shuts down and the 587 Zone converts to the 529 Zone, with supply conveyed to 587 Zone customers via two check valves from the 529 Zone. It is anticipated that additional supply will be available to the 587 Zone in the 10- and 20-year planning periods following completion of a future West Hill

<sup>(2)</sup> Pump 1 was removed from service in 2009.

<sup>(3)</sup> DOH *Water System Design Manual* 10.1.2 recommends that at least 30 psi be provided during PHDs in a closed zone with the largest capacity booster pump out of service.

BPS. A future 587 Zone reservoir is also anticipated to be constructed, providing additional redundancy to the 587 Zone and the West Hill operating area. Following completion of a future 587 Zone reservoir, the 587 Zone will not be considered a closed zone, and the 587 Zone supply facilities will be required to supply the MDD of the 587 Zone with all pumps operational, instead of the current requirement of supplying the PHD of the zone with the largest capacity booster pump out of service. It is anticipated that the primary West Hill operating area supply in future planning periods will be the future West Hill BPS; therefore, the MDD of the other West Hill pressure zones is included in the supply requirements for the future planning periods.

**Table 7-7** summarizes the current and future supply requirements of the 587 Zone based on existing and projected water demands for the operating area. **Table 7-7** also summarizes the amount of water supply available to the 587 Zone. The results of the analyses indicate that the existing and proposed configurations and capacities of the 587 Zone facilities are sufficient to meet both existing and future domestic demands. However, sufficient fire flow is not available throughout the existing 587 Zone, as presented in the **Storage Analysis Results** section of this chapter. The proposed West Hill operating area supply improvements described in additional detail in **Chapter 9** will resolve the existing fire flow supply deficiency in the 587 Zone.

	Table 7-7	
587	Supply Evaluation	n

	Base Year	Existing	Proje	ected
			2028	2038
Description	2016	2018	(+10 years)	(+20 years)
Re	quired Supply (၄	gpm)		
587 Zone MDD			378	385
587 Zone PHD	435	444		
587 Zone Maximum Fire Flow <sup>1</sup>				
Other Zones MDD			454	462
Total Required Supply	435	444	831	847
Availab	le Supply Capac	ity (gpm)		
Pump Station #6 - Pump 1	200	200	200	200
Pump Station #6 - Pump 2	450	450	450	450
Pump Station #6 - Pump 3	550	550	550	550
Pump Station #8 (HWD Intertie) <sup>2</sup>				
Largest Pump Out of Service <sup>3</sup>	(550)	(550)	0	0
Future West Hill BPS Firm Capacity			1,000	1,000
<b>Total Supply Capacity</b>	650	650	2,200	2,200

### Surplus or Deficient Supply Capacity (gpm)

Surplus or Deficiency 215 206 1,369 1,353	1,369 1,353
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- (1) Fire flow is currently provided by the 529 Zone; therefore, it is not included in the 587 Zone supply evaluation. Fire flow in future planning periods will be provided by a future West Hill reservoir in the 587 Zone, and is not included in the 587 Zone supply evaluation.
- (2) Pump Station #8 is used in emergency situations to pump water from Highline Water District to the 587 Zone and other West Hill Zones. Pump Station #8 consists of three identical 400 gpm pumps equipped with VFDs, but is not included in the 587 Zone supply evaluation because the facility is used only when Pump Station #6 is out of service.
- (3) DOH *Water System Design Manual* 10.1.2 recommends that at least 30 psi be provided during PHDs in a closed zone with the largest capacity booster pump out of service. The largest pump was not assumed to be out of service in future planning periods wherein a future 587 Zone West Hill reservoir is constructed and the 587 Zone is no longer a closed pressure zone.

# East Hill Operating Area

Water supply to the East Hill operating area currently is provided by multiple sources directly to the 416 and 590 Zones, with the supply to the other East Hill pressure zones conveyed by Pump Station #5 and multiple PRVs. The easterly portion of the existing 590 Zone is expected to be converted to a 640 Zone prior to 2028; therefore, a 640 Zone supply analysis is included within this section. The proposed 640 Zone creation improvements are described in additional detail in **Chapter 9**.

The Armstrong Springs Wells, Seven Oaks Well, and RWSS POD #3 can supply either the 240 Zone via the Kent Springs Transmission Main or the East Hill operating area. For the purposes of the supply analysis, supply from the Armstrong Springs Wells and the Seven Oaks Well were assumed to be entirely available to the 240 Zone because RWSS POD #3 and other supply facilities are capable of supplying the East Hill operating area and have sufficient capacity to meet the existing and projected supply requirements of the East Hill operating area without supply from the Armstrong Springs Wells and the Seven Oaks Well. The majority of the City's total RWSS supply historically has been to the 590 Zone, with approximately 67 percent supplied to the 590 Zone in 2016 compared to approximately 33 percent supplied to the 240 Zone in 2016. The 2016 RWSS supply percentages have been assumed to be applicable for the 2018, 2028, and 2038 planning periods.

### 416 Zone

The 416 Zone does not have any direct service connections but includes the 6 MG #1 Reservoir which serves as the termination point of the Clark Springs Transmission Main. Water stored in the 6 MG #1 Reservoir may be pumped to the 485 Zone or 590 Zone by Pump Station #5. Water pumped to the 485 Zone is stored in the 125K Tank, is consumed by customers within the 485 Zone, and is conveyed to five zones each supplied by a single PRV station (271 Alvord, 308 Hilltop, 339 Seattle, 366 Stetson, and 368 Weiland Zones). The 416 Zone supply analysis considers the combined MDD of these pressure zones.

Supply from the Armstrong Springs Wells, Clark Springs, the Seven Oaks Well, and the 590 Zone (via a normally closed valve at the 114<sup>th</sup> Street valve station) can be conveyed to the 416 Zone in the Clark Springs Transmission Main. Supply from the 590 Zone can also be conveyed to the 416 Zone through a bypass valve in the Pump Station #5 pump manifold. For the purposes of these analyses, supply from the Armstrong Springs Wells, the Seven Oaks Well, and the 590 Zone were assumed to be entirely available to the 240 Zone because the supply capacity of Clark Springs is sufficient to meet the combined MDD of the pressure zones supplied by the 416 Zone. In the event that the Clark Springs source is out of service or is otherwise unable to supply the 416 Zone, supply from the Armstrong Springs Wells and the Seven Oaks Well is capable of supplying the 416 Zone.

**Table 7-8** summarizes the current and future supply requirements of the 416 Zone based on existing and projected water demands for the zone. **Table 7-8** also summarizes the current and future amount of water supply available to the 416 Zone. The results of the analyses indicate that the existing and proposed configurations are of sufficient capacity to meet both existing and future demands.

Table 7-8 416 Zone Supply Evaluation

	Base Year	Existing	Proje	ected
Description	2016	2018	2028 (+10 years)	2038 (+20 years)
Required	l Supply (gpm	1)		
416 Zone MDD <sup>1</sup>	0	0	0	0
Other Zones MDD <sup>2</sup>	467	476	554	630
Total Required Supply	467	476	554	630
Available Sup	pply Capacity	(gpm)		
Armstrong Springs Wells <sup>3</sup>	0	0	0	0
Clark Springs	5,400	5,400	5,400	5,400
Seven Oaks Well <sup>3</sup>	0	0	0	0
590 Zone Intertie at 114th Street Valve Station	0	0	0	0
Total Supply Capacity	5,400	5,400	5,400	5,400
Surplus or Deficier	nt Supply Cap	acity (gpm)		
Surplus or Deficiency	4,933	4,924	4,846	4,770

- (2) The MDD of the 271 Alvord, 308 Hilltop, 339 Seattle, 366 Stetson, 368 Weiland, and 485 Zones are included in the 416 Zone supply evaluation. Demands in excess of these zone's MDD (i.e., PHD or fire flow) are supplied by the 125K Tank in the 485 Zone.
- (3) Supply from the Armstrong Springs Wells and the Seven Oaks Well were assumed to be entirely available to the 240 Zone.

#### 485 Zone

The 485 Zone is primarily supplied by Pump Station #5, with supplemental supply provided from the 590 Zone via multiple PRV stations. During normal operations, the Pump Station #5 small pumps (Pumps 1 and 2) supply the 485 Zone. Pump 2 is a dual speed pump that is also capable of supplying the 590 Zone. Pump Station #5 is required to supply the MDD of the 485 Zone, as well as the MDD of the 271 Alvord, 308 Hilltop, 339 Seattle, 366 Stetson, and 368 Weiland Zones, which are supplied via subsequent PRV stations. Table 7-9 summarizes the current and future supply requirements of the 485 Zone based on existing and projected water demands for the zone. **Table 7-9** also summarizes the amount of water supply available to the 485 Zone. The results of the analyses indicate that the existing and proposed configurations and capacities of the 485 Zone facilities are sufficient to meet both existing and future MDDs, with and without the largest pumping unit in service.

<sup>(1)</sup> No direct service connections exist within the 416 Zone. Water stored in, and supplied to, the 416 Zone is conveyed to other pressure zones via Pump Station #5 and the transmission main to the Garrison Creek (6 MG #2) Reservoir.

Table 7-9
485 Zone (Open System) Supply Evaluation

	Base Year	Existing	Proje	ected
Description	2016	2018	2028 (+10 years)	2038 (+20 years)
	Required Supply (	gpm)		
485 Zone MDD	404	412	463	513
Other Zones MDD <sup>1</sup>	63	64	91	117
Total Required Supply	467	476	554	630
Avail	able Supply Capac	city (gpm)		
Pump Station #5 - Pump 1	1,225	1,225	1,225	1,225
Pump Station #5 - Pump 2	1,225	1,225	1,225	1,225
Pump Station #5 - Pump 3 <sup>2</sup>	0	0	0	0
Pump Station #5 - Pump 4 <sup>2</sup>	0	0	0	0
590 to 485 Zone PRVs <sup>3</sup>	6,750	6,750	6,750	6,750
Total Supply Capacity	9,200	9,200	9,200	9,200

Surplus or Deficient Supply Capacity (gpm)

	Gaipiac oi i	Jonoloni Gappiy	oapaoity (gr	J,	
Surplus or Deficiency		8,733	8,724	8,646	8,570

<sup>(1)</sup> The MDD of the 271 Alvord, 308 Hilltop, 339 Seattle, 366 Stetson, and 368 Weiland Zones are included in the 485 Zone supply evaluation. Demands in excess of these zone's MDD (i.e., PHD or fire flow) are supplied by the 125K Tank.

- (2) Pump Station #5 large pumps supply the 590 Zone and are unavailable to provide direct supply to the 485 Zone.
- (3) Surplus supply available in the 590 Zone presented as available to the 485 Zone, up to the maximum physical capacity of the PRVs, which is calculated to be 5,400 gpm based on the maximum suggested intermittent flow through three 6-inch-diameter Cla-Val 90-01 PRVs.

As presented in the **Storage Analysis Results** section of this chapter, the only direct storage facility in the 485 Zone is the 125K Tank, which does not have sufficient capacity to meet the storage needs of the 485 Zone and subsequent zones via PRVs. A closed system supply evaluation for the 485 Zone is shown in **Table 7-10**, which indicates that sufficient supply from the 590 Zone can be conveyed to the 485 Zone via PRVs in the event that the 125K Tank and the Pump Station #5 small pumps (Pumps 1 and 2) are offline to meet the existing and future demands of the 485 Zone.

Table 7-10
485 Zone (Closed System) Supply Evaluation

	Base Year	Existing	Proje	ected
			2028	2038
Description	2016	2018	(+10 years)	(+20 years)
Re	quired Supply (	gpm)		
485 Zone PHD	590	602	677	749
Other Zones PHD <sup>1</sup>	92	94	133	171
Maximum Fire Flow Requirement <sup>2</sup>	3,282	3,282	3,282	3,282
Total Required Supply	3,964	3,978	4,091	4,203
Availab	le Supply Capac	city (gpm)		
Pump Station #5 - Pump 1	0	0	0	0
Pump Station #5 - Pump 2	0	0	0	0
Pump Station #5 - Pump 3 3	0	0	0	0
Pump Station #5 - Pump 4 3	0	0	0	0
590 to 485 Zone PRVs <sup>4</sup>	6,750	6,750	6,750	6,750
Total Supply Capacity	6,750	6,750	6,750	6,750

**Surplus or Deficient Supply Capacity (gpm)** 

Surplus or Deficiency	2,786	2,772	2,659	2,547

- (1) The PHD of the 271 Alvord, 308 Hilltop, 339 Seattle, 366 Stetson, and 368 Weiland Zones are included in the 485 Zone supply evaluation.
- (2) Kent Hillside Church.
- (3) Pump Station #5 large pumps supply the 590 Zone and are unavailable to provide direct supply to the 485 Zone.
- (4) Surplus supply available in the 590 Zone presented as available to the 485 Zone, up to the maximum physical capacity of the PRVs, which is calculated to be 5,400 gpm based on the maximum suggested intermittent flow through three 6-inch-diameter Cla-Val 90-01 PRVs.

#### 590 Zone

The 590 Zone is supplied by RWSS POD #3, the East Hill Well, and Pump Station #5. During normal operations, the Pump Station #5 small pumps (Pumps 1 and 2) supply the 485 Zone. Pump 2 is a dual speed pump that is also capable of supplying the 590 Zone. For the purposes of the supply analyses presented in this section, the Pump 2 was assumed to be unavailable to the 590 Zone. The Pump Station #5 large pumps (Pumps 3 and 4) supply the 590 Zone during normal operations.

The majority of the City's total RWSS supply has historically been to the 590 Zone, with approximately 67 percent supplied to the 590 Zone in 2016 compared to approximately 33 percent supplied to the 240 Zone in 2016. The 2016 RWSS supply percentages have been assumed to be applicable for the 2018, 2028, and 2038 planning periods. The easterly portion of the existing 590 Zone is expected to be converted to a 640 Zone prior to 2028 that will be

supplied by a future 590 to 640 Zone BPS. The 590 Zone supply requirements include the 640 Zone MDD in the future 2028 and 2038 planning periods.

**Table 7-11** summarizes the current and future supply requirements of the 590 Zone based on existing and projected water demands for the zone. **Table 7-11** also summarizes the amount of water supply available to the 590 Zone. The results of the analyses indicate that the existing and proposed configurations and capacities of the 590 Zone facilities are sufficient to meet both existing and future MDDs, with and without the largest 590 Zone supply facility in service.

Table 7-11 590 Zone Supply Evaluation

	11 3			
	Base Year	Existing	Proje	ected
			2028	2038
Description	2016	2018	(+10 years)	(+20 years)
	Required Supply (	gpm)		
590 Zone MDD	3,710	3,786	2,822	2,912
Other Zones MDD <sup>1</sup>	0	0	1,098	1,132
Total Required Supply	3,710	3,786	3,920	4,045
Avai	lable Supply Capac	city (gpm)		
Pump Station #5 - Pump 1	0	0	0	0
Pump Station #5 - Pump 2 2	0	0	0	0
Pump Station #5 - Pump 3	1,950	1,950	1,950	1,950
Pump Station #5 - Pump 4	1,950	1,950	1,950	1,950
East Hill Well	1,900	1,900	1,900	1,900
King County WD 111 Intertie <sup>3</sup>				
Soos Creek WSD Intertie <sup>4</sup>				
RWSS POD #3 <sup>5</sup>	5,852	5,852	5,852	5,852
Total Supply Capacity	11,652	11,652	11,652	11,652

### **Surplus or Deficient Supply Capacity (gpm)**

Surplus or Deficiency	7,942	7,866	7,732	7,607

- (1) The MDD of the 640 Zone is included in the 590 Zone supply evaluation for 2028 and 2038.
- (2) Pump Station #5 Pump 2 was assumed to be unavailable to the 590 Zone.
- (3) The combined capacity of the three 6-inch meters that comprise the intertie with Water District 111 is 2.0 MGD. The intertie is a two-way intertie and is only used during emergency conditions; therefore it is not included in this supply capacity evaluation.
- (4) The intertie has a capacity of 1.0 MGD, providing water from SCWSD's 627 Pressure Zone to the City's 590 Zone during emergency conditions; therefore it is not included in this supply capacity evaluation.
- (5) The City's portion of the available RWSS capacity is 12.64 MGD (8,778 gpm), with water being supplied to the 240 Zone (via the Kent Springs Transmission Main) or the 590 Zone. RWSS supply is provided at two connection points; RWSS POD #1, which conveys supply directly to the 240 Zone; and RWSS POD #3, which can supply either the 240 Zone or the 590 Zone. The majority of the City's total RWSS supply has historically been to the 590 Zone. In 2016, approximately 67 percent of the City's RWSS supply was conveyed to the 590 Zone, with approximately 33 percent of the RWSS supply conveyed to the 240 Zone. For the purposes of these analyses, 67 percent of the City's RWSS capacity was assumed to be available in the 590 Zone, with the remaining 33 percent available in the 240 Zone.

### 640 Zone

The 640 Zone is expected to be created prior to the 2028 planning period and consists of the easterly portion of the existing 590 Zone. The 640 Zone will be supplied by two future 640 Zone BPSs, and the existing 640 Tank will provide water storage for the zone. One future 640 Zone BPS is planned to be constructed at the Blue Boy Standpipe site, and is anticipated to consist of three 1,750 gpm pumps, resulting in a firm capacity of 3,500 gpm with one pump out of service. The other future 640 Zone BPS is planned to be constructed at the RWSS POD #3 site, and is also anticipated to consist of three 1,750 gpm pumps, resulting in a firm capacity of 3,500 gpm with one pump out of service, and providing the future 640 Zone a redundant supply facility.

Table 7-12 summarizes the future supply requirements of the 640 Zone based on projected water demands for the zone. Table 7-12 also summarizes the amount of water supply available to the 640 Zone. The results of the analyses indicate that the proposed configuration and capacity of one of the future 640 Zone BPSs is sufficient to meet future MDDs with the largest pumping unit out of service.

Table 7-12 640 Zone Supply Evaluation

	Base Year	Existing	Proje	ected
			2028	2038
Description	2016	2018	(+10 years)	(+20 years)
Requ	ired Supply (g	pm)		
640 Zone MDD			1,098	1,132
Other Zones MDD			0	0
Total Required Supply			1,098	1,132
Available \$	Supply Capaci	ty <sup>1</sup> (gpm)		
640 Zone BPS (Blue Boy Standpipe Site)			3,500	3,500
640 Zone BPS (RWSS POD #3 Site)			3,500	3,500
Total Supply Capacity			7,000	7,000
Surplus or Defi	cient Supply C	apacity (gpr	n)	
Surplus or Deficiency			5,902	5,868

<sup>(1)</sup> Firm capacity for each BPS shown (i.e., largest pumping unit in each BPS out of service).

### **FACILITY DEFICIENCIES**

The West Hill operating area lacks redundancy without the use of the Highline Water District Emergency Intertie, as Pump Station #3 is the only facility that supplies the West Hill operating area, and Pump Station #4 is the only facility that can supply the 529, 575, and 587 Zones. If Pump Station #4 was out of service, these zones would need to be supplied by the Highline Water District Emergency Intertie, which is limited in capacity to 1,200 gpm based on the capacity of Pump Station #8. If Pump Station #3 is out of service, the West Hill operating area could be temporarily supplied by the water stored in the Reith Road Standpipe, which has capacity to provide approximately 1.7 days of storage to the West Hill operating area during existing ADD conditions. Improvements to provide redundancy to the West Hill operating area by constructing additional facilities are described in **Chapter 9**.

The O'Brien Well is not normally operated because 480-volt power is not available at the facility and the City has to transport a generator to the site to operate the well pump, sand is present inside the well screen, and high levels of manganese are present in the groundwater. Manganese is a secondary contaminant that can stain fixtures and laundry and may lead to aesthetic customer complaints if not mitigated. **Chapter 9** identifies improvements to provide 480-volt power to the site, redevelop the well, and provide a manganese treatment facility.

# STORAGE FACILITIES

This section evaluates the City's existing water storage tanks to determine if they have sufficient capacity to meet the existing and future storage requirements of the system. This section also identifies facility deficiencies that are not related to the capacity of the water tanks.

### ANALYSIS CRITERIA

Water storage is typically made up of the following components: operational storage; equalizing storage; standby storage; fire flow storage; and dead storage. Each storage component serves a different purpose and will vary from system to system. A definition of each storage component and the criteria used to evaluate the capacity of the City's storage tanks is provided below.

*Operational Storage* – Volume of the reservoir used to supply the water system under normal conditions when the source or sources of supply are not delivering water to the system (i.e., sources are in the off mode). Operational storage is the average amount of drawdown in the reservoir during normal operating conditions, which represents a volume of storage that most likely will not be available for equalizing storage, fire flow storage, or standby storage. The operational storage is based on the amount of storage between the fill, or pump starting setpoint level, and the overflow elevation of the tank.

*Equalizing Storage* – Volume of the reservoir used to supply the water system under peak demand conditions when the system demand exceeds the total rate of supply of the sources. DOH requires that equalizing storage be stored above an elevation that will provide a minimum

pressure of 30 psi at all service connections throughout the system under PHD conditions. Because the City's supply sources primarily operate on a "call on demand" basis to fill the reservoirs, the equalizing storage requirements are determined with Equation 9-1 from the DOH *Water System Design Manual* that considers the difference between the system PHD and the combined capacity of the supply sources.

Equation 9-1: ES = (PHD - Qs)(150 minutes), but in no case less than zero

Where:

ES = Equalizing Storage, in gallons

PHD = Peak Hour Demand, in gpm

 $Q_S$  = Sum of all installed and active sources, except emergency supply, in gpm.

The capacities of the sources that supply each zone are sufficient to meet the peak hour demands of their zones. Therefore, the equalizing storage requirement for each supply area is zero.

Standby Storage – Volume of the reservoir used to supply the water system under emergency conditions when supply facilities are out of service due to equipment failures, power outages, loss of supply, transmission main breaks, and any other situation that disrupts the supply source. DOH requires that standby storage be stored above an elevation that will provide a minimum pressure of 20 psi at all service connections throughout the system. The criteria for determining the standby storage requirements for the City's system, which has multiple supply sources, is based on Equation 9-3 from the DOH Water System Design Manual, which requires average day demand and supply source capacity data. The amount required is sufficient to supply the system for a 48-hour period when the primary supply facility is out of service and the system is experiencing average day demands.

Equation 9-3: $SB = (2 \text{ days})[(ADD)(N) - t_m (Q_S - Q_L)]$	$(O_S - O_L)$	$ADD)(N) - t_m$	days)[	SB = (2	uation 9-3:	Equ
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Where:	
SB =	Standby Storage, in gallons
ADD =	Average Day Demand per equivalent residential unit (ERU), in gallons per day (gpd) per ERU
N =	Number of ERUs
$Q_S =$	Sum of all installed and continuously available sources, except emergency supply, in gpm
$Q_L =$	The capacity of the largest source available to the system, in gpm
$t_m =$	Time the remaining sources are pumped on the day when the largest source is not available, in minutes. Unless otherwise restricted, this value is 1,440 minutes.

In addition to the standby storage requirements calculated from Equation 9-3, DOH recommends that the minimum standby storage volume be no less than 200 gallons per ERU.

*Fire Flow Storage* – Volume of the reservoir used 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 established by the local fire authority, the Puget Sound Regional Fire Authority. DOH requires that fire flow storage be stored above an elevation that will provide a minimum pressure of 20 psi at all points throughout the distribution system under MDD conditions.

The fire flow storage requirements shown in the analyses that follow are based on the maximum fire flow requirements in each pressure zone. The maximum fire flow requirement in the 240 Zone is 5,000 gpm for a 4-hour duration, which is equivalent to 1,200,000 gallons. The maximum fire flow requirement in the 354.5 Zone is 1,650 gpm for a 2-hour duration, which is equivalent to 198,000 gallons. The maximum fire flow requirement in the 529 Zone operating area and in the 587 Zone operating area is 4,600 gpm for a 4-hour duration, which is equivalent to 1,104,000 gallons. The maximum fire flow requirement in the 485 Zone is 3,282 gpm for a 4-hour duration, which is equivalent to 1,104,000 gallons. The maximum fire flow requirement in the 590 Zone operating area is 4,600 gpm for a 4-hour duration, which is equivalent to 1,104,000 gallons. The maximum fire flow requirement in the future 640 Zone operating area is 3,500 gpm for a 3-hour duration, which is equivalent to 630,000 gallons.

**Dead Storage** – Volume of the reservoir that cannot be used because it is stored at an elevation that does not provide system pressures that meet the minimum pressure requirements established by DOH without pumping. This unusable storage occupies the lower portion of most ground-level reservoirs. Water that is stored below an elevation that cannot provide a minimum pressure of 20 psi is considered dead storage for the analyses that follow.

### STORAGE ANALYSIS RESULTS

### System-Wide Storage

The storage analyses are based on an evaluation of the existing storage facilities providing water to the City's distribution system. The maximum combined storage capacity of the City's reservoirs is 23.33 MG, as shown in **Table 7-13**. Operational storage is based on BPS setpoints provided by the City. Equalizing storage is based on the results of Equation 9-1 from the DOH *Water System Design Manual*. Standby storage is based on providing 200 gallons of storage per ERU, which is more conservative than the results of Equation 9-3 from the DOH *Water System Design Manual*. There is currently 3.76 MG of dead storage (i.e., non-usable storage) in the water system, of which 3.65 MG is within the 590 Zone. The results of the existing storage evaluation, as shown in **Table 7-13**, indicate that the existing (2018) system has a storage surplus of approximately 5.82 MG.

Table 7-13
System-Wide Storage Evaluation

	Base Year	Existing	Projected	
			2028	2038
Description	2016	2018	(+10 years)	(+20 years)
Ava	ilable/Usable Stora	ige (MG)		
Maximum Storage Capacity	23.33	23.33	30.28	30.28
Dead (Non-usable) Storage	3.76	3.76	6.06	6.06
Total Available Storage	19.57	19.57	24.22	24.22
	Required Storage (	(MG)		
Operational Storage	3.57	3.57	4.12	4.12
Equalizing Storage	0.00	0.00	0.00	0.00
Standby Storage	8.97	9.22	9.61	10.26
Fire Flow Storage	1.20	1.20	1.20	1.20
Total Required Storage	13.74	13.99	14.93	15.58
Surpl	us or Deficient Sto	rage (MG)		
Surplus or Deficient Amount	5.82	5.58	9.29	8.64

The system's future storage requirements, also shown in **Table 7-13**, were computed for the 10- and 20-year planning periods based on the corresponding demand projections shown in **Chapter 4**. The 10- and 20-year planning periods include additional usable storage within the existing 640 Tank that will become available to the system as part of the 640 Zone conversion project, and the construction of 3.00 MG of usable storage in the West Hill operating area. The City is projected to have a system-wide storage surplus through the 20-year planning period.

Valley Operating Area

240 Zone Storage

The City's 240 Zone, which is provided storage by the 6 MG #2 and Guiberson Reservoirs, has an existing combined storage capacity of 9.00 MG, as shown in **Table 7-14**. Operational storage is based on source setpoints provided by the City. Equalizing storage is based on the results of Equation 9-1 from the DOH *Water System Design Manual*. Standby storage is based on a rate of 200 gpd per ERU in the zone, which is more conservative than the results of Equation 9-3 from the DOH *Water System Design Manual*. There is currently no dead storage (i.e., non-usable storage) in the 240 Zone. The results of the storage evaluation, as shown in **Table 7-14**, indicate that the 240 Zone storage facilities have sufficient capacity to meet the existing and future storage requirements through the 20-year planning period.

Table 7-14 240 Zone Storage Capacity Evaluation

	Base Year	Existing	Proje	ected	
			2028	2038	
Description	2016	2018	(+10 years)	(+20 years)	
Ava	ilable/Usable Stora	ige (MG)			
Maximum Storage Capacity	9.00	9.00	9.00	9.00	
Dead (Non-usable) Storage	0.00	0.00	0.00	0.00	
Total Available Storage	9.00	9.00	9.00	9.00	
	Required Storage (	(MG)			
Operational Storage	0.49	0.49	0.49	0.49	
Equalizing Storage	0.00	0.00	0.00	0.00	
Standby Storage	5.15	5.29	5.49	5.97	
Fire Flow Storage	1.20	1.20	1.20	1.20	
Total Required Storage	6.84	6.98	7.18	7.65	
Surpl	us or Deficient Sto	rage (MG)			
Surplus or Deficient Amount	2.16	2.02	1.82	1.35	

As presented in **Chapter 9**, the Guiberson Reservoir is proposed to be replaced within the 20-year planning period. The City is considering constructing the replacement reservoir with a larger capacity than the 3.00 MG capacity of the existing reservoir, with the proposed reservoir capacity to be identified during the predesign and design phases of the project. The storage capacity evaluation presented in **Table 7-14** assumes the Guiberson Reservoir storage volume to be 3.00 MG through the 20-year planning period, and any increase in storage volume that occurs when the Guiberson Reservoir is replaced will increase the surplus storage capacity available in the 240 Zone.

West Hill Operating Area

354.5 Zone Storage

The City's 354.5 Zone, which is provided storage by the Reith Road Standpipe, has an existing storage capacity of 1.01 MG, as shown in **Table 7-15**. Operational storage is based on BPS setpoints provided by the City. Equalizing storage is based on the results of Equation 9-1 from the DOH *Water System Design Manual*. Standby storage is based on the results of Equation 9-3 from the DOH *Water System Design Manual*, which is more conservative than a rate of 200 gpd per ERU in the zone. There is currently 0.12 MG of dead storage (i.e., non-usable storage) in the 354.5 Zone. The results of the storage evaluation, as shown in **Table 7-15**, indicate that the 354.5 Zone storage facility has sufficient capacity to meet the existing and future storage requirements through the 20-year planning period. For conservatism, the future system 354.5 Zone storage evaluation shown in **Table 7-15** does not include consideration for a future West Hill Reservoir that is proposed to be constructed in the 587 Zone to provide additional storage capacity in the West Hill operating area.

Table 7-15 354.5 Zone Storage Capacity Evaluation

	Base Year	Existing	Proje	ected
Description	2016	2018	2028 (+10 years)	2038 (+20 years)
Avail	able/Usable Stora	age (MG)		
Maximum Storage Capacity	1.01	1.01	1.01	1.01
Dead (Non-usable) Storage	0.12	0.12	0.12	0.12
Total Available Storage	0.90	0.90	0.90	0.90
F	Required Storage	(MG)		
Operational Storage	0.24	0.24	0.24	0.24
Equalizing Storage	0.00	0.00	0.00	0.00
Standby Storage	0.13	0.13	0.16	0.16
Fire Flow Storage	0.20	0.20	0.20	0.20
Total Required Storage	0.57	0.57	0.59	0.60
Surplu	s or Deficient Sto	rage (MG)		
Surplus or Deficient Amount	0.33	0.33	0.30	0.30

529 Zone Storage

The City's 529 Zone, which is currently provided storage by the Cambridge Tank, has an existing storage capacity of 0.30 MG, as shown in **Table 7-16**. Operational storage is based on BPS setpoints provided by the City. Equalizing storage is based on the results of Equation 9-1 from the DOH Water System Design Manual. Standby storage is based the results of Equation 9-3 from the DOH Water System Design Manual, which is more conservative than a rate of 200 gpd per ERU in the zone. There is currently no dead storage (i.e., non-usable storage) in the 529 Zone. The Cambridge Tank currently provides fire flow storage for not only the 529 Zone, but also the 575 and 587 Zones. The results of the storage evaluation, as shown in **Table 7-16**, indicate that the Cambridge Tank does not have sufficient capacity to meet the existing and future storage requirements through the 20-year planning period. During a fire or emergency event, supply to the 529 Zone is initially provided by the Cambridge Tank, but as shown in **Table 7-16**, the Cambridge Tank capacity is significantly less than the volume required for fire flow. As the Cambridge Tank water level is reduced, Pump Station #4 is utilized to provide supply to the 529 Zone during fire or emergency events. Prior to 2028, it is expected that a new West Hill Reservoir will be constructed in the 587 Zone to provide adequate storage for the 529, 575, and 587 Zones, and improve redundancy in the West Hill operating area. The Cambridge Tank will remain operational following the completion of a future West Hill Reservoir and will be normally filled by water conveyed from the future West Hill Reservoir via a future PRV proposed to be installed at Pump Station #7.

Table 7-16 529 Zone Storage Capacity Evaluation

	Base Year	Existing	Proje	cted <sup>1</sup>
Description	2016	2018	2028 (+10 years)	2038 (+20 years)
Avai	ilable/Usable Stora	ge (MG)		
Maximum Storage Capacity	0.30	0.30	0.30	0.30
Dead (Non-usable) Storage	0.00	0.00	0.00	0.00
Total Available Storage	0.30	0.30	0.30	0.30
ı	Required Storage (	MG)		
Operational Storage	0.16	0.16	0.16	0.16
Equalizing Storage	0.00	0.00	0.00	0.00
Standby Storage	0.90	0.92	0.95	0.96
Fire Flow Storage	1.10	1.10	1.10	1.10
Total Required Storage	2.16	2.18	2.21	2.23
Surpl	us or Deficient Sto	rage (MG)		
	(1.86)	(1.88)	(1.91)	(1.93)

<sup>(1)</sup> A proposed 587 Zone West Hill reservoir will provide future system storage for the 529, 575, and 587 Zones.

587 Zone Storage

The City's 587 Zone currently does not have water storage, and adequate fire flow storage is not available in the three West Hill operating zones with the highest hydraulic grades (529, 575, and 587 Zones). A future 587 Zone reservoir is expected to be constructed prior to 2028 to improve fire flow protection and reliability in the West Hill operating area. **Table 7-17** presents the projected 2028 and 2038 storage capacity evaluation for the 587 Zone. The storage requirements of the 354.5, 529, and 575 Zones are included in the 587 Zone evaluation shown in **Table 7-17**, which indicate that the proposed 587 Zone reservoir will provide sufficient capacity to meet the existing and future storage requirements of the 587 Zone operating area, which includes the entire West Hill operating area (354.5, 529, 575, and 587 Zones), through the 20-year planning period.

Table 7-17
587 Zone Storage Capacity Evaluation

	Base Year	Existing	Proje	ected	
			2028	2038	
Description	2016	2018	(+10 years)	(+20 years)	
Ava	ilable/Usable Stora	ge (MG)			
Maximum Storage Capacity			5.30	5.30	
Dead (Non-usable) Storage			2.30	2.30	
Total Available Storage			3.00	3.00	
	Dearrined Ctenens	(B4O)			
	Required Storage (	(MG)	0.55	0.50	
Operational Storage			0.55	0.56	
Operational Storage Equalizing Storage Standby Storage	•	,	0.55 0.00 0.65	0.56 0.00 0.66	
Operational Storage Equalizing Storage Standby Storage			0.00	0.00	
Operational Storage Equalizing Storage Standby Storage Fire Flow Storage <sup>1</sup>			0.00 0.65	0.00 0.66	
Operational Storage Equalizing Storage Standby Storage Fire Flow Storage  Total Required Storage	  	  	0.00 0.65 1.50	0.00 0.66 1.50	

(1) Existing maximum fire flow requirement in the 587 and 575 Zones is 4,600 gpm for 4 hours (Totem Middle School), resulting in a fire flow storage volume of 1.10 MG. The City anticipates redevelopment within the 587 Zone, and is planning for a future maximum fire flow requirement of 5,000 gpm for 5 hours in the 587 Zone, resulting in a fire flow storage volume of 1.50 MG.

East Hill Operating Area

590 Zone Storage

The City's 590 Zone, which is currently provided storage by the 3.5 MG Tank, the Blue Boy Standpipe, and the 640 Tank, has an existing combined storage capacity of 6.88 MG as shown in **Table 7-18**. Operational storage is based on BPS setpoints provided by the City. Equalizing storage is based on the results of Equation 9-1 from the DOH *Water System Design Manual*. Standby storage is based on a rate of 200 gpd per ERU in the zone, which is more conservative than the results of Equation 9-3 from the DOH *Water System Design Manual*. There is currently 3.65 MG of dead storage (i.e., non-usable storage) in the 590 Zone, the majority of which will be eliminated following the 640 Zone conversion project that is described in more detail in **Chapter 9**. The results of the 590 Zone storage evaluation, as shown in **Table 7-18**, indicate that the 590 Zone storage facilities do not have sufficient capacity to meet the existing storage requirements.

Table 7-18
590 Zone Storage Capacity Evaluation

	Base Year	Existing	Proje	ected
			2028	2038
Description	2016	2018	(+10 years)	(+20 years)
Avail	able/Usable Stora	age (MG)		
Maximum Storage Capacity	6.88	6.88	4.50	4.50
Dead (Non-usable) Storage	3.65	3.65	1.32	1.32
Total Available Storage	3.23	3.23	3.17	3.17
F	Required Storage	(MG)		
Operational Storage	0.90	0.90	0.21	0.21
Equalizing Storage	0.00	0.00	0.00	0.00
Standby Storage	2.86	2.94	2.19	2.26
Fire Flow Storage	1.10	1.10	1.10	1.10
Total Required Storage	4.87	4.95	3.50	3.57
Surplu	s or Deficient Sto	orage (MG)		
Surplus or Deficient Amount	(1.64)	(1.72)	(0.33)	(0.40)

Prior to 2028, the easterly portion of the 590 Zone is expected to be converted to a 640 Zone, which reduces the available and required storage in the 590 Zone. However, the City will be able to fill the 640 Tank to a maximum hydraulic grade of 645 feet following implementation of the 640 Zone conversion, resulting in approximately 1.65 MG of additional storage capacity. Additionally, the highest existing 590 Zone service connections will be transferred to the 640 Zone in the future, reducing the dead storage volume in the future 590 Zone storage facilities (Blue Boy Standpipe and the 3.5 MG Tank) by approximately 1.39 MG. Future surplus storage volume in the 640 Zone, presented in the 640 Zone Storage section of this chapter, will be available to the 590 Zone via multiple PRVs to resolve the projected 10- and 20-year planning period storage deficiencies shown in Table 7-18.

#### 640 Zone Storage

Storage in the 640 Zone will be provided by the existing 640 Tank, which is currently operated at a maximum hydraulic grade of 590 feet. In the future, the 640 Tank will provide 3.10 MG of usable storage to the 640 Zone and will be operated at a maximum hydraulic grade of 645 feet. **Table 7-19** presents the projected 2028 and 2038 storage evaluation for the 640 Zone, and indicates that the 640 Tank has sufficient capacity to meet the future 640 Zone storage requirements through the 20-year planning period. The projected 640 Zone storage surplus is also sufficient to resolve the projected 590 Zone storage deficiencies in the 10- and 20-year planning periods.

Table 7-19 640 Zone Storage Capacity Evaluation

	Base Year	Existing	Proje	Projected	
			2028	2038	
Description	2016	2018	(+10 years)	(+20 years)	
Avail	able/Usable Stora	age (MG)			
Maximum Storage Capacity			4.03	4.03	
Dead (Non-usable) Storage			0.93	0.93	
Total Available Storage			3.10	3.10	
	Required Storage	(MG)			
Operational Storage			0.81	0.81	
Equalizing Storage			0.00	0.00	
Standby Storage			0.85	0.88	
Fire Flow Storage			0.63	0.63	
Total Required Storage			2.29	2.32	
Surplu	s or Deficient Sto	rage (MG)			
Surplus or Deficient Amount			0.81	0.78	

The combined storage requirements of the 590 and 640 Zones following the 640 Zone conversion project is shown in **Table 7-20**. The combined 590 and 640 Zones storage requirements are based on the sum of the operational and standby storage volumes in the two zones. Equalizing storage is based on the results of Equation 9-1 from the DOH *Water System Design Manual*. Fire flow storage is based on the maximum planning-level fire flow requirement in the 590 and 640 Zones, which is 4,600 gpm for 4 hours based on the requirements of the Fred Meyer located on SE 240<sup>th</sup> Street, The Home Depot located on 104<sup>th</sup> Avenue SE, and Kent-Meridian High School located on SE 256<sup>th</sup> Street.

Table 7-20 Combined 590 and 640 Zone Future Storage Capacity Evaluation

	Base Year	Existing	Proje	Projected	
Description	2016	2018	2028 (+10 years)	2038 (+20 years)	
Avail	able/Usable Stora	age (MG)			
Maximum Storage Capacity			8.53	8.53	
Dead (Non-usable) Storage			2.26	2.26	
Total Available Storage			6.27	6.27	
	Required Storage	(MG)	1 02	1 02	
Operational Storage	<del>.</del>	`	1.02 0.00	1.02	
Operational Storage Equalizing Storage Standby Storage					
Operational Storage Equalizing Storage Standby Storage			0.00	0.00	
Operational Storage Equalizing Storage			0.00 3.04	0.00 3.14	
Operational Storage Equalizing Storage Standby Storage Fire Flow Storage Total Required Storage	 		0.00 3.04 1.10	0.00 3.14 1.10	

485 Zone Storage

The City's 485 Zone, which is provided direct storage by the 125K Tank, has an existing storage capacity of 0.13 MG. The City's 6 MG #1 Reservoir provides indirect storage to the 485 Zone via Pump Station #5, which pumps from the 6 MG #1 Reservoir to the 125K Tank and the 485 Zone. As described in the **Supply Analysis Results** section of this chapter and shown in **Table 7-10**, the City can utilize Pump Station #5 to provide supply to the 485 Zone during peak demand and emergency demand conditions. Therefore, the combined storage capacity of the 125K Tank and the 6 MG #1 Reservoir, 6.14 MG, is considered in the 485 Zone storage capacity evaluation shown in **Table 7-21**. Operational storage is based on BPS setpoints provided by the City. Equalizing storage is based on the results of Equation 9-1 from the DOH Water System Design Manual, with demands in Equation 9-1 equivalent to the maximum pumping capacity of Pump Station #5 to represent the maximum conveyance out of the 6 MG #1 Reservoir, and a supply rate equivalent to the Clark Springs capacity. Standby storage is based on a rate of 200 gpd per ERU in the zone, which is more conservative than the results of Equation 9-3 from the DOH Water System Design Manual. There is currently no dead storage (i.e., non-usable storage) in either reservoir. The results of the 485 Zone storage evaluation, as shown in Table 7-21, indicate that the 125K Tank and the 6 MG #1 Reservoir have sufficient capacity to meet the existing and future storage requirements of the 485 Zone through the 20-year planning period.

Table 7-21
485 Zone Storage Capacity Evaluation

	Base Year	Existing	Proje	ected
			2028	2038
Description	2016	2018	(+10 years)	(+20 years)
Availabl	e/Usable Stora	age (MG)		
485 Zone Maximum Storage Capacity	6.14	6.14	6.14	6.14
485 Zone Dead (Non-usable) Storage	0.00	0.00	0.00	0.00
Total Available Storage	6.14	6.14	6.14	6.14
Req	uired Storage	(MG)		
Operational Storage	1.99	1.99	1.99	1.99
Equalizing Storage	0.23	0.23	0.23	0.23
Standby Storage	0.36	0.37	0.43	0.49
Fire Flow Storage	0.79	0.79	0.79	0.79
Total Required Storage	3.37	3.38	3.44	3.50
Surplus o	r Deficient Sto	rage (MG)		
Surplus or Deficient Amount	2.77	2.76	2.70	2.64

## FACILITY DEFICIENCIES

In order to resolve the storage deficiency in the West Hill operating area (as shown within the **529 Zone Storage** evaluation), a new 587 Zone reservoir will be constructed in the West Hill area. The City is considering a currently undeveloped property on the West Hill between 38<sup>th</sup> Avenue S and Military Road S, adjacent to S 248<sup>th</sup> Street. Construction of a new 587 Zone reservoir is described in **Chapter 9**.

In order to resolve the storage deficiency in the City's 590 Zone, the City is converting the easterly portion of the 590 Zone to a 640 Zone, which reduces the available and required storage in the 590 Zone. The City will be able to fill the 640 Tank to a maximum hydraulic grade of 645 feet following implementation of the 640 Zone conversion (currently, the maximum hydraulic grade of the 640 Tank is 590 feet), resulting in approximately 1.65 MG of additional storage capacity. Additionally, the highest existing 590 Zone service connections will be transferred to the 640 Zone in the future, reducing the dead storage volume in the future 590 Zone storage facilities by approximately 1.39 MG. The resulting storage evaluation for the combined 590 and 640 Zones indicates sufficient capacity will be available in the storage facilities to meet the requirements through the 20-year planning period.

The City's 2016 sanitary survey identified the need to retrofit or replace the air vents on the 6 MG #1 Reservoir, 125K Tank, Blue Boy Standpipe, Cambridge Tank, and the Reith Road Standpipe. The Cambridge Tank retrofit has been completed, and the 125K Tank retrofit is being designed in 2018 with construction planned for 2019. The retrofits for the remaining three tanks are scheduled to be completed by 2021, as identified in **Chapter 9**.

# DISTRIBUTION AND TRANSMISSION SYSTEM

This section evaluates the City's existing distribution and transmission system (i.e., water mains) to determine if they are adequately sized and looped to provide the necessary flow rates and pressures to meet the existing and future requirements of the system. This section also identifies deficiencies that are not related to the capacity of the water mains.

#### ANALYSIS CRITERIA

Distribution and transmission mains must be capable of adequately and reliably conveying water throughout the system at acceptable flow rates and pressures. The criteria used to evaluate the City's distribution and transmission system are the state mandated requirements for Group A water systems contained in WAC 246-290-230 – Distribution Systems. The pressure analysis criteria state that the distribution system "...shall be designed with the capacity to deliver the design PHD quantity of water at 30 psi under PHD flow conditions measured at all existing and proposed service water meters." It also states that if fire flow is to be provided, "... the distribution system shall also provide MDD plus the required fire flow at a pressure of at least 20 psi at all points throughout the distribution system."

Hydraulic analyses of the existing system were performed under existing PHD conditions to evaluate its current pressure capabilities and identify existing system deficiencies. The existing system also was analyzed under existing MDD conditions to evaluate the current fire flow capabilities and identify additional existing system deficiencies. Additional hydraulic analyses were then performed with the same hydraulic model under future PHD and MDD conditions and with the proposed improvements to demonstrate that the identified improvements will eliminate the deficiencies and meet the requirements far into the future. The following is a description of the hydraulic model, the operational conditions, and facility settings used in the analyses.

#### HYDRAULIC MODEL

#### Description

A computer-based hydraulic model of the existing water system was updated to the CONNECT edition of the WaterGEMS® program (developed by Bentley Systems, Inc.) with the City's most recent Geographic Information System (GIS) shapefile to reflect the best-known information on distribution system geometry and pipe characteristics, including diameter, material, and installation year.

Hydraulic model pipe roughness coefficients were initialized with computed estimates based on the water main material and age information from the City's water main GIS shapefile. Based on the premise that the internal surface of water mains become rougher as they get older, older water mains were assigned higher roughness coefficients than newer water mains. The junction node elevation data were updated using King County provided 5-foot contour data. A hydraulic model

node diagram, providing a graphical representation of the model of the water system, is contained in **Appendix L**.

#### **Demand Data**

The hydraulic model of the existing system contains demands based on 2016 individual customer meter water demand data provided by the City. Demand data for each parcel was distributed to the closest representative junction node of the model based on the recorded usage, which was then uniformly scaled to simulate the 2016 MDD and PHD. The peaking factors calculated in **Chapter 4** were used to analyze the system under PHD and MDD conditions.

The hydraulic model of the proposed system contains 10-year demand levels that are projected for the year 2028, and 20-year demand levels that are projected for the year 2038.

The future demand distribution is based on planning area estimates identified in **Chapter 3**, which include population projections in Traffic Analysis Zones (TAZ) and employment projections in census tracts provided by the Puget Sound Regional Council (PSRC). The resulting ADD allocation for each pressure zone is shown in **Table 7-22**.

Table 7-22
Pressure Zone Demand Allocation

	ADD (gpm)						
Pressure Zone	2016 (Base)	2018 (Existing)	2028 (+10 years)	2038 (+20 years)			
240	3,070	3,133	3,251	3,534			
271 Alvord	12	12	16	20			
308 Hilltop	0.4	0.4	1	1			
339 Seattle	11	11	18	23			
354.5	45	46	54	55			
366 Stetson	2	2	3	3			
368 Weiland	3	3	5	6			
416	0.0	0.0	0.0	0.0			
485	186	189	213	236			
529	147	150	155	157			
575	28	28	30	31			
587	137	140	144	146			
590	1,706	1,741	1,298	1,339			
640	0.0	0.0	505	521			
Total	5,348	5,458	5,691	6,074			

#### **Facilities**

The hydraulic model of the existing system contains all active, existing system facilities. For the proposed system analyses in the year 2028 and 2038, the hydraulic model contains all active existing system facilities and proposed system improvements identified in **Chapter 9** for the 10- and 20-year planning periods, respectively.

The facility settings for the pressure analyses corresponded to a PHD event in the water system. All sources of supply that currently are available to the system or will be available in the future for the years 2028 and 2038 analyses, during a peak period were operating at their normal summertime pumping rates. The reservoir levels were modeled to reflect full utilization of operational and equalizing storage. The operational conditions for the pressure analyses are summarized in **Table 7-23**.

Table 7-23
Hydraulic Analyses Operational Conditions

	PHD	Pressure Ana	lyses	Fi	re Flow Analys	ses
Description	2016	2028 (+10 years)	2038 (+20 years)	2016	2028 (+10 years)	2038 (+20 years)
Demand	2016 PHD	2028 PHD	2038 PHD	2016 MDD	2028 MDD	2038 MDD
	Sto	rage Facilities	HGL (feet)			
Garrison Creek Reservoir	237.75	237.75	237.75	234.53	234.53	234.53
Guiberson Reservoir	236.50	236.50	236.50	233.28	233.28	233.28
Reith Road Standpipe	345.20	345.20	345.20	337.46	337.46	337.46
6 MG #1 Reservoir	404.00	404.00	404.00	404.00	404.00	404.00
125K Tank	456.31	456.31	456.31	463.51	463.51	463.51
Cambridge Tank	519.35	519.35	519.35	499.11	499.11	499.11
3.5 MG Tank	586.40	586.40	586.40	571.79	560.45	560.45
Blue Boy Standpipe	586.40	586.40	586.40	563.09	551.75	551.75
640 Tank	579.00	620.60	620.60	564.39	601.54	601.54
Future West Hill Reservoir		571.23	571.23		528.23	528.23
208th Street/		Supply Facilitie				
212th Street Wellfield	OFF	OFF	OFF	OFF	OFF	OFF
Armstrong Springs Wells	ON	ON	ON	ON	ON	ON
Clark Springs	ON	ON	ON	ON	ON	ON
East Hill Well	ON	ON	ON	ON	ON	ON
Garrison Creek Well	ON	ON	ON	ON	ON	ON
Kent Springs	ON	ON	ON	ON	ON	ON
O'Brien Well	OFF	OFF	OFF	OFF	OFF	OFF
Seven Oaks Well	ON	ON	ON	ON	ON	ON
RWSS POD #3	ON	ON	ON	ON	ON	ON
		BPS Facilities	Status			
Pump Station #3	ON	ON	ON	ON	ON	ON
Pump Station #4	ON	ON	ON	ON	ON	ON
Pump Station #5	ON	ON	ON	ON	ON	ON
Pump Station #6	ON	ON	ON	ON	ON	ON
Pump Station #7	ON	ON	ON	ON	ON	ON
Pump Station #8	ON	ON	ON	ON	ON	ON
Future West Hill BPS		ON	ON		ON	ON
uture 640 Zone BPS (Blue Boy)		ON	ON		ON	ON
uture 640 Zone BPS (POD #3)			ON			ON

Separate fire flow analyses were performed on the system to size distribution system improvements and calculate fire flow availability. The hydraulic model for the fire flow analyses contained settings that correspond to MDD events. All sources of supply that currently are available to the system during a peak period were operating at their normal pumping rates, and reservoir levels were modeled to reflect full utilization of operational, equalizing, and fire flow storage based on the maximum planning-level fire flow requirement. **Table 7-23** summarizes the operational conditions for the fire flow analyses for the existing and future planning periods.

#### Calibration

Hydraulic model calibration was completed during the preparation of this Water System Plan (WSP). Hydraulic model calibration is achieved by adjusting the roughness coefficients of the water mains in the model so the resulting pressures and flows closely match the pressures and flows from actual field tests under similar demand and operating conditions. Initial Darcy-Weisbach roughness coefficients were entered in the model based on computed estimates of the coefficients from available pipe age and material data. For example, older water mains were assigned higher roughness coefficients than newer water mains; thereby assuming that the internal surface of water pipe becomes rougher as it gets older. Additional calibration of the model was achieved using field flow and pressure data that were collected throughout the system during hydrant testing for this purpose.

Hydrant flow tests were performed at 51 locations in late 2017, with hydrant flows, static pressures, and residual pressures measured during each test for use in calibrating the hydraulic model. Telemetry data for each of the City's water system facilities were provided in 30-second intervals during the tests and used to initialize the settings of the facilities in the hydraulic model. Pressure transducers recording at 2-second intervals were installed throughout each pressure zone during the flow tests to verify the static and residual pressures at intermediate points in the system (between the water system facilities and the hydrant flow test locations). Hydraulic model calibration of the 51 locations was achieved by adjusting the roughness coefficients and connectivity of the water mains, adding check valves at appropriate locations, adding the "small" PRV within each PRV station in the hydraulic model, and updating BPS initial settings and controls. The identification of these differences was generally the result of sensitivity analyses, which consist of iterative model adjustments to assist in troubleshooting the cause of a discrepancy between field measurements and model calculations. Examples of sensitivity analyses performed for the City's hydraulic model include temporarily opening or closing a PRV to identify if the PRV opened in the field but not in the model (or vice versa); temporarily adjusting the pressure setpoints of pumps or valves to determine the impact on system pressures; or temporarily closing pipes or adding check valves to pipes to confirm the presence of a zone valve or check valve at pressure zone boundaries.

The hydraulic model's calculated head loss during the flow tests was within plus or minus 4.3 psi (10 feet) of the field-measured head loss at all 51 hydrants that were flow tested, and within 2.2 psi (5 feet) at 41 of the 51 hydrants. The accuracy of the calibrated hydraulic model is consistent with the guidelines published by Walski et al. (Walski) in the 2003 *Advanced Water Distribution Modeling and Management* book, which suggests that the hydraulic model is able to

predict the hydraulic grade line (HGL) to within 5 to 10 feet at model calibration points during peak demands. A summary of the difference between the hydraulic model's calculated head loss during the flow tests and the field-measured head loss at each flow test location is shown in **Chart 7-2**.

5.0 Walski Guideline +4.3 psi (+10 feet) 4.0 Pressure Difference Between Field Measurements and Model Calculations (psi) 3.0 • 2.0 8 1.0 1 0.0 -1.0 8 -2.0 -3.0 -4.0 Walski Guideline -4.3 -5.0 240 Zone 271 Alvord 308 Hilltop 339 Seattle 354.5 Zone 366 Stetson 368 Weiland 485 Zone 529 Zone 575 Zone 587 Zone 590 Zone 7one Zone 7one 7one 7one - Average Error per Zone Error per Test Location

Chart 7-2
Hydraulic Model Calibration Results Summary

#### HYDRAULIC ANALYSIS RESULTS

Several hydraulic analyses were 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 determine the pressures throughout the system under base year (i.e., 2016) PHD conditions. Subsequent analyses were performed to determine the pressures throughout the system under future 10- and 20-year PHD conditions. The results of the analyses were used to identify locations of low and high pressures. To satisfy the minimum pressure requirements, the pressure at all water service locations must be at least 30 psi during PHD conditions. In addition, the system should not have widespread areas with high pressures, generally considered to be more than 100 psi.

The City provides at least 30 psi to all existing service connections during PHD conditions, although there are multiple areas receiving less than 40 psi during PHD conditions, as shown in **Table 7-24**. Pressure zone improvements identified in **Chapter 9** increase the pressure above 40 psi at more than half of the low-pressure locations shown in **Table 7-24** within the 20-year planning period.

All water mains with pressures greater than 100 psi, as identified from the analyses, are generally located along pressure zone boundaries. Water services in these areas, as with any future services, are required to be equipped with individual PRVs to limit the maximum pressure to 80 psi. **Figure 7-1** presents a summary of the pressures provided throughout the water system during base year (i.e., 2016) PHD conditions.

Table 7-24 Pressure Analysis Summary

			_		+10 years w/	ssure (psi) +20 years w/	
		Existing Pressure			Proposed	Proposed	+20 years w/ Al
Land Use	Approximate Location	Zone	Junction No.	2016	Improvements <sup>1</sup>	Improvements <sup>2</sup>	Improvements
Single Family 6	Neighborhood in cul-de-sac of Carter Pl.	339 Seattle	Pressure Areas				
Units/Acre	east of Van De Vanter Ave	Zone	J-2105	30	34	34	34
Single Family 6 Units/Acre	Near intersection of Reith Rd and S 253rd St	354.5 Zone	J-1674	32	32	32	32
Single Family 6 Units/Acre	Near intersection of SE 248th St and 120th Ave SE	590 Zone	J-26570	32	55	55	55
Parks and Open Space	Neighborhood just west of 124th Ave SE at SE 248th St	590 Zone	J-26236	33	55	55	55
Single Family 6 Units/Acre	Near intersection of SE 240th St and 116th Ave SE (First Christian Church)	590 Zone	J-2547	34	65	64	64
Single Family 6 Units/Acre	Neighborhood near SE 244th St and 119th Ave SE	590 Zone	J-2483	34	62	62	62
Single Family 6 Units/Acre	Neighborhood adjacent to and north of S 254th St and 45th Ave S	354.5 Zone	J-533	35	35	35	35
Single Family 6 Units/Acre	Neighborhood in cul-de-sac of SE 237th PI, east of 112th Ave SE	590 Zone	J-2403	36	74	73	72
Single Family 6 Units/Acre	Near intersection of S 264th St and 34th Ave S	529 Zone	J-1732	36	36	36	36
Single Family 6 Units/Acre	Near intersection of E James St and N Lenora Ave	240 Zone	J-131	38	39	39	40
Medium Density Multifamily	Near intersection of S 248th St and 98th Ave S	485 Zone	J-1601	39	39	39	40
Single Family 4.5 Units/Acre	Neighborhood near 94th PI S and S 216th PI	240 Zone	J-25901	39	40	40	40
Single Family 8 Units/Acre	Adjacent to 98th Ave S, between S 248th St and S 243rd St	485 Zone	J-2091	40	40	40	42
Single Family 6 Units/Acre	Approximately the 9700 block between S 239th Pl and S 243rd St	485 Zone	J-26787	41	41	41	43
Single Family 6 Units/Acre	Near intersection of 94th Ave S (Hamilton Rd) and S 233rd Pl	485 Zone	J-2036	42	42	42	45
		High	n Pressure Areas				
Single Family 6 Units/Acre	Neighborhood along 92nd Ave S, north of S 222nd St	485 Zone	J-25910	144	143	143	147
Medium Density Multifamily	Near intersection of Summit Ave N and E Smith St	485 Zone	J-472	129	129	128	131
Single Family 6 Units/Acre	Near intersection of Alexander Ave and E Cherry Hill St	485 Zone	J-1143	129	128	128	130
Single Family 6 Units/Acre	Neighborhoods along 100th Ave SE, north of S 228th Pl	590 Zone	J-26408	126	132	132	128
Single Family 6 Units/Acre	Near intersection of Reiten Rd and E Maclyn St	485 Zone	J-26929	124	124	124	125
Single Family 6 Units/Acre	Near intersection of Alvord Ave N and Spring Ave N	485 Zone	J-2367	120	120	120	123
Single Family 6 Units/Acre	Near intersecton of S 222nd St and 93rd Ave S	485 Zone	J-26933	120	120	120	123
Single Family 6 Units/Acre	Near intersection of E Cherry Hill St and Olympic Way	485 Zone	J-1589	120	120	119	121
Single Family 6 Units/Acre	NW side of Scenic Way neighborhood, near Central Ave S and E Titus St	339 Seattle Zone	J-750	114	118	118	118
Single Family 6 Units/Acre	Near intersection of 96th PI S and 97th Ave S	485 Zone	J-2737	113	113	113	117
Single Family 6 Units/Acre	East side of S 243rd St neighborhood	587 Zone	J-263	110	105	106	106
Single Family 6 Units/Acre	Near intersection of SE 228th St and 101st PI SE	590 Zone	J-1799	107	113	113	110
Parks and Open Space	Along Canyon Drive near Kent Meridian HS field	590 Zone	J-26746	105	112	112	105
Single Family 6 Units/Acre	Near intersection of 104th Ave SE and SE 267th St	590 Zone	J-648	105	114	114	107
Single Family 6 Units/Acre	Neighborhood near intersection of S 262nd St and 46th Ave S	529 Zone	J-1653	103	103	103	104
Parks and Open Space	Near intersection of S 252nd St and 97th PI S	590 Zone	J-641	102	108	109	101
Medium Density Multifamily	Near intersection of Lake Fenwick Rd and 46th Ave S	354.5 Zone	J-993	101	101	101	101
Single Family 8 Units/Acre	Neighborhood along Kensington Ave S, south of Reiten Rd	339 Seattle Zone	J-1576	97	101	101	101

<sup>(1)</sup> Includes 10-year CIP projects presented in Chapter 9, and assumed high priority water main replacement improvements.
(2) Includes 20-year CIP projects presented in Chapter 9, and does not include medium or low priority water main replacement improvements.
(3) Includes 20-year CIP projects presented in Chapter 9, and all medium and low priority water main replacement projects.

The second set of analyses was performed to determine the capability of the water system to provide fire flow throughout the water system under base year MDD conditions. A separate fire flow analysis was performed for each node in the model to determine the available fire flow at a minimum residual pressure of 20 psi in the main adjacent to the hydrant and a maximum allowable water main velocity of 8 feet per second (fps). More than 3,600 fire flow analyses were performed to comprehensively evaluate the water system. For each node analyzed, the resulting fire flow was compared to its general planning-level fire flow requirement, which was assigned according to its land use classification. As is typical of most water systems, the City's distribution system was constructed to meet fire flow requirements that were in place at the time of construction. Land use classification changes and/or increases in fire flow requirements over time may create deficiencies. A summary of the results of the base year (2016) fire flow analyses is presented in **Figure 7-2**.

**Table 4-11** in **Chapter 4** lists the general planning-level fire flow requirements for each land use classification. Since the fire flow requirement varies for buildings within each land use classification, the land use based fire flow requirements are only used as a general target for the primary purpose of the system-wide analyses that were performed for this WSP. Additional improvements may be needed in areas where actual fire flow requirements exceed the planning-level targets and shall be the responsibility of the developer. The results of the fire flow analyses were used to identify undersized water mains and proposed water main improvements based on the general planning-level fire flow requirements and current design criteria, which is not necessarily the same requirements and criteria that were in place when current developments and water main were constructed. The Puget Sound Regional Fire Authority provided the City the fire flow requirements for the largest structures in each pressure zone if the structures were to be new construction based on current regulations and guidelines. These fire flow requirements are shown in **Table 7-25**, along with the fire flow availability at these locations in the existing system, for future planning periods in the City's existing system, and for future planning periods with the improvements identified in **Chapter 9**.

Table	: 7-25
Large Structure Fire Fle	ow Analysis Summary

	Available Fire Flow (gpm)							
Location Description	Address	Existing Pressure Zone	Junction No.	2016	+10 years w/ Proposed Improvements <sup>1</sup>	+20 years w/ Proposed Improvements <sup>2</sup>	+20 years w/ All Improvements <sup>3</sup>	Target Fire Flow (gpm)
Amazon Fulfillment Center	20403 68th Ave S	240 Zone	J-26014	4,666	3,749	4,647	6,000	4,600
Carpet Exchange	9021 S 180th St	240 Zone	J-26488	3,876	3,903	3,900	6,000	5,000
Farrington Court Retirement	516 Kenoshia Ave	240 Zone	J-27093	856	969	970	6,000	4,800
Kent North Corporate Park	7611 & 7691 S 180th St	240 Zone	J-27134	1,391	1,406	1,404	1,404	5,000
Regional Justice Center	401 4th Ave N	240 Zone	J-27091	1,910	1,878	2,801	6,000	5,000
Stafford Suites Retirement	112 Kennebeck Ave	240 Zone	J-779	740	900	1,248	4,684	3,450
Lake Fenwick Estate Apts.	24849 46th Ave S	354.5 Zone	J-27094	1,750	1,908	1,893	1,893	1,650
Kent Church of the Nazarene	930 E James St	485 Zone	J-2111	418	432	432	1,382	3,282
Fire Station 73	26512 Military Rd S	529 Zone	J-854	1,253	1,253	1,382	1,382	1,500
Star Lake Elementary <sup>4</sup>	4014 S 270th St	529 Zone	J-798				777	3,163
Trinity Reformed Church	3807 Reith Road	529 Zone	J-27096	1,416	5,649	5,927	6,000	2,013
Totem Middle School	26630 40th Ave S	575 Zone	J-27095	1,235	850	879	1,594	4,600
Cornerstone Baptist Church	25030 Military Rd	587 Zone	J-1749	1,414	2,581	2,522	2,217	1,725
Sunny Crest Elementary	24629 42nd Ave S	587 Zone	J-26671	1,198	1,199	1,207	5,039	3,594
West Hill Plaza	24700 36th Ave S	587 Zone	J-27092	(N/A)	2,376	1,763	6,000	2,200
Home Depot	26120 104th Ave SE	590 Zone	J-1100	5,010	3,457	3,338	6,000	4,600
Kent-Meridian High School	10020 SE 256th St	590 Zone	J-26269	4,046	4,035	4,012	6,000	4,600

- (1) Includes 10-year CIP projects presented in Chapter 9, and assumed high priority water main replacement improvements.
- (2) Includes 20-year CIP projects presented in Chapter 9, and does not include medium or low priority water main replacement improvements.
- (3) Includes 20-year CIP projects presented in Chapter 9, and all medium and low priority water main replacement projects.

(4) Fire protection provided by Highline Water District.

Once all deficiencies were identified based on the general planning-level fire flow requirements, proposed water main improvements were included in the model, and pressure and fire flow analyses were performed throughout the system to demonstrate that the improvements will eliminate the deficiencies and meet the current flow and pressure requirements. These analyses were modeled under projected year 2028 and 2038 MDD conditions to ensure that the improvements are sized sufficiently to meet the future systems' needs. A description of these improvements and a figure showing their locations are presented in **Chapter 9**, and the results of the 20-year fire flow analyses is presented in **Figures 7-3** and **7-4**, based on the improvements scheduled to be completed within the 20-year planning period as identified in **Chapter 9** (and not including medium or low priority water main replacement projects). A summary of the fire flow deficiencies and limitations in the 2038 planning period with the proposed 20-year improvements is as follows.

 240 Zone: No widespread limitation, fire flows largely localized issues with 6-inch or 8-inch main being located adjacent to land uses with fire flow requirements in excess of 3,000 gpm.

- 271 Alvord: Limited by 8-inch main downstream of PRV, which was installed in 2012. Fire flow in zone limited to approximately 1,300 gpm due to this piping.
- 339 Seattle: Limited by 6-inch main downstream of PRV, which was installed in 2006. Fire flow in zone limited to approximately 750 gpm due to this piping.
- 366 Stetson: Limited by 6-inch main downstream of PRV, which was installed in 2012. Fire flow in zone limited to approximately 750 gpm due to this piping.
- 368 Weiland: Limited by 6-inch main upstream and downstream of PRV, which was installed in 1993. Fire flow in zone limited to approximately 680 gpm due to this piping.
- 485 Zone:
  - South of SR 516: 6-inch main throughout neighborhood limiting fire flow to approximately 1,100 gpm.
  - o North of 234<sup>th</sup> Street: limited by 8-inch main on either side of the 234<sup>th</sup> and 96<sup>th</sup> PRV. Fire flow in vicinity limited to 1,000 to 1,400 gpm.
- 590 and 640 Zones: Fire flow limitations largely localized issues at dead-ends, or as a result of 6-inch main within neighborhoods.
- West Hill Zones: Fire flow limitations largely localized issues at dead-ends, or as a result of 6-inch main within neighborhoods.

#### **DEFICIENCIES**

Several areas throughout the system have sufficient fire flow; however, high water velocities are experienced in the system because the water mains are undersized to carry the demands and fire flows at acceptable water velocities. Operating the system with high water velocities can potentially damage the system due to the high pressure surges that commonly occur with high water velocities.

Some areas of the system have water mains that are more than 50 years old, which is approaching or beyond the average life expectancy of water mains of this vintage. Approximately 23 percent of the City's water main is cast iron pipe. Most of the cast iron pipe is located in the older areas of the City. The City is planning to replace the aging water main in the future, as shown in the schedule of planned improvements in **Chapter 9**. All new water main installations are required to use ductile iron water main in accordance with the City's Water System Standards, a copy of which is included in **Appendix G**.

# TELEMETRY AND SUPERVISORY CONTROL SYSTEM

This section evaluates the City's existing telemetry and supervisory control system to identify deficiencies related to its condition and current operational capability.

#### **EVALUATION AND DEFICIENCIES**

The water system has a Headquarters telemetry control panel at the Public Works Operations Building at 5821 South 240<sup>th</sup> Street. System facilities, including source, storage, and pumping, can be monitored with the telemetry system. The City performs regular calibration checks of the telemetry system components, including annual inspections of all telemetry recording instruments and mechanical flow meters. The City continually strives to improve the capabilities of the supervisory control and data acquisition (SCADA) system, and has plans to implement remote totalizer reading capabilities, which will allow for system-wide supply totals to be obtained instantaneously to allow for better recordkeeping of supply and consumption. There are no known deficiencies with the existing telemetry/SCADA system.

# SYSTEM CAPACITY

This section evaluates the capacity of the City's existing water system components (e.g., supply, storage, and transmission) to determine the maximum number of ERUs it can serve. Once determined, system capacity becomes useful in calculating how much capacity is available in the water system to support new customers that apply for water service through the building permit process. The system capacity information, together with the projected growth of the system expressed in ERUs, as shown in **Chart 4-7** of **Chapter 4**, also provides the City with a schedule of when additional system capacity is needed.

#### ANALYSIS CRITERIA

The capacity of the City's system was determined from the limiting capacity of the water rights, source, transmission, and storage facilities. The supply capacity analysis was based on the limiting capacity of the supply facilities and the system's MDD per ERU.

The transmission capacity analysis was based on the total capacity of the transmission system with a maximum pipeline velocity of 5 fps for the PHD analysis and 8 fps for the MDD plus fire flow analysis. The transmission capacity analysis considered the limiting supply requirement between the system's PHD and the MDD plus the maximum fire flow requirement for the system. The transmission system includes the following components.

- 31-inch-diameter Kent Springs Transmission Main (240 Zone).
- 12-inch-diameter Kent Springs Transmission Main (590 Zone).
- 21-inch-diameter Clark Springs Transmission Main.
- 16-inch-diameter transmission main downstream of the Garrison Creek Well and Reservoir site.
- 16-inch-diameter transmission main downstream of the 208<sup>th</sup>/212<sup>th</sup> Wellfield site.
- 12-inch-diameter transmission main downstream of the East Hill Well site.
- Two 16-inch-diameter transmission mains downstream of the Guiberson Reservoir site.

The storage capacity analysis was based on the storage capacity for equalizing and standby storage and the computed storage requirement per ERU. Operational and fire flow storage capacity were excluded from the storage analysis because these components are not directly determined by water demand or ERUs. For the analyses, a reserve amount equivalent to the existing operational and fire flow storage requirements were deducted from the total available storage capacity to determine the storage capacity available for equalizing and standby storage. This storage capacity available for equalizing and standby storage was divided by the existing number of ERUs presented in **Chapter 4** to determine the storage requirement per ERU.

The annual water rights capacity evaluation was based on the existing annual water rights, as summarized in **Chapter 6**, and the system's average day demand per ERU. The instantaneous water rights capacity evaluation was based on the existing instantaneous water rights, as summarized in **Chapter 6**, and the system's MDD per ERU.

The ERU-based demand data was derived from the average day demand of the system and demand peaking factors from **Chapter 4**.

#### CAPACITY ANALYSIS RESULTS

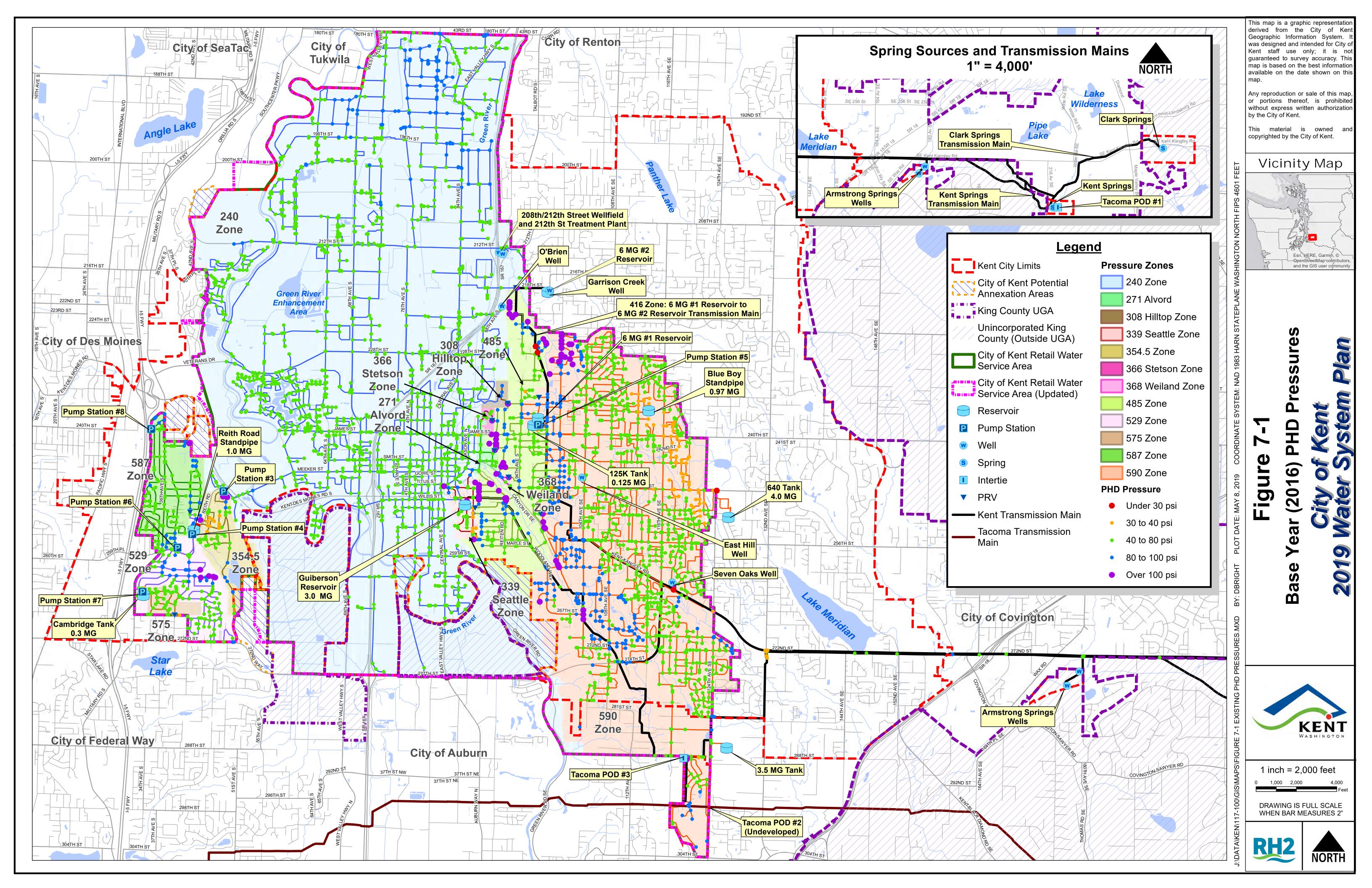
A summary of the results of the existing system capacity analysis is shown in **Table 7-26**. The results of the existing (2018) system capacity analysis indicate that the limiting capacity of the system is storage, which can support up to a maximum of approximately 73,972 ERUs. The existing water system has a surplus of approximately 27,893 ERUs based on this limiting component.

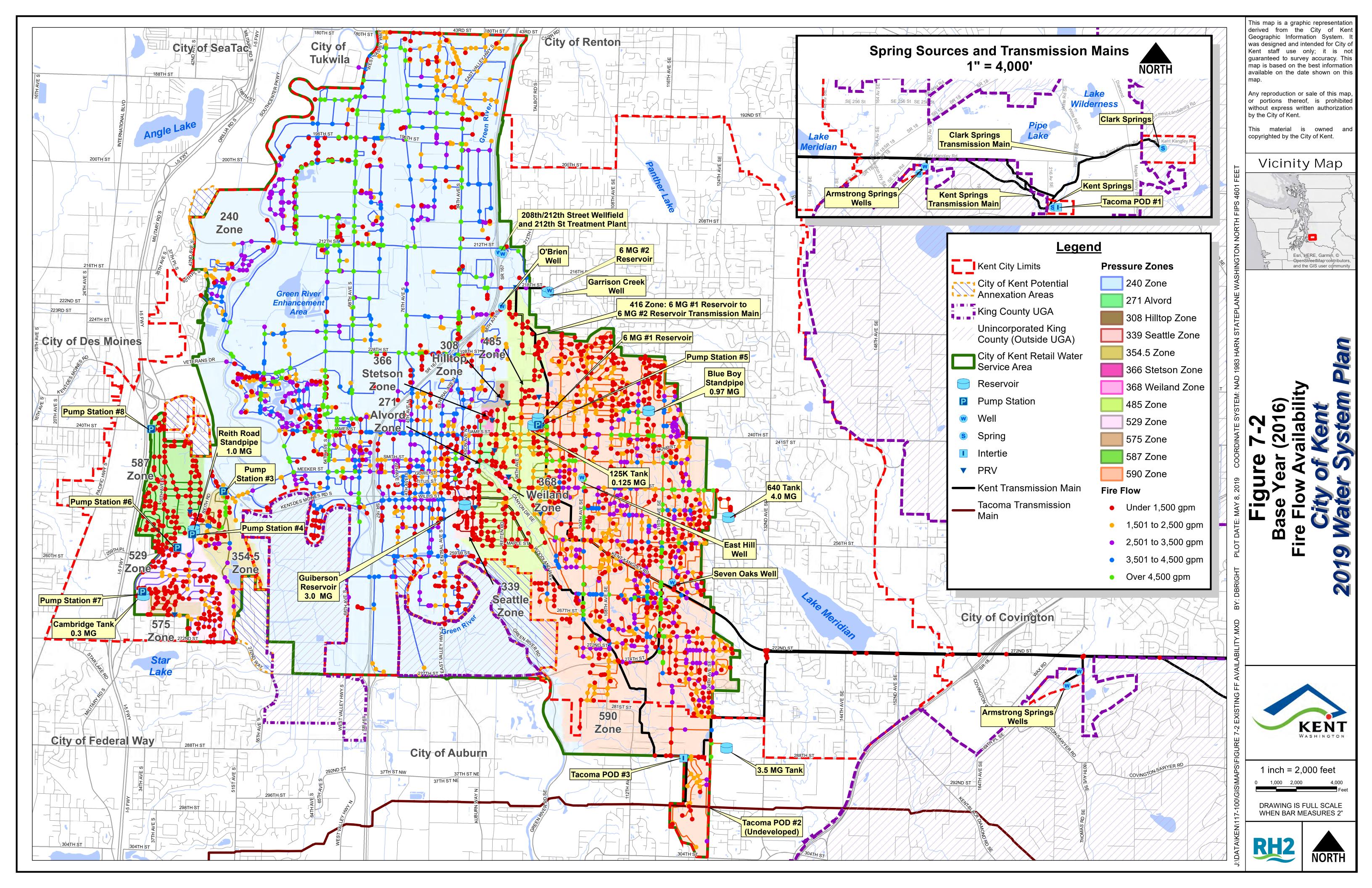
Table 7-26 System Capacity Analysis

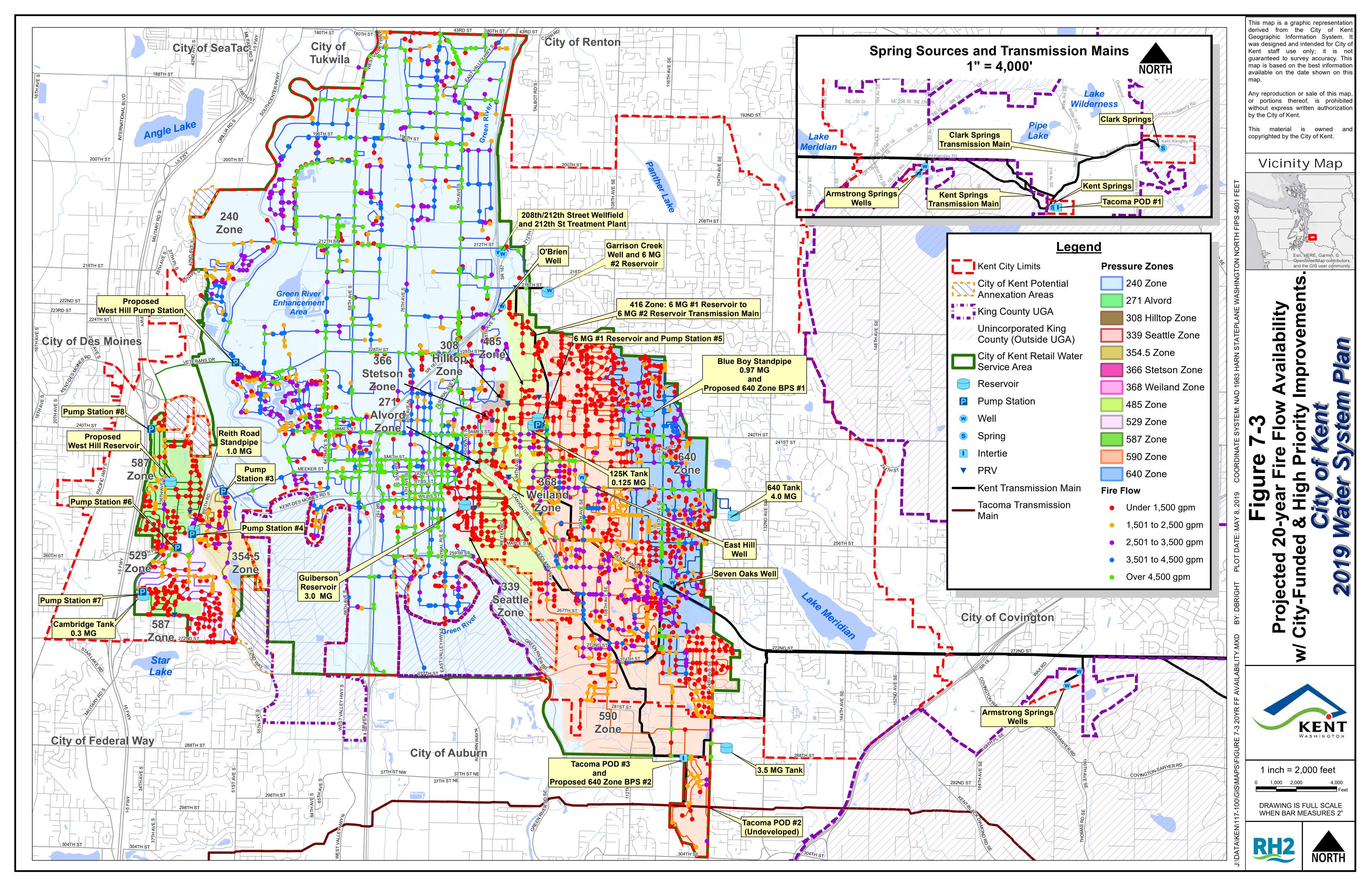
	Base Year	Existing		ected
Description	2016	2018	2028 (+10 years)	2038 (+20 years)
Demands	Per ERU Basis			
Average Day Demand per ERU (gal/day) <sup>1</sup>	172	171	171	171
Maximum Day Demand per ERU (gal/day) <sup>1</sup>	373	371	371	371
Peak Hour Demand per ERU (gal/day) <sup>1</sup>	546	542	542	542
Water Rights Capac	ity: Annual Average	e Based		
Water Rights Capacity - Annual Average Based (gal/day)	30,134,126	30,134,126	30,134,126	30,134,126
Average Day Demand per ERU (gal/day)	172	171	171	171
Water Rights Annual Average Based Source Capacity (ERUs)	175,500	176,674	176,674	176,674
Water Rights Capa	city: Instantaneous	Based		
Water Rights Capacity - Instantaneous Based (gal/day)	46,002,240	46,002,240	46,002,240	46,002,240
Maximum Day Demand per ERU (gal/day)	373	371	371	371
Maximum Day Based Source Capacity (ERUs)	123,216	124,040	124,040	124,040
Source Capacity	r: Maximum Day Ba	ised		
Source Treatment Capacity - Maximum Day Based (gal/day)	36,227,520	36,227,520	36,227,520	36,227,520
Maximum Day Demand per ERU (gal/day)	373	371	371	371
Maximum Day Based Source Treatment Capacity (ERUs)	97,035	97,684	97,684	97,684
Stora	ge Capacity			
Maximum Equalizing & Standby Storage Capacity (gal)	14,794,367	14,794,367	18,898,504	18,898,504
Equalizing & Standby Storage Requirement per ERU (gal)	200	200	200	200
Maximum Storage Capacity (ERUs)	73,972	73,972	94,493	94,493
Transmission Car	acity: PHD Based (	5 fps)		
Transmission Capacity (gal/day)	36.273.200	36,273,200	36,273,200	36,273,200
Peak Hour Demand per ERU (gal/day)	546	542	542	542
Maximum Transmission Capacity (ERUs)	238,794	240,391	240,391	240,391
Transmission Capacity:	MDD + Fire Flow B	ased (8 fns)		
Transmission Capacity (gal/day)	35.222.880	35.222.880	35,222,880	35,222,880
MDD + Maximum Fire Flow Requirement (gpm)	16,629	16,867	17,375	18,208
Maximum Day Demand per ERU (gal/day)	373	371	371	371
Maximum Transmission Capacity (ERUs)	151,741	151,831	149,860	146,627
Maximum	System Capacity			
Maximum System Capacity (ERUs)	73,972	73,972	94,493	94,493
Limiting Facility	Storage	Storage	Storage	Storage
	ble System Capaci	•		
Maximum System Capacity (ERUs)	73,972	73,972	94,493	94,493
Projected ERUs	44,854	46,079	48,049	51,283
Unused Available System Capacity (ERUs)	29,118	27,893	46,443	43,210

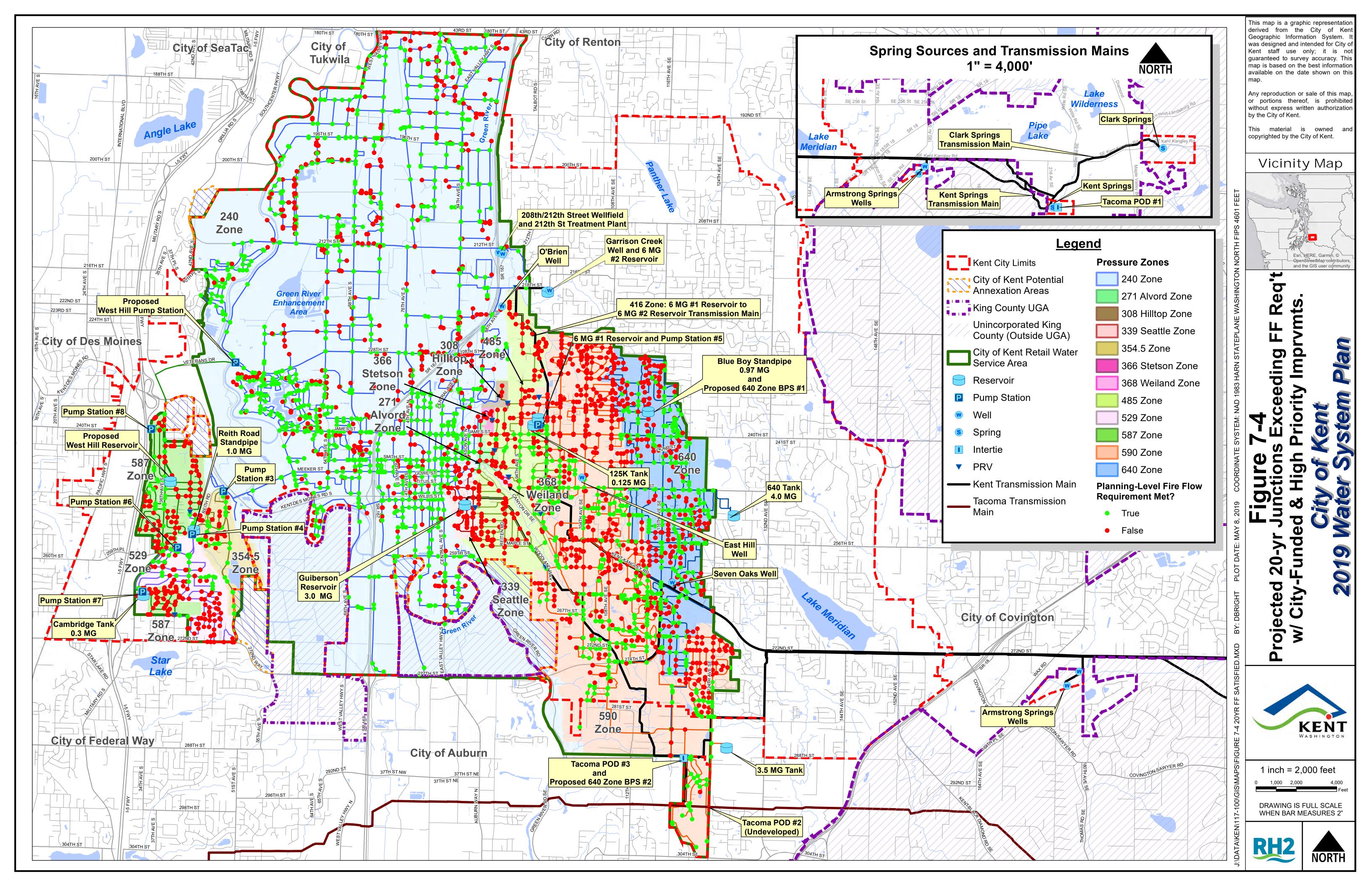
A summary of the results of the 10-year projected system capacity analysis also is shown in **Table 7-26**. The 10-year projected system capacity analysis includes improvements that are planned to be completed within the 10-year planning period, as described in **Chapter 9**. The primary improvements that impact the system capacity analysis are the proposed construction of a West Hill Reservoir and the 640 Zone conversion, which increases the available storage volume in the existing 640 Tank. The results of the 10-year projected system capacity analysis indicate that the storage capacity increases to 94,493 ERUs, and the limiting component remains storage. The system is projected to have a surplus of approximately 46,443 ERUs in 2028 if the improvements are completed as planned.

The water system's projected 2038 capacity is 94,493 ERUs, based on the same storage limitations as projected in 2028. In 2038, the system is projected to have a surplus of approximately 43,210 ERUs if the improvements are completed as planned.









# 8 | OPERATION AND MAINTENANCE PROGRAM

# WATER DEPARTMENT GENERAL INFORMATION

The City of Kent Water Department's current mailing address and phone number is as follows.

City of Kent Water Department Mailing Address: 220 4<sup>th</sup> Avenue South

Kent, Washington 98032-5895

Phone: (253) 856-5600 Fax: (253) 856-6600

City of Kent Water Department's Site Address: City of Kent Water Department

5821 South 240<sup>th</sup>

Kent, Washington 98032-5895

State Department of Health Identification Number: 381501

State Department of Health Contact Person: Ms. Brietta Carter, P.E.

State Department of Health 20425 72<sup>nd</sup> Avenue South

Bldg. 2, Suite 310

Kent, Washington 98032-2358

(253) 395-6770

State Department of Health After Business Hours Hotline: 1 (877) 481-4901

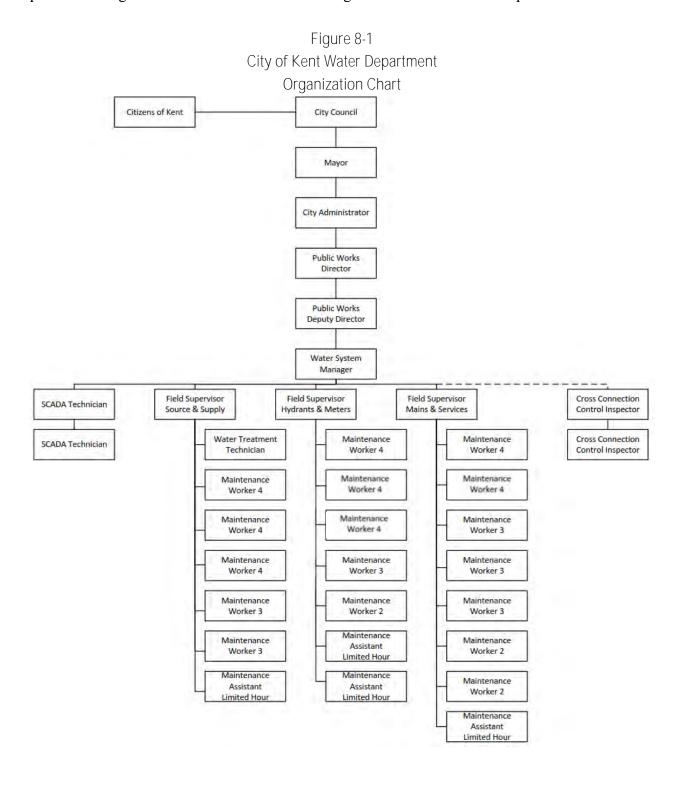
(Weekends, Evenings, Holidays)

# WATER SYSTEM ORGANIZATION, MANAGEMENT, AND PERSONNEL

The City of Kent (City) is a municipality organized with an elected mayor/council type of government. Overall City management, including Public Works, is provided by a City Operations Manager who acts under the direction of the Mayor and City Council. The Public Works Director manages the entire Public Works Department, including an Engineering Division that provides support to all of the Public Works divisions. A Public Works Operations Manager oversees the operation of the Public Works Maintenance Division, which includes the Water Department. The water system is operated and maintained under the direct supervision of a Water System Manager, who holds the Water Distribution Manager 4 certification required by the Washington State Department of Health (DOH).

The Water System Manager and Public Works Deputy Director/Operations Manager handle the routine management decisions for the Water Department. The Public Works Director is involved with all decisions of a significant nature, including the planning for future needs. All major policy decisions and capital requests are reviewed and approved by the Mayor/City Council/Operations Manager. The following sections identify functions in the City Water Department, and an asterisk (\*) denotes specifically qualified and licensed/certified personnel

necessary for water system operation in accordance with the requirements of DOH. **Figure 8-1** presents an organizational chart of the internal organization of the Water Department.



#### NORMAL DAY TO DAY OPERATIONS

Management, supervision, and direction is provided by the Water System Manager.\* The Field Supervisors implement and follow through on the planned schedules for operation and maintenance of the water system, and implement emergency repairs under the direction of the Water System Manager. Routine repair needs are often requested or reported by customers or citizens of Kent, by meter reader personnel, or by other City staff; and are prioritized and merged with the work schedules by the Field Supervisors\* for their specific areas of responsibility. The Water System Manager is required to hold a State of Washington Water Distribution Manager 4 (WDM 4) certification.

#### PREVENTATIVE MAINTENANCE

Weekly work schedules and personnel assignments are prepared by the Field Supervisors\* and reviewed with the Water System Manager. Ongoing preventative maintenance programs are improved upon continuously by the field personnel, along with new programs, under the direction of the Field Supervisors and the Water System Manager. The implementation of an Infrastructure Management System (Cityworks) is in progress and will be used to track system component inventory, record maintenance history, produce preventative maintenance work schedules, and predict expected life for the water system infrastructure.

#### FIELD ENGINEERING

Three technical groups support the engineering needs of the water system. The general areas of responsibility are identified in the sections that follow and are shown with the group that normally handles the work in that area.

#### Consulting Engineers\*

Consulting engineers are typically retained to perform specialized studies related to the water system, such as this Water System Plan (WSP). They also are retained for specialized design, planning, and construction needs such as water quality studies and system planning, water storage reservoirs, treatment systems, pump stations, hydraulic analyses, and structural improvements. Consulting engineers are considered Engineer of Record on many of the City's projects, and as such, are required to be registered as Professional Engineers in the State of Washington in the specific engineering application that is required for a given project.

#### Public Works Operations Engineers\*

The City of Kent's Public Works Operations Engineers typically are registered Professional Engineers. These individuals typically are responsible for specialized projects and smaller design and construction needs that do not require assistance from outside consultants. These include completion of water treatment and distribution project management, water system construction standards, construction plan review, Geographic Information System (GIS) conversion and implementation, water system planning, and capital project coordination.

#### Public Works Engineering\*

Employees of the Public Works Engineering group normally design and manage distribution water system projects, and manage developer improvements to the water system, water tank painting and structural improvements, water main replacements, and construction standards. A variety of certifications are applicable to this category of Public Works staff, primarily registered Professional Engineers.

#### WATER OUALITY MONITORING

Daily system monitoring of water quality and the required water system monitoring is performed by the Water Source and Supply Staff of the Water Department, under the direction of the Water System Manager, a WDM 4 in compliance with DOH requirements. Water treatment plant operation is performed by Water Treatment Plant Operator 2 (WTPO-2) certified personnel,\* as required by DOH, under the direction of the Water System Manager. In-house staff performs most routine water analysis functions daily, and a State-certified contract laboratory is used for compliance monitoring requirements.

#### **EMERGENCY RESPONSE**

This section provides a brief overview of the key staff responsible for emergency response as it relates to the water system. The City maintains a comprehensive City-wide emergency response plan that is used in the event of an emergency. The emergency contact list is located in the Water Facilities Control Center at 5821 S. 240<sup>th</sup> Street, Kent, Washington 98032. Additional information of the basic elements of that plan is provided later in this chapter. The water system emergency response program itself is classified as a confidential document due to the critical nature of maintaining water system security as a matter of practicality, and in accordance with the Homeland Security Act.

#### After Hours Emergency Personnel

The Water System Manager is on-call at all times, available by telephone 24 hours a day. The City's Police Department maintains call-out lists of all Water Department personnel, as well as procedures for contacting them during emergencies or for customer complaints. Two Water Department personnel are normally on 24 hour standby duty, with cell phones and a City vehicle available for use after hours, on weekends during the higher demand months, and on holidays.

#### Normal Working Hours Emergency Personnel

Most emergencies during normal working hours are routed through Administration Staff for prioritization and dispatch to field crews. The Water Control Center monitors the Master Supervisory Control and Data Acquisition (SCADA) terminal and monitors the water system operation, under the direction of the Water System Manager. Major City emergencies are managed by the City Emergency Operations Committee (EOC) and the Kent Fire Department, and coordinated with the Water Department and other utilities through the Public Works DOC.

#### CROSS-CONNECTION CONTROL PERSONNEL

The City's Cross-Connection Control (CCC) program is managed by a designated Cross Connection Control Inspector\* (CCS-1) under the supervision of the Water System Manager. All Water Department personnel classified as Maintenance Worker 3 and above are required to be CCS-1 certified to assist with water system protection and implementation of the program.

#### IMPLEMENTATION OF THE IMPROVEMENT PROGRAM

Improvements are jointly planned, budgeted, and prioritized by personnel of the Engineering and Operations divisions of the Public Works Department. Once developed, the annual budget is submitted to the Public Works Department for review and approval, and to the Mayor and City Council for adoption. Overall implementation is the responsibility of the Public Works Director or designee, who assigns specific elements thereof to the City Engineer or Operations Manager.

#### **BUDGET FORMULATION**

Field crews and Field Supervisors prepare and submit operating budget and capital budget requests to the Water System Manager, who prioritizes requests and adds capital improvements, reviews them with the Public Works Operations Manager, and submits them to the Public Works Director for review and approval. Final approval is given by the City Operations Manager, Mayor, and City Council. The Water Department rate structure and debt service is managed by the Public Works Director and staff, as well as the City Finance Department.

#### RESPONSE TO COMPLAINTS

Complaints are recorded by office staff and routed to the Water System Manager or Field Supervisors for follow up or crew dispatch in a timely manner. Follow-up results are reviewed by the Water System Manager and recorded by office staff. An Infrastructure Management System Customer Service module is used to provide better complaint tracking and more effective response.

#### PUBLIC PRESS CONTACT

All press-related releases related to the Water System are generally routed to the Water System Manager, and reviewed with the Public Works Operations Manager and the Public Works Director.

#### BILLING

Water customers' billing and meter reading is managed by the Utility Billing division of the Finance Department.

# PERSONNEL CERTIFICATIONS

DOH requires State certifications for individuals responsible for certain aspects of water system management and operation. The City associates State certifications with specific job classifications as follows:

- Water System Management Water Distribution Manager 4
- Water Treatment Plant Supervision WTPO-2
- Water Treatment Plant Operation WTPO-1
- Cross-Connection Control Program CCS-1

The City has on staff the personnel to meet or exceed those requirements and requires DOH certification of all tenured water operations and maintenance personnel. This is achieved by sponsoring personnel attendance at appropriate safety and technical seminars to encourage advancements and compliance with the professional growth required. **Table 8-1** provides a listing of current certifications held by City staff members, and those required by DOH for this water system as indicated by an asterisk (\*).

Table 8-1
Employee Certification

Certification	Number of Certified Personnel
BAT - Backflow Assembly Tester	1
*CCS 1 - Cross-Connection Specialist 1	24
WDMIT - Water Distribution Manager in Training	0
WDM1 - Water Distribution Manager 1	6
WDM2 - Water Distribution Manager 2	13
WDM3 - Water Distribution Manager 3	5
*WDM4 - Water Distribution Manager 4	1
WDS - Water Distribution Specialist	10
WTPOIT - Water Treatment Plant Operator in Training	4
*WTPO1 - Water Treatment Plant Operator 1	5
*WTPO2 - Water Treatment Plant Operator 2	2
WTPO3 - Water Treatment Plant Operator 3	2
WTPO4 - Water Treatment Plant Operator 4	1

# SAFETY PROCEDURES

Employees of the City's Water Department adhere to all relevant Occupational Safety and Health Administration (OSHA)/Washington Industrial Safety and Health Act (WISHA) safety requirements, and follow procedures that meet or exceed those requirements (i.e., lock out/tag

out for pump station repairs and maintenance). Regular training of employees during safety meetings and tailgate meetings ensures that all employees are reminded of current safety policies and procedures.

Areas of potential work place hazards that have been identified by Water Department personnel are as follows:

- Confined space hazards primarily atmospheric or oxygen deficiency
- Electrical, mechanical, and energy hazards
- Hazardous chemicals and materials
- Asbestos pipe hazards
- Fall hazards
- Excavation hazards
- Equipment operation hazards

The City has compiled programs to ensure the safety of its employees and citizens in each of the areas above. The employees are thoroughly trained in each of the safety programs as they apply to their job duties, and there are daily safety tailgate meetings with crews held by Field Supervisors to review specific safety procedures for the scheduled tasks and assignments. The department crews meet together monthly for mandatory safety training organized and coordinated by the Safety Committee, made up of representatives from each department. The committee also regularly inspects facilities and maintenance practices, as well as investigating incidents and accidents, to aggressively reduce workplace accidents and injuries of employees. First aid training is required for all employees, and first aid equipment (ten unit packs) are maintained in all vehicles and at major facilities. Emergency services (911) is called whenever needed for medical aid.

# ROUTINE SYSTEM OPERATION

The following presents a schedule of inspection and maintenance for major water system components within the City's water system. Detailed information regarding specific facilities and equipment is not presented herein and is contained in Operation and Maintenance manuals.

#### WELLS AND SPRINGS

Well and spring source facilities are exercised regularly to maintain reliability when not in use. Disinfection and bacteriological analyses are performed after long periods of inactivity or following rehabilitation work on the source facilities. When online, local programmable logic controller (PLC) or remote (SCADA) controls start and stop the pumps as needed based on reservoir levels or system pressure.

#### PUMP STATIONS

Pumps alternate on and off regularly, usually every 24 hours, to provide exercise and maintain maximum reliability. Local controls (or remote SCADA control) start and stop the pumps as needed based on system pressures or reservoir levels.

#### RESERVOIRS

Reservoirs are monitored regularly for chlorine residuals, daily or weekly, to ensure frequent water turnover and avoid stagnation. Pump start and stop setpoints are set to ensure frequent water level cycling. Reservoirs that are drained for maintenance or repairs are cleaned, disinfected, and sampled for bacteriological or volatile organic compounds (VOCs) before being returned to service, following American Water Works Association (AWWA) Standards.

#### METER READING

Source, pump station, and reservoir meters are read each weekday on a regular schedule when online. The Water Department plans to implement remote totalizer reading with its new SCADA system in the near future, which will allow for system-wide totals to be obtained at a preset time, even on weekends and holidays. This will allow for better recordkeeping of production and demand, and enhance daily demand planning during peak periods.

# SYSTEM PERFORMANCE

The overall performance of the water system is monitored by two critical parameters:

- Water Quality Reliability Operations and maintenance programs and priorities are aligned to achieve optimum water quality that meets or exceeds DOH requirements throughout the water system. Water quality performance is measured by the history of Maximum Contaminant Level (MCL) violations, as well as the number, frequency, and type of complaints from customers regarding water quality. Performance also is measured by the daily source/system water quality parameters being above or below the average recorded. The City's water system has an excellent record of water quality over the last 6 years; and
- Water Production and Storage Operations and maintenance programs and priorities are aligned to achieve a reliable water supply measured in quantity stored to meet both demands and system pressures. The City's system has a good history of maintaining reservoir levels at or above 80 percent at all times and water system pressures meeting the system design, even during peak summer demands and fire flow conditions/testing. Performance is measured by monitoring and recording reservoir levels and system pressures, as well as tracking customer complaints for low pressure. Customers are advised of the system pressure available and what is causing the volume restrictions.

Facility or system component performance is generally reflected in one of the two areas identified above. Individual equipment or appurtenance performance is monitored for reliability throughout its life cycle. Those which do not meet the criteria are scheduled/budgeted for replacement. The Hansen IMS system will assist in tracking performance and maintenance history in the future, as well as maintenance and repair costs.

## PREVENTATIVE MAINTENANCE

The City maintains a strong preventative maintenance program to maximize the useful life of all water system facilities and avoid emergency conditions wherever possible by performing system maintenance on a regularly scheduled and timely manner. A key component of the City's preventative maintenance and asset management is the Hansen IMS (Infrastructure Management System). The City invested in this program to track maintenance work on its infrastructure and create a database that includes maintenance information on water system facilities such as valves, hydrants, water mains, water meters and services, pump stations, sources/wells, treatment facilities, and storage tanks/reservoirs.

Another key change to water system operation and maintenance in recent years is the advancement of the City's GIS. The City's in-house GIS staff and Water Department personnel have worked to create a comprehensive water system map in GIS linked to the Hansen technical maintenance data for a specific location or facility. When the Hansen system generates a work order, it also has the capability (as soon as it is linked to GIS) to print a map of where the asset identified on the work order is located. This allows for City-wide integration of data and assists with a variety of inter-department functions such as scheduling capital improvements projects, budgeting, and coordinating water, sewer, street, and storm water infrastructure repairs and projects through the common GIS database.

Another key benefit of the Hansen software in conjunction with the City-wide GIS system is that it provides a mechanism for developing an inventory of all water system assets. Using the inventory of assets and historical maintenance and repair data, a "self-thinking" database can be established to prompt staff when preventative maintenance work needs to be performed. Full implementation of the program will allow the City to:

- Inventory/track all assets by ID number and physical address;
- Track labor, material, and associated costs;
- Schedule work by individual asset or group assets;
- Generate work orders for scheduled and unscheduled preventative maintenance;
- Forecast repairs and replacement part needs; and
- Project budgetary information.

#### FIRE HYDRANTS

There are approximately 2,900 hydrants within the water system that are maintained by the Water Department. Information such as location, size, type, feeder information, manufacturer, and number of turns for the foot valve are examples of the information that is collected for the database.

Presently, City Water personnel have the responsibility for an ongoing program of inspecting and flushing hydrants. The Water Department hires one or more Maintenance Assistants who have a goal to inspect and operate approximately one-half of the fire hydrants annually and notify the Water Distribution Supervisor of any items requiring maintenance. With the addition of the

Hansen system, the Water Department does not anticipate changing the current inspection procedures; however, it will provide the database for labor, material, and historical data.

#### METERS 3 INCHES AND LARGER

Large meters, sized 3 inches and 4 inches, currently undergo bi-annual testing, and all meters sized 6 inches to 10 inches are tested annually. Some large meters require additional personnel to enter the confined space and provide support during the testing. The work order generated by the Hansen system will prompt crews in advance if the meter is located within a confined space, as well as the history of repairs and accuracy profile of each meter. The City has been upgrading many of the large meters and vaults for the past 10 years, and the accuracy, reliability, and safety has been significantly improved.

#### WATER MAINS/DEAD-END MAINS

There are approximately 595 dead-end mains within the distribution system. Dead-end mains are flushed on a yearly basis or more frequently as required. Each dead-end main has been assigned a unique identifier within the Hansen system for better tracking of historical data. Each time the main is flushed, it is recorded in the database. After a few years (or sooner for mains that require more frequent flushing), the database will generate work orders for main flushing. Other distribution mains are flushed or cleaned on an as-needed basis.

#### **PUMP STATIONS**

All water sources and pump stations are visited on a daily basis while in operation. Well and pump data is recorded and monitored to identify any irregularities in system operation. Pumps and pump station equipment receive regular service on an hours-in-operation or lapsed time basis.

#### STORAGE RESERVOIRS

Daily visits to the storage reservoirs are made to check security and overall site conditions. The reservoirs are taken out of service approximately every 3 to 5 years for cleaning and are painted every 10 to 15 years or on an as-needed basis.

#### PRESSURE REDUCING VALVES

City-owned distribution system pressure reducing valves are inspected monthly, receive complete maintenance on an annual basis, and are rebuilt every 5 years. Maintenance for privately owned pressure reducing valves is the responsibility of the customer.

#### **TELEMETRY**

The telemetry system employs primarily electronic components that require little maintenance, other than calibration checks and battery replacement. The telemetry system is inspected annually. This includes inspecting all telemetry recording instruments and mechanical flow meters.

In addition, more frequent checks are made to monitor facilities having temporary problems. Emergency response equipment and spare parts inventory also are checked periodically.

#### WATERSHED INSPECTION

To assist in maintaining the integrity of the City's water supply sources, the City has a watershed inspection and wellhead protection area (WHPA) program. Under this WHPA, the watershed areas are inspected on a regular basis for any activity that may affect the water quality at the City's facilities. Should a potential issue appear, the City would proceed with the necessary testing and studies to verify or discount the concerns. Should a concern be validated, the City would take whatever steps necessary to protect the integrity of its sources, which could include both physical improvements at its sources and legal action against the polluter. The City has obtained baseline sampling results from multiple sites within its most susceptible watershed and WHPA's 1 year time of travel, for high and low aquifer level periods, as phase one of its WHPA program.

The City also has advised King County of areas under County jurisdiction that fall within the watershed area and requested consideration and cooperation of protection of the watershed in County land use planning and actual developments.

Further protection of the sources of supply is achieved by regular, contracted daily security patrol services during evening and night time hours at these sources.

#### PREVENTATIVE MAINTENANCE SCHEDULE

A summary of the City's water system preventative maintenance schedule is described in **Table 8-2**.

Table 8-2
Preventative Maintenance Schedule

Task			Interva	al		
Sources of Supply	Daily	Weekly	Monthly	Semi- Annual	Annual	Comments
Inspect online buildings and sites, pumps, and chemical feed equipment, record flow and hour meter readings and electronic well levels, make adjustments, add chemicals, and sample and record water quality information.	Х					
Exercise generators.		Χ				
Inspect all facilities, manually sound and record pumping and monitoring well levels. Clean buildings and piping.		Х				
Inspect and exercise/test all equipment, perform scheduled PM, lubricate, and adjust equipment as necessary per manufacturers recommendations, record pump and motor voltage, amperage, and efficiency values.			X			
Inspect and test motor/pump bearings - ultrasound.					Х	
Inspect and test electrical panels and motor connections - infrared.					Χ	
Inspect watersheds and surrounding areas - WHPA.			Х			
Monitoring well levels recorded.			Х			More thorough summer/winter
Grounds maintenance, mowing, and weeding.		Х				Spring/Summer
Tree pruning and clearing fence lines.				X		Spring/Fall
Repaint buildings and piping.						1-5 years
Inspect/clean/test pump control valves.					Χ	
Rebuild pump control and flow control valves - replace all rubber parts.						Contractor (4 years)
Calibrate flow meters, level, and pressure transmitters, rebuild as necessary.					X	

Table 8-2
Preventative Maintenance Schedule (Continued)

Pump Stations	Daily	Weekly	Monthly	Semi- Annual	Annual	Comments
Inspect online buildings and sites, pumps, and equipment. Record flow/hour meter and pressure readings, check Cl <sub>2</sub> and pH readings.	Х					
Exercise generator(s) and diesel pump(s).		Х				
Inspect all facilities, clean buildings and piping.		Χ				
Inspect and exercise/test all equipment, perform scheduled PM, lubricate, and adjust equipment as necessary per manufacturers recommendations, record pump and motor voltage, amperage, and efficiency values.			Х			
Inspect and test motor/pump bearings - ultrasound.					Χ	
Inspect and test electrical panels and motor connections - infrared.					Х	
Inspect/clean/test pump control valves.					Χ	
Rebuild pump control valves - replace all rubber parts.						Contractor (4 years)
Calibrate flow meters and pressure transmitters - rebuild as necessary.					Χ	
Repaint buildings and piping.						1-5 years
Grounds maintenance, mowing, and weeding.		Χ				
Tree pruning and clearing fence lines.				Х		Spring/Fall
Pressure Reducing Valves Stations and Vaults	Daily	Weekly	Monthly	Semi- Annual	Annual	Comments
Inspect and clean valve stations and vaults. Record pressures and check operation.			Х			
Inspect, clean, adjust, and test pressure reducing valves.					X	
Rebuild control valves - replace all rubber parts.						Contractor (4 years)

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Table 8-2
Preventative Maintenance Schedule (Continued)

SCADA System		Weekly	Monthly	Semi- Annual	Annual	Comments
Remote units (RTU) - Inspect and test batteries, calibration, and radio transmission.				Χ		
Base station and master SCADA - test auxiliary power.			Х			
Clean and test/verify function of all discrete, analog, and control points from remote sites.					Χ	
Distribution System	Daily	Weekly	Monthly	Semi- Annual	Annual	Comments
Collect representative samples Cl <sub>2</sub> , NaE, and pH.	Х					
Reservoir/remote sites Cl <sub>2</sub> , NaE, pH, and bacteriological.	Х	Х	Х			DOH requirement - 70 per month for bacteriological
Flush all dead-end mains.					Х	More frequently when needed
Air/vacuum release valves - inspect, clean, and test.						As needed
Transmission mains (inspect and clear easements).					X	As needed
Distribution mains - leak detect program.						When leakage is above standard
Fire hydrants/hydrant valves - inspect, test, operate, and record pressures.					X	As needed or every 2 years
Distribution valves - exercise and clean out valve box.						As needed
Test 3-inch and larger meters.					Х	Annual (6" and up) Bi-annual (3" and 4")
Replace 2-inch and smaller meters.						15 to 20 years or as needed
Read commercial meters.			X			
Read residential meters.						Bi-monthly
Distribution main cleaning - ongoing.						10 to 20 years or as needed
Cross-connection/backflow devices tested by Certified BAT.					Х	Documentation provided to City

## **EOUIPMENT INVENTORY**

The City maintains a full array of heavy equipment, vehicles, and supplies to maintain regular system operations, construct small system extensions and replacements, and respond to emergency conditions. Identification of routine supplies and emergency response equipment and materials has been coordinated with the City's emergency response and hazard mitigation plans, a complete vulnerability assessment, and the needs of various departments within the City. An ongoing materials list and inventory is maintained by the Water Department for in-house needs and to assist with emergency response if requested by other purveyors in the area.

#### CHEMICAL INVENTORY

Operation and maintenance of a public water system requires use of various chemicals for water treatment and disinfection of facilities. **Table 8-3** identifies the typical types of chemicals stored and their purpose. Chemical specifications are identified in the City's Warehouse/Purchasing agents files, the material safety data sheet (MSDS) records, and posted onsite wherever chemical agents and compounds are used for water treatment.

Table 8-3 Chemical Inventory

Chemical	Purpose/Use
Chlorine (Liquid/Gas)	Disinfection of Water Supply
Sodium Fluoride	Fluoridation of Water Supply
Sodium Hypochlorite (12.5%)	Disinfection of Water Supply
Sodium Hydroxide (25%)	pH Adjustment (Corrosion Control)
Potassium Permanganate (Dry)	Iron and Manganese Removal
Potassium Permanganate (4% Solution)	Iron and Manganese Removal

# WATER QUALITY MONITORING PROGRAM

Each of the City's water supply sources currently is classified as groundwater. The City is conducting an extensive WHPA program to serve as an early detection of possible aquifer contamination. The program involves monitoring from selected wells within the 1 year, 5 year, and 10 year zones of influence for the sources most susceptible to contamination: Clark Springs; Kent Springs; and Armstrong Springs.

The current quality of the City's water supply is excellent, with only minor secondary contaminant concerns. Secondary contaminants are classified by the U.S. Environmental Protection Agency (EPA) as aesthetic concerns and not a threat to human health. These contaminants are primarily iron and manganese, which are treated by aeration and dilution for the Seven Oaks (Soos Creek) and Garrison well sites, and oxidation followed by filtration for the 208<sup>th</sup> and 212<sup>th</sup> well sites. The City chlorinates its water supply for public health protection from bacteriological pathogens. The City also fluoridates the water supply for dental health benefits for consumers. The City's water supply also is moderately hard, with a relatively low pH;

consequently, it is slightly corrosive to plumbing fixtures. In June 2012, the City completed and put online a corrosion control facility at Guiberson Reservoir to adjust the pH of Kent Springs water and Kent Springs water when blending with Tacoma water to make it less corrosive. The 212<sup>th</sup> Treatment Plant adjusts the pH of its product water to a pH of 8.2 whenever it is operating. A summary of the City's water treatment is shown in **Table 8-4**.

As discussed in **Chapter 6**, the City maintains compliance with the regulations set forth by the EPA's Safe Drinking Water Act (SDWA); Title 40 Code of Federal Regulations (CFR) Part 141 National Primary Drinking Water Regulations; and DOH Drinking Water Regulations for Group A, Public Water Systems, Chapter 246-290 WAC.

Table 8-4 Water Treatment

Source	Type of Treatment	Comments
Clark Springs	Chlorination, fluoridation, and pH adjustment	None
Kent Springs	Chlorination, fluoridation, and pH adjustment	None
East Hill Well	Chlorination, fluoridation, and pH adjustment	None
Seven Oaks (Soos Creek Well)	Chlorination, fluoridation	Blended with Clark Springs or Kent Springs
Armstrong Springs Wells #1 and #2	Chlorination, fluoridation	Blended with Clark Springs or Kent Springs
Garrison Well	Chlorination, fluoridation	Blended with treated water at 6 MG #2  Reservoir
O'Brien Well	Chlorination, fluoridation	None
208th Well and 212th Wells #1, #2, and #3	Chlorination, fluoridation, filtration, and pH adjustment	208th and 212th Wells treated together at the 212th Street Treatment Plant

**Table 8-5** includes a partial list of analytical laboratories used by the City for routine and specific analysis of drinking water samples. These laboratories are EPA and DOH certified for compliance with Department of Health regulations. The City's current water quality monitoring program is included in **Appendix I**.

Table 8-5
Water Quality Analytical Laboratories
(State of Washington Approved)

Laboratory	Phone Number	Address	Analysis Performed
Water Management Labs Inc.	(253) 531-3121	1515 80th Street E Tacoma, WA 98404	Bacteriological, IOC, VOC, SOC, THM, general chemistry, and other water quality analysis
Edge Analytical Laboratories	(800) 755-9295	1620 S Walnut Street Burlington, WA 98233	Bacteriological, IOC, VOC, SOC, THM, general chemistry, and other water quality analysis UCMR II
Washington DOH Public Health Laboratories	(206) 418-5400	1610 NE 150th Street Shoreline, WA 98155	Maximum total Trihalomethane potential (MTTPs), radionuclides, general organic chemistry
AmTest Laboratories	(425) 885-1664	13600 NE 126th Place, Suite C Kirkland, WA 98034	Bacteriological, IOC, VOC, SOC, THM, general chemistry, and other water quality analysis

#### PUBLIC NOTIFICATION

In accordance with the requirements of the EPA, the City prepares an annual water quality report sometimes referred to as a Consumer Confidence Report. A copy of this report is included in **Appendix K**.

In the event of an issue with the water supply, the City has established procedures for various levels of emergency, including suspected water quality issues, known contaminants identified in the water system, boil water notifications, and water supply interruption or shortage. The exact procedures and language identified for each potential water quality or quantity emergency is included in the City's Coliform Monitoring Plan, Cross-Connection Control Program, Water Shortage Response Plan, or Emergency Response Plan, as appropriate. In general, the City is fully prepared for the following public notification measures. Please note that these general methods of notification are intended only as a summary of complete procedures and language identified in the aforementioned plans and procedures.

- Newspaper Notices
- Direct Mail Notice or Hand Delivery to all Consumers or Customers in a Specific Area of the System
- Posted Notice
- Notice to Radio and Television Stations
- Notices to New Billing Units or New Hookups
- City of Kent social media sites

# **EMERGENCY RESPONSE**

All water supply systems are subject to damage and interruption from unusual emergency events. The City's Water Department has participated in City-wide emergency response planning and has a detailed program for responding to a variety of emergency conditions. The details of that

emergency response program are classified confidential for the protection of the system, health and safety of system customers, and privacy of water system personnel. The following provides a general overview of key activities that have been evaluated and/or are in place.

#### WATER SYSTEM PERSONNEL EMERGENCY CALL-UP LIST

The City maintains information that identifies, in order (based on DOH certification level and experience), water system personnel responsible for making decisions in specific emergency situations. Job titles and phone numbers (work and home) are included. The Kent Police Department (phone 253-856-5800) has a current list of all phone numbers on file and available 24 hours a day, as well as procedures for emergency callout of the proper personnel.

#### NOTIFICATION PROCEDURES

A Boil Water Notice may be approved or distributed by the City. In all cases the Public Works Director, City Operations Manager, and/or the Mayor are to be notified of any action taken as soon as possible.

#### SFISMIC VUI NERABII ITY ANALYSIS

Kennedy Jenks completed a seismic vulnerability assessment of the City's water system in 2017. The objectives of the study were to determine the potential for damage, disruption of services, and injury or loss of life (life-safety) due to an earthquake; and to develop preliminary mitigation recommendations and estimated construction costs. The City has implemented the recommendations of the vulnerability analysis in its budgeting and Capital Improvement Program (CIP) (Chapter 9). Water system component vulnerability was assessed in the following areas: major fire; earthquake; chlorine gas; mechanical failure; bomb; power; employee accident/illness; sub-zero weather; flooding; and windstorm. The study did not identify any system components as "very vulnerable." However, the analysis did put forth recommendations for corrective action on some system components. While key recommendations for security improvements have been accomplished, this is considered an ongoing expense to the City, with improvements accomplished as technology allows and system components require.

Other system vulnerability upgrades have been identified in consultant reports and summarized in the CIP contained in **Chapter 9**. The identification and addition of all system improvements, however, will increase the reliability of the water system in the event of an emergency and extend the useful life of the system.

# **EMERGENCY PREPAREDNESS**

Table 8-6
Preparation Common to All Emergencies

	Advise personnel to arrange for safety of families in advance.			
Personnel	Prepare emergency schedule and brief personnel.			
reisonnei	Put all personnel on emergency status.			
	Strategically locate and station crews.			
	Check vehicles, auxiliary electrical power, and pumping units.  A. Sufficient fuel.  B. Operation of emergency power/battery operated lights.  C. Operation of vehicles.			
Facilities	Check emergency communication equipment for readiness.			
	Maintain emergency rations, water, clothing, and bedding at the maintenance shops sufficient for 72 hours.			
	Secure equipment and supplies in exposed areas; secure buildings; install storm shutters, if available and appropriate.			
	Review possible repair materials for local purchase of items on short notice in an emergency.			
Materials	Arrange with local suppliers and nearby utilities for access to stored chemicals, tools, repair parts, etc., which may be required immediately after the disaster.			
	Determine the need to relocate certain materials to outlying sites.			

# **CONDITIONS OF SERVICE**

Throughout the year, three distinctive conditions of service (green, yellow, or red) can exist. The conditions are explained below. The Water System Manager is responsible for making all changes in the condition or service, with the approval of the Public Works Director.

- 1. Condition Green Normal water use. Notification of Water Department Control Center is required for all unusual or excessive water/hydrant use.
- 2. Condition Yellow Caution is necessary with all water/hydrant use. All inspections/water main flushing and/or hydrant flows must be cleared through the Water Department Control Center in advance.
- 3. Condition Red
  - Level #1 No hydrant use. No inspection water flows. Contact Water Department Control Center on all emergency hydrant use or water flows.

- Level #2 Same as Level #1 except public irrigation is authorized on alternate days based on street address (odd/even), ONLY.
- Level #3 Same as Level #1 except that public irrigation is prohibited.

#### PUBLIC NOTIFICATIONS

Many of the City's water quality monitoring and emergency response plans call for notification of the public of emergency conditions and of required demand curtailment measures. Sample announcements are presented here in increasing order of severity. The City should contact newspapers and several local radio and television stations, which broadcast in the service area, to make prior arrangements concerning emergency announcements.

#### Sample I

#### For Immediate Release:

The City of Kent is experiencing unusually high water demand and is having difficulty maintaining adequate reservoir reserves. Residents of the City are requested to reduce water consumption and to avoid wasting water wherever possible. It will be particularly helpful if homeowners will make every effort to reduce lawn irrigation. The problem is expected to be temporary in nature, and a public announcement will be made when normal water consumption can be resumed.

#### Sample II

#### For Immediate Release:

The City of Kent is experiencing a major loss of its water production capacity. The City's customers are directed to stop all irrigation and to make every effort to conserve potable water. Failure to do so may result in the application of fines of up to \$50/day, according to City ordinance #2227. The City is doing everything possible to correct the situation, and will make a public announcement as soon as the problem has been rectified.

#### Sample III

#### For Immediate Release:

This is a Community Emergency Announcement. The City of Kent has experienced a major loss of its water production capacity, and, therefore, is unable to maintain normal water deliveries. It is mandatory that all irrigation, industrial, and commercial use be discontinued. Water must be conserved for sanitary and potable use only. Your cooperation is urgently requested. Failure to eliminate unessential uses of water may result in the application of fines of up to \$50/day, according to City ordinance #2227. The City is doing everything possible to restore the water system to normal operations. You will be notified of any change in the situation. Note: repeat the above message.

#### Sample IV

#### For immediate Release:

The City of Kent has experienced a total loss of its water production capacity; as a result, the water mains have been shut off and normal water deliveries have been discontinued. The City

has made arrangements to deliver water by tanker truck or bottled water to residential areas for potable and sanitary uses only.

When picking up water at the tank truck locations, please bring your own clean containers. The City is doing everything possible to resume normal water service and will notify you as soon as water service has been restored.

State law, WAC 248-54-750, Reporting and Public Notification, clearly outlines the City's responsibilities for both oral and written communication with water users in situations that may be caused by emergencies. All staff with authority for public announcements should be familiar with these regulations.

In addition to public announcements, communication with emergency services is vital.

## CUSTOMER COMPLAINT RESPONSE PROGRAM

The City has adopted the following policy and procedures for taking and responding to complaints/inquiries.

To contact the Water Department, citizens contact the Public Works Operations Department through the public number, which is (253) 856-5600. The phone is operated by City employees Monday through Friday (except holidays) between the hours of 7:30 a.m. and 4:00 p.m. During non-working hours, the phones are answered by a voice message system. In the case of emergencies during non-working hours, the calls are forwarded to the City Police Department who contacts Water Department employees on a callback list, the employees on standby, or the Water System Manager.

During standard working hours, the individual receiving the call shall record all of the pertinent information (i.e., name, address, location of the problem, date, phone number, and the nature of the call) on a complaint/inquiry form in the WebQA System for assignment and tracking. Each form has a unique identifying number to assist in tracking. Once all the pertinent information is recorded, a copy of the form is given to the corresponding supervisor or System Manager.

Field Supervisors/System Managers are responsible for contacting the citizen as soon as possible within a 24 hour period. After the citizen has been contacted and the situation assessed, the response given to the citizen is recorded in the WebQA database.

#### **COMPLAINT RESPONSE**

Following are the established procedures for responding to the most common complaints/inquiries.

High Chlorine – Contact customer by phone, explain chlorination practices and monitoring, follow up with visit to customer location (if necessary) and perform field analysis. Explain results to customer and give advice on procedures to lessen chlorine tastes and odors if normal levels have become objectionable to the customer.

Stains on Plumbing Fixtures – Contact customer by phone, determine type of stain (i.e., result of type of plumbing), explain water quality, and need to eliminate leakage that is leaving stain.

Request for Water Quality Results – Contact customer by phone to determine type of result they are looking for or reason for needing the information. Follow up with mail, email, or fax of results needed by customer.

Inquiry on Fluoride – Contact customer by phone. Generally, customer inquiry is "do we fluoridate the water?" Check customer address to verify City of Kent customer, and inform them of fluoride concentration.

Bad Tasting/Smelling Water – Contact customer by phone to determine type of smell or taste causing concern. Set up site visit to check water quality; and check chlorine residuals to determine quality of water. Meet with customer to review concerns, ways to eliminate or lessen concerns (i.e., flushing, refrigeration), and dispatch distribution crews for main flushing if necessary.

"Ill Because of Water" – Contact customer by phone and get information on the reason for this concern and schedule an appointment for meeting with the customer. Meet with customer and take chlorine residual to determine possibility of high chlorine demand; determine necessity of bacteriological sampling and sample if necessary with sample going to certified laboratory for analysis. Contact customer with results and inform them of physician responsibility to report suspected waterborne illness to local Health Department and the fact that the Health Department is not reporting a problem; advise customer to follow up with a doctor if necessary. If concern is related to other causes, such as minerals or chlorine, City staff inform the customer of water quality and methods for lessening exposure to these areas. If customer is still concerned, suggestion may be made to drink bottled water.

Inquiry of Lead Content – Inform customer of the absence of lead in the City water supply, but explain the potential for lead in plumbing piping and fixtures. Explain lead/copper monitoring program, City water quality characteristics, corrosion control facilities, and ways to eliminate exposure (i.e., flushing standing water, using cold water for cooking and drinking); provide customers with lead information packets.

Specks of Material in Water – Call customer and determine type of specks. Schedule an appointment with customer for determination of material. If it is related to the customers plumbing, suggest ways to clear. If related to distribution system, dispatch distribution crew for main flushing and determine cause.

Rusty Water – Call customer and determine if problem is internal to building or if it is from distribution system. If internal, suggest ways to clear problem. If external, dispatch distribution crew for main flushing and determine cause (i.e., dead-end main, contractor activity, or water system surges).

#### PROCEDURES FOR RECORD REPORTING TO DOH

For coliform monitoring and chemical analysis of water for compliance issues, the contracted certified laboratory sends a copy of the results to the City and a copy of the results directly to DOH. The City maintains water quality analysis results and provides these results to DOH upon request. For special programs such as lead/copper rule or synthetic organic susceptibility, the City mails results directly to DOH Drinking Water offices in Olympia.

#### Reporting to the Department of Health

For coliform monitoring, any instance of a positive coliform present analysis requires the City to follow the procedures outlined in the Coliform Monitoring Plan.

## RECORDKEEPING AND REPORTING

DOH has enacted regulations for recordkeeping and reporting that may be found in WAC 246-290-480. The regulations identify recordkeeping and reporting procedures for operations and water quality testing. Records shall be kept for chlorine residual and other information as specified by DOH. DOH requires retention of critical records dealing with facilities and water quality issues as summarized below.

- Bacteriological analysis results: 5 years.
- Chemical analysis results: for as long as the system is in operation.
- Daily source meter readings: 10 years.
- Other records of operation and analyses as may be required by DOH: 3 years.
- Documentation of actions to correct violations of primary drinking water standards: 3 years after last corrective action.
- Records of sanitary surveys: 10 years.
- Project reports, construction documents and drawings, inspection reports, and approvals: life of the facility.
- Construction completion reports: life of the facility.

Table 8-7
Record Keeping and Reporting

	S	Storage Location					
Type of Record	Records Room	Supervisor Office	Electronic	Length of Retention			
Customer Complaints	Х	Х	Χ	Permanent			
DOH Water Facilities Inventory (WFI)		Х	Х	Permanent			
Construction Completion Reports	Х	Х	Х	Permanent			
Ground Water Under Direct Surface Influence (GWUI)	Х	Х	Х	Permanent			
Wellhead Protection Plan Monitoring (WHPP)		Х	Х	Permanent			
Source Production	Х	Х	Х	Permanent			
Water Quality Analysis	Х	Х	Х	Permanent			
Coliform Monitoring	Х	Х	Х	Permanent			
Fluoride/Chlorine	Х	Х	Х	Permanent			
Inorganics (IOCs)	Х	Х	Х	Permanent			
Volatile Organics (VOCs)	Х	Х	Х	Permanent			
Synthetic Organics (SOCs)		Х	Х	Permanent			
Trihalomethanes (THMs)	Х	Х	Х	Permanent			
Radionuclides		Х	Х	Permanent			
Lead/Copper Rule (LCR) Monitoring		Х	Х	Permanent			
Water Department Time Books/Journals/Log Books	Х	Х		Permanent			

The most recent sanitary survey of the City's water system by DOH was conducted in December 2016, and no major deficiencies were found. DOH found that the City's water system is in good sanitary condition, and that the water system is being operated and managed in a diligent manner. DOH also determined that the City has a functional operations and maintenance group with routine tasks documented and followed, has added additional security measures, is improving its telemetry system, offers reliability with the capability to move flow between zones and utilize different sources, and has auxiliary power available. The City continues to stay in compliance with its water quality sampling requirements.

It was very evident to DOH that City staff take their responsibilities seriously and are dedicated toward delivering safe and reliable drinking water to all customers.

# 9 | WATER SYSTEM IMPROVEMENTS

# INTRODUCTION

This chapter presents proposed improvements to the City of Kent's (City) water system that are necessary to resolve existing system deficiencies and accommodate the projected growth of water customers. The water system improvements were identified from an evaluation of the results of the water system analyses presented in **Chapter 7**. The water system improvements were sized to meet both the existing and future demand conditions of the system.

A Capital Improvement Program (CIP) number has been assigned to each improvement identified by the City. Numbers assigned to the improvements start at the west end of the system and generally increase incrementally to the east, as shown in **Figures 9-1** through **9-7**, which are plan views of the improvements. A brief description of the extents shown in these figures is as follows.

- Figure 9-1: System-Wide
- Figure 9-2: West Hill
- Figure 9-3: 240 Zone West
- Figure 9-4: 240 Zone Downtown
- Figure 9-5: 240 Zone North
- Figure 9-6: East Hill North
- Figure 9-7: East Hill South

The improvements also are illustrated in the hydraulic profile of the future water system (**Figure 9-8**). The improvements are organized and presented in this chapter according to the following categories.

- Recent Water System Improvements
- Water Main Improvements
- Pressure Zone Improvements
- Facility Improvements
- Miscellaneous Improvements

The remainder of this chapter presents a brief description of each group of improvements, the criteria for prioritization, the basis for the cost estimates, and the schedule for implementation.

# DESCRIPTION OF IMPROVEMENTS

This section provides a general description of each group of improvements and an overview of the deficiencies they will resolve. Most of the improvements are necessary to resolve existing system deficiencies.

## RECENT WATER SYSTEM IMPROVEMENTS

The water system has undergone several changes since 2011, when the City last updated its Water System Plan (WSP). **Table 9-1** lists the major water system CIP projects that have been completed since 2011.

Table 9-1
Major Improvements Completed Since 2011 WSP

Project Description	Year Completed
640 Tank Construction	2011
Guiberson Corrosion Control Facility	2011
Pump Station #6 Emergency Generator Transfer Switch Installation	2011
Clark Springs Surge Tank Electrical Upgrade	2012
Pump Station #5 Control Valve Auma Replacements	2012
Pump Station #7 Mag Meter Replacement	2012
Pump Station #7 Generator Set Installation	2012
Cambridge Tank Overflow and Drain Improvements	2012
Blue Boy Standpipe Piping and Control Vault Improvements	2012
Armstrong Springs Chlorination Equipment Upgrade	2013
East Hill Well Generator Set Installation	2013
Clark Springs Well #1 MCC Replacement	2015
City of Tacoma Green River Filtration Facility	2015
Kent Springs Gallery Level Sensor and Chlorination Equipment Installation	2015
Pump Station #5 MCC Upgrade and Installation of Soft Starts for Pumps 3 and 4	2015
212th Street Treatment Plant Mag Meter Upgrade and Auma Valve Control Actuator Installation	2016
Armstrong Springs Wells Back-up Generator with MCC Installation	2016
Armstrong Springs Wells Property Purchase for Source Protection	2016
Pump Station #5 Control Vault Upgrades for 125K Tank	2016
6 MG #2 Reservoir Hatch Security Improvements	2016
Guiberson Reservoir Lining, Manifold, and Security Improvements	2016
3.5 MG Tank Drain and Control Vault Installation, and Flow Meter Installation	2016
East Hill Well Redevelopment and Pump and Motor Replacement	2017
3.5 MG Tank Cleaning, Inspection, and PAX Mixer Replacement	2017
Clark Springs Habitat Conservation Measure #6 – Rock Creek Woody Debris	2017
Clark Springs Watershed Property Purchase for Source Protection (Gribble Property)	2017
Guiberson Reservoir Exterior Coating	2017
Kent Springs Overflow Box Vault Lid Installation	2017
Kent and Lake Meridian Water District Intertie #3 Vault and Meter Upgrade	2017
Pump Station #8 Generator Hook-Up and Transfer Switch Installation	2017
Reith Road Tank Cleaning and Inspection	2017
485 Individual Customer PRVs Installed for Future 640 Zone Conversion	2018
6 MG #1 Reservoir Exterior Cleaning	2018
640 Tank Interior Cleaning and Inspection	2018
Clark Springs Augmentation Meter Upgraded	2018
Clark Springs Manual Generator Hook-Up Installed for Secondary Emergency Power	2018
Clark Springs Rock Creek Augmentation Pump Rebuilt and Replaced	2018
Clark Springs Wells 1, 2, and 3 Waste Discharge Line Flow Meter Installed	2018
Gribble Property Monitoring Well Drilled for Sampling South of the Landsburg Mine	2018
SCADA Security Study Performed with Department of Homeland Security	2018
640 Zone Conversion Improvements	2011-Ongoing

#### WATER MAIN IMPROVEMENTS

The following water main improvements were identified from the results of the distribution and transmission system analyses discussed in **Chapter 7** to meet the City's 2019 design criteria. Some of the water main improvements will replace existing distribution water main and are grouped in the "Annual Water Main Replacement Program – High Priority" project (CIP WM1). The individual water main improvement projects within this group are numbered 1 through 55, as shown in **Figures 9-9** through **9-15**. Medium and low priority projects were not identified with a CIP number, but they are shown in **Figures 9-9** through **9-15**. Other water main improvements are mostly larger diameter water mains that function more like transmission mains than distribution mains and are identified by the City as individual projects (CIP WM2 through WM13).

CIP WM1: Annual Water Main Replacement Program - High Priority

**Deficiency:** Most of the water main improvements shown in **Figures 9-9** through **9-15** are required to resolve existing system fire flow deficiencies based on 2019 design criteria for new construction and are caused primarily by undersized water mains. Some of the water main improvements address aging water main materials, such as asbestos cement (AC) and cast iron (CI). Many areas also have known occurrences of water main leaks or breaks.

**Improvement:** Replace existing water main with new water main in accordance with the City's construction standards. The individual water main improvements grouped under this project are numbered 1, 2, 3, etc., as shown in **Figures 9-9** through **9-15**. The selection of specific projects will be accomplished annually during the City's budget development process and guided by the prioritization presented later in this chapter. This provides the City with the flexibility to coordinate these projects with other projects that may occur within the same area. An average allowance of approximately \$2,200,000 per year has been established for the annual replacement of water mains.

CIP WM2: Veterans Drive and Military Road Transmission Main

**Deficiency:** A single transmission main in Meeker Street crosses the Green River to connect the City's supply facilities to the City's West Hill operating area. A secondary transmission main is proposed to be installed to provide a redundant conveyance route to the West Hill operating area.

**Improvement:** The proposed main is recommended to be 16-inch-diameter to meet the future supply needs of the West Hill operating area and for compatibility with the proposed **CIP F1: West Hill BPS** capacity. The alignment of the proposed main is proposed to be within Veterans Drive, between a future West Hill BPS located immediately east of the Green River and Military Road, and primarily within Military Road, between Veterans Drive and a future West Hill Reservoir located at approximately S 248<sup>th</sup> Street. It is recommended that this project be designed and constructed in conjunction with CIP F1: West Hill BPS. This project location is shown on **Figure 9-2**.

CIP WM3: Reith Road Transmission Main Improvements

**Deficiency:** The existing 8-inch-diameter main in Reith Road between 42<sup>nd</sup> Avenue S and 38<sup>th</sup> Avenue S is undersized and does not provide sufficient fire flow to the 529 Zone.

**Improvement:** Replace the existing main in this location with 16-inch-diameter main. This project location is shown on **Figure 9-2**.

CIP WM4: 68th Avenue S Transmission Main Improvements

**Deficiency:** The existing main in 68<sup>th</sup> Avenue S between James Street and S 190<sup>th</sup> Street is predominantly constructed of concrete and is over 50 years old. The water main has likely reached or is approaching the end of its design life. Additionally, a *Seismic Vulnerability Assessment*, prepared in 2017 by Kennedy/Jenks Consultants, recommends that key transmission main in the City's 240 Zone be upgraded with the installation of seismically restrained main to prevent service interruptions following a seismic event.

**Improvement:** Replace the existing main in this location with 12- and 16-inch-diameter main. It is recommended that the replacement main be seismically restrained water main. This project location is shown on **Figures 9-3**, **9-4**, and **9-5**.

CIP WM5: S 212th Street Transmission Main Improvements

**Deficiency:** The existing main in S 212<sup>th</sup> Street between Russell Road and 84<sup>th</sup> Avenue S is over 50 years old and has likely reached or is approaching the end of its design life. Additionally, a *Seismic Vulnerability Assessment*, prepared in 2017 by Kennedy/Jenks Consultants, recommends that key transmission main in the City's 240 Zone be upgraded with the installation of seismically restrained main to prevent service interruptions following a seismic event.

**Improvement:** Replace the existing main in this location with 16-inch-diameter main. It is recommended that the replacement main be seismically restrained water main. This project location is shown on **Figures 9-3** and **9-5**.

CIP WM6: 84th Avenue S Transmission Main Improvements

**Deficiency:** The existing main in 84<sup>th</sup> Avenue S between S 228<sup>th</sup> Street and S 192<sup>nd</sup> Street is predominantly constructed of concrete and is over 60 years old. The water main has likely reached or is approaching the end of its design life. Additionally, a *Seismic Vulnerability Assessment*, prepared in 2017 by Kennedy/Jenks Consultants, recommends that key transmission main in the City's 240 Zone be upgraded with the installation of seismically restrained main to prevent service interruptions following a seismic event.

**Improvement:** Replace the existing main in this location with 16-inch-diameter main. It is recommended that the replacement main be seismically restrained water main. This project location is shown on **Figure 9-5**.

CIP WM7: Guiberson Reservoir Transmission Main Improvements

**Deficiency:** The Guiberson Reservoir has two primary transmission mains to convey water to the 240 Zone. The transmission main that conveys water west from the Guiberson Reservoir is

located primarily within easements, is difficult to access, and is located on a steep slope that has been the location of a historical landslide (Figure 2-2, *Seismic Vulnerability Assessment*, Kennedy/Jenks Consultants, 2017).

**Improvement:** Abandon the existing transmission main to the west of the Guiberson Reservoir, between approximately Kennebeck Avenue and Central Avenue S. Replace the existing transmission main to the north of the Guiberson Reservoir with 24-inch-diameter main in Kennebeck Avenue, between Guiberson Street and E Titus Street, and in E Titus Street between Kennebeck Avenue and Central Avenue S. It is recommended that the replacement main be seismically restrained water main. This project location is shown on **Figure 9-4**.

CIP WM8: 78th Avenue S Water Main Improvements

**Deficiency:** The existing 8-inch-diameter main in 78<sup>th</sup> Avenue S between approximately S 262<sup>nd</sup> Street and S 277<sup>th</sup> Street is undersized and does not provide sufficient fire flow to existing customers served by the looped main in this location.

**Improvement:** Replace the existing main in this location with 12-inch-diameter main. This project location is shown on **Figure 9-4**.

CIP WM9: 88th Avenue S Water Main Improvements

**Deficiency:** No water main currently exists in 88<sup>th</sup> Avenue S between S 218<sup>th</sup> Street and approximately S 222<sup>nd</sup> Street.

**Improvement:** Install 12-inch-diameter main in this location. This project location is shown on **Figure 9-5**.

CIP WM10: S 218th Street Transmission Main Improvements

**Deficiency:** The existing 12-inch-diameter main in S 218<sup>th</sup> Street between the 6 Million Gallon #2 (6 MG #2) Reservoir located at Garrison Creek Park and 88<sup>th</sup> Avenue S is undersized and does not provide sufficient fire flow to the 240 Zone.

**Improvement:** Replace the existing main in this location with 18-inch-diameter main. It is recommended that the replacement main be seismically restrained water main. In addition to the transmission main improvement, evaluate the reconfiguration of the S 218<sup>th</sup> Street pressure reducing valve (PRV) to allow the City to convey water directly to the 240 Zone from the 6 MG #2 Reservoir Transmission Main in the event that the 6 MG #2 Reservoir is out of service, or to wheel City of Tacoma water directly into the 240 Zone. This project location is shown on **Figure 9-5**.

CIP WM11: SE 284<sup>th</sup> Street Water Main Improvements

**Deficiency:** Additional conveyance capacity between the City of Tacoma (Tacoma) Point of Delivery (POD) #3 and the 590 Zone will be necessary following creation of the 640 Zone, which will truncate some existing distribution main in the east side of the existing 590 Zone.

**Improvement:** Install 12-inch-diameter main in SE 284<sup>th</sup> Street between 118<sup>th</sup> Avenue SE and 109<sup>th</sup> Avenue SE, and in 108<sup>th</sup>/109<sup>th</sup> Avenue SE between SE 284<sup>th</sup> Street and SE 279<sup>th</sup> Street. This project location is shown on **Figure 9-7**.

CIP WM12: 640 Zone BPS #2 Transmission Main Improvements

**Deficiency:** The City is converting the easterly portion of the existing 590 Zone to the 640 Zone, which will be supplied by two future BPSs. Transmission from the proposed 640 BPS #2 (CIP F5), proposed to be located at the Tacoma POD #3 site, will be required to connect the proposed BPS with the 640 Zone distribution system.

**Improvement:** Install 18-inch-diameter 640 Zone main in 118<sup>th</sup> Avenue SE between SE 284<sup>th</sup> Street and SE 277<sup>th</sup> Place, in SE 277<sup>th</sup> Place between 118<sup>th</sup> Avenue SE and 120<sup>th</sup> Avenue SE, and in 120<sup>th</sup> Avenue SE between SE 277<sup>th</sup> Place and SE 272<sup>nd</sup> Place. The proposed 18-inch-diameter main in 120<sup>th</sup> Avenue SE between SE 276<sup>th</sup> Street and SE 272<sup>nd</sup> Place is proposed to replace the existing 6- and 8-inch-diameter main in the same location.

Replace existing 8-inch-diameter main in SE 272<sup>nd</sup> Place between 116<sup>th</sup> Place SE and 102<sup>nd</sup> Avenue SE with 12-inch-diameter 640 Zone main.

Replace existing 4-inch-diameter main in 117<sup>th</sup> Avenue SE between SE 276<sup>th</sup> Street and SE 272<sup>nd</sup> Place with 8-inch-diameter 640 Zone main.

Convert approximately 800 linear feet of existing 18-inch-diameter 590 Zone main in SE 288<sup>th</sup> Street between the Tacoma POD #3 and 118<sup>th</sup> Avenue SE, and approximately 1,500 linear feet of existing 24-inch-diameter 590 Zone main in 118<sup>th</sup> Avenue SE between SE 288<sup>th</sup> Street and SE 284<sup>th</sup> Street SE to 640 Zone main.

Isolate the proposed 590 and 640 Zones near the vicinity of these proposed improvements with zone valves. This project location is shown on **Figure 9-7**.

CIP WM13: 590 Zone Transmission Main Downstream of Tacoma POD #3

**Deficiency:** The City is converting the easterly portion of the existing 590 Zone to the 640 Zone, and the existing 18-inch-diameter 590 Zone main in SE 288<sup>th</sup> Street is proposed to be converted to 640 Zone main as part of CIP WM16. Additional conveyance capacity from Tacoma POD #3 to the 590 Zone will be necessary following the conversion of the existing 590 Zone main.

**Improvement:** Install 12-inch-diameter 590 Zone main within an easement in approximately 120<sup>th</sup> Avenue SE between Tacoma POD #3 and SE 284<sup>th</sup> Street. Replace the existing 8-inch-diameter 590 Zone main in SE 284<sup>th</sup> Street between approximately 120<sup>th</sup> Avenue SE and 124<sup>th</sup> Avenue SE with 12-inch-diameter 590 Zone main. This project location is shown on **Figure 9-7**.

Future Water Main Extensions and Replacements

All new water main extensions and replacements shall be installed in accordance with the City's Water System Standard Plans, which are included in **Appendix G**. All new water mains shall be sized by hydraulic analysis to ensure that all pressure, flow, and velocity requirements stated in **Chapter 5** are met. In general, new and replacement water mains that will carry fire flow in

residential areas shall be a minimum of 8 inches in diameter and looped for multi-family and residential developments. New and replacement water mains in commercial, business park, industrial, and school areas shall be a minimum of 12 inches in diameter and looped.

#### PRESSURE ZONE IMPROVEMENTS

The following pressure zone improvements will improve the reliability and redundancy to vulnerable locations throughout the water system and will improve various low and high pressure problem areas throughout the water system. A brief description of the existing deficiency and the improvement itself is provided in the following sections.

CIP PZ1: Military Road Connection Between 587 and 575 Zones

**Deficiency:** The City's West Hill operating area includes independent 587 and 575 Zones, each of which are closed pressures zones that are supplied by separate BPSs. During a fire flow or emergency event, the hydraulic grade of these pressure zones is reduced, and the zones are supplied via the 529 Zone.

**Improvement:** A transmission main is proposed to be installed within Military Road to connect the 587 and 575 Zones to improve redundancy and reliability of these zones, and to convert both zones to open zones with the same hydraulic grade (587 feet) following the completion of a future West Hill Reservoir. The proposed main is recommended to be 12 inches in diameter, and to be installed primarily within Military Road, between approximately S 257<sup>th</sup> Street and S 264<sup>th</sup> Street, where the transmission main is proposed to extend to the Cambridge Tank and Pump Station #7 site and connect to the existing 575 Zone main on the discharge side of Pump Station #7. Following this improvement, supply to the converted 575 Zone will primarily be from 587 Zone facilities, with Pump Station #7 operating as backup supply. Operational controls for Pump Station #6 and Pump Station #7 should be adjusted accordingly. This project location is shown on **Figure 9-2**.

CIP PZ2: 640 Zone Conversion

**Deficiency:** The City is converting the easterly portion of the existing 590 Zone to the 640 Zone and will require multiple PRV stations to continue to provide a sufficient level of service to the 590 Zone following the pressure zone conversion, closed valves to separate the 590 and 640 Zones, and the installation of individual PRVs for customers that will experience an increase in service pressures for those that exceed 80 pounds per square inch (psi).

Improvement A (116<sup>th</sup> Avenue and SE 272<sup>nd</sup> Place): Install a PRV station at the westerly SE 272<sup>nd</sup> Place dead-end, between 116<sup>th</sup> Avenue SE and 116<sup>th</sup> Place SE. Install 12-inch-diameter water main between the proposed PRV and the existing 10-inch-diameter 590 Zone main at the intersection of 116<sup>th</sup> Avenue SE and 114<sup>th</sup> Avenue SE. A modified version of this improvement was originally identified in a 640 Zone Creation Report, prepared by RH2 Engineering, Inc., (RH2) in July 2008, and was subsequently included in the analyses presented in a 640 Zone Phasing Analysis Technical Memorandum, prepared in August 2016 by PACE Engineers, Inc. This project location is shown on Figure 9-7.

**Improvement B** (SE 270<sup>th</sup> Street): Install a PRV station in SE 270<sup>th</sup> Street, immediately east of the intersection with 120<sup>th</sup> Avenue SE. This improvement was originally identified in a 640 Zone Creation Report, prepared by RH2 in July 2008, and was subsequently included in the analyses presented in a 640 Zone Phasing Analysis Technical Memorandum, prepared in August 2016 by PACE Engineers, Inc. This project location is shown on **Figure 9-7**.

**Improvement** C (116<sup>th</sup> Avenue SE): Install a PRV station in 116<sup>th</sup> Avenue SE at approximately SE 270<sup>th</sup> Street. This improvement was originally identified in a 640 Zone Creation Report, prepared by RH2 in July 2008, and was subsequently included in the analyses presented in a 640 Zone Phasing Analysis Technical Memorandum, prepared in August 2016 by PACE Engineers, Inc. This project location is shown on **Figure 9-7**.

**Improvement D** (SE 265<sup>th</sup> Street): Install a PRV station in SE 265<sup>th</sup> Street, between 114<sup>th</sup> Place SE and 115<sup>th</sup> Place SE. This improvement was originally identified in a 640 Zone Creation Report, prepared by RH2 in July 2008, and was subsequently included in the analyses presented in a 640 Zone Phasing Analysis Technical Memorandum, prepared in August 2016 by PACE Engineers, Inc. This project location is shown on **Figure 9-6**.

**Improvement E (SE 248<sup>th</sup> Street)**: Install a PRV station in SE 248<sup>th</sup> Street just east of the intersection with 110<sup>th</sup> Avenue SE. This improvement was originally identified in a *640 Zone Creation Report*, prepared by RH2 in July 2008, and was subsequently included in the analyses presented in a *640 Zone Phasing Analysis Technical Memorandum*, prepared in August 2016 by PACE Engineers, Inc. This project location is shown on **Figure 9-6**.

**Improvement F (Valve Closures)**: Close existing in-line valves at the following locations, and install and close new in-line valves at the following locations if a valve is not currently installed at these locations. The list of zone valves starts in the south end of the existing 590 Zone and increase to the north.

- Between the two 116<sup>th</sup> Place SE cul-de-sacs.
- In SE 276<sup>th</sup> Street at the intersection with 116<sup>th</sup> Place SE.
- At the intersection of 120<sup>th</sup> Avenue SE and SE 276<sup>th</sup> Street.
- At the intersection of 120<sup>th</sup> Avenue SE and SE 272<sup>nd</sup> Street.
- In SE 266<sup>th</sup> Street, just west of the intersection with 116<sup>th</sup> Avenue SE.
- In the southwest corner of the Aspen Grove Condominium property, along the 8-inch-diameter main that connects 116<sup>th</sup> Avenue SE and 114<sup>th</sup> Avenue SE.
- In State Route (SR) 516 (Kent Kangley Road) on the east side of the intersection with 114<sup>th</sup> Avenue SE.
- In SE 256<sup>th</sup> Street between 113<sup>th</sup> Avenue SE and 114<sup>th</sup> Avenue SE.
- On the north side of SE 256<sup>th</sup> Street between 111<sup>th</sup> Avenue SE and 111<sup>th</sup> Place SE to convert the existing main installed within an easement at this location to a dead-end 640 Zone main.

- At the intersection of SE 252<sup>nd</sup> Street and 113<sup>th</sup> Avenue SE.
- At the intersection of SE 252<sup>nd</sup> Street and 111<sup>th</sup> Avenue SE (close two valves at this location).
- In SE 244<sup>th</sup> Street between 110<sup>th</sup> Place SE and 111<sup>th</sup> Avenue SE.
- In SE 240<sup>th</sup> Street at approximately 110<sup>th</sup> Avenue SE.
- At the intersection of 110<sup>th</sup> Avenue SE and SE 238<sup>th</sup> Street.
- In 108th Avenue SE between SE 236th Place and SE 236th Street.
- At the intersection of SE 236<sup>th</sup> Street and 108<sup>th</sup> Avenue SE.
- In SE 235<sup>th</sup> Street, just west of the intersection with 109<sup>th</sup> Avenue SE.
- At the intersection of SE 232<sup>nd</sup> Place and 108<sup>th</sup> Avenue SE (and activate the existing PRV at this same location).
- At the intersection of SE 232<sup>nd</sup> Street and 106<sup>th</sup> Place SE.
- At approximately 22900 106<sup>th</sup> Place SE.
- At the intersection of 108<sup>th</sup> Avenue SE and SE 228<sup>th</sup> Street/108<sup>th</sup> Avenue SE.

**Improvement G (Individual PRVs)**: Install approximately 400 individual PRVs for customers in the proposed 640 Zone that will experience service pressures in excess of 80 psi.

#### **FACILITY IMPROVEMENTS**

The following water system facility improvements were identified from the results of the water system analyses that are discussed in **Chapter 7**. The improvements are primarily necessary to resolve existing system deficiencies, but also have been sized to accommodate projected growth.

#### CIP F1: West Hill BPS

**Deficiency:** Pump Station #3 is the only non-emergency supply facility for the City's West Hill operating area, and the suction main for Pump Station #3 is installed on the Meeker Street Bridge, which has been identified as a seismically vulnerable bridge. In the event that the main on the Meeker Street Bridge is out of service, or Pump Station #3 is out of service, the only supply available to the City's West Hill operating area is via an emergency intertie with the Highline Water District.

**Improvement:** Construct the West Hill BPS on Veterans Drive, east of the Green River. The proposed BPS will have a firm capacity capable of providing at least the projected 20-year maximum day demand (MDD) of the West Hill operating area, calculated to be 847 gallons per minute (gpm) in **Chapter 7**. This capacity assumes that **CIP F2: West Hill Reservoir** is completed before, or in conjunction with, the proposed West Hill BPS project. Therefore, the proposed West Hill BPS will normally pump to an open zone and will not be required to provide the fire flow requirement or peak hour demand (PHD) of the West Hill operating area. However, if the City would like to plan for temporary operations or maintenance conditions involving the

proposed West Hill Reservoir being offline, consideration for additional pumping capacity and equipping the proposed pumps with variable frequency drives (VFDs) is recommended to be evaluated during the preliminary design phase of the project. A stationary emergency generator with an automatic transfer switch is recommended to be installed at the West Hill BPS to maintain service in the event of a power outage. The number of pumps, their capacities, and configuration should be determined during the preliminary design phase of the project. For the purposes of this WSP, the West Hill BPS was assumed to consist of two pumps, each capable of providing at least 1,000 gpm to exceed the projected 20-year MDD of the West Hill operating area. It is recommended that this project be designed and constructed in conjunction with CIP WM2: Veterans Drive and Military Road Transmission Main, and that the sizing and configuration of the proposed BPS be determined during design of CIP F2: West Hill Reservoir. This project location is shown on Figure 9-2.

#### CIP F2: West Hill Reservoir

**Deficiency:** The West Hill operating area currently consists of four pressure zones, three of which are either closed pressure zones (575 and 587 Zones), or an open pressure zone without sufficient storage capacity to meet the regulatory requirements for the zone (529 Zone). In the event that the pump stations supplying these zones are out of service, or if a fire event occurs, the level of service provided to customers in these zones decreases significantly and can be reduced below regulatory and City's minimum standards.

**Improvement:** Construct a West Hill Reservoir to provide sufficient water storage for the West Hill operating area beyond the 20-year planning period, calculated to be 2.72 million gallons (MG) of usable storage in **Chapter 7**. To accommodate growth beyond the 20-year planning period presented in this WSP, the City is proposing to construct the West Hill Reservoir with approximately 10 percent additional usable storage volume, resulting in approximately 3.00 MG of usable storage proposed for the West Hill Reservoir.

During the preparation of this WSP, the City was evaluating multiple sites for the proposed West Hill Reservoir and considering standpipe and composite tank configurations for the proposed reservoir. For the purposes of this WSP, the future West Hill Reservoir was assumed to be a standpipe located at a currently undeveloped property on the West Hill between 38<sup>th</sup> Avenue S and Military Road S adjacent to S 248<sup>th</sup> Street.

The existing ground elevation at the future reservoir location is approximately 440 feet, and the minimum water level to provide 20 psi to the highest existing service elevation is approximately 501 feet, resulting in approximately 61 feet of dead storage at the bottom of the proposed reservoir. **Chart 9-1** presents a not-to-scale schematic identifying the approximate elevations and volumes of the proposed West Hill Reservoir storage components.

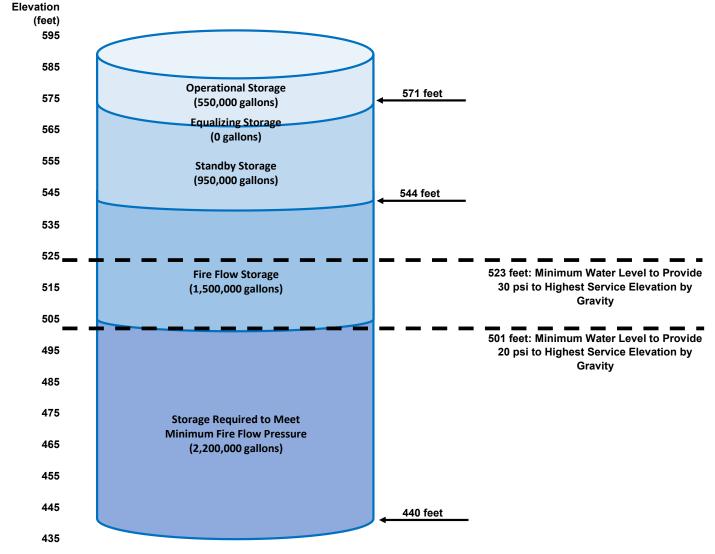


Chart 9-1: Approximate West Hill Reservoir Storage Component Elevations and Volumes

Based on a minimum usable storage volume of 3.00 MG, a minimum usable water level of 501 feet, and a maximum water level of 587 feet (to match the existing 587 Zone hydraulic grade), the resulting standpipe diameter is calculated to be approximately 78 feet. Constructing the proposed West Hill Reservoir with a maximum water level of 587 feet allows the existing 587 Zone customers to receive the same normal service pressures that are provided currently. However, the existing 587 Zone, and the existing 575 Zone that is proposed to be combined with the 587 Zone, provide pressures to existing customers that is approximately 10 to 20 psi higher than the minimum standards required by the Washington State Department of Health (DOH) and the City's design criteria. Water quality evaluations are recommended to take place during the predesign phase of the project to estimate the time to achieve full water turnover in the reservoir (hydraulic residence time), to review potential mixing-related solutions to minimize stagnation within the proposed reservoir, and to evaluate the need for rechlorination at the proposed reservoir site. It is recommended that this project be designed in conjunction with CIP F1: West

Hill BPS and CIP F3: West Hill PRVs and Altitude Valves, and constructed at the same time or prior to the West Hill BPS. This project location is shown on Figure 9-2.

CIP F3: West Hill PRVs and Altitude Valves

**Deficiency:** Following construction of the proposed West Hill BPS and Reservoir, the City desires to provide the primary supply to the 529 and 345.5 Zones from the West Hill Reservoir. Installation of PRVs at four locations is recommended to facilitate this operational adjustment and improve fire flow availability downstream of each location.

**Improvement:** Install a PRV station at the following four locations.

- Within or adjacent to Pump Station #3 (354.5 Zone to 240 Zone).
- Within or adjacent to Pump Station #4 (529 Zone to 354.5 Zone).
- Within or adjacent to Pump Station #6 (587 Zone to 529 Zone).
- Within or adjacent to Pump Station #7 and on the existing Cambridge Tank site (587 Zone to 529 Zone).

The hydraulic grades in the preceding bullets reference the proposed hydraulic grades at these locations, following completion of the proposed West Hill BPS and Reservoir, and the proposed 587 and 575 Zone connection and conversion project (CIP PZ1). Proposed sizing for each PRV station includes a 3-inch PRV for low flows (between 2 and 460 gpm), and an 8-inch PRV for high flows (up to 3,900 gpm) to supplement supply to these zones during a fire flow event. The proposed PRV station within or adjacent to Pump Station #3 allows the Meeker Street transmission main to receive flow from two directions instead of functioning as a dead end, and negates the need for approximately 7,100 linear feet of existing Meeker Street transmission main between Washington Avenue and Pump Station #3 to be replaced with larger diameter main to meet the planning-level fire flow requirement along this alignment. It is recommended that these proposed PRV sizes and flow rates be reviewed during the predesign phase of the CIP F2: West Hill Reservoir project.

Altitude valves are recommended to be installed at the existing Reith Road Reservoir and the existing Cambridge Tank locations to prevent reservoir overflows from occurring following installation of the proposed PRV stations. This project location is shown on **Figure 9-2**.

CIP F4: 640 Zone BPS #1 (Blue Boy Standpipe Site)

**Deficiency:** The City is converting the easterly portion of the existing 590 Zone to the 640 Zone, which will be supplied by two future BPSs.

**Improvement:** Construct a 640 Zone BPS at the Blue Boy Standpipe site. The proposed BPS will have a firm capacity capable of providing at least the projected 20-year MDD of the 640 Zone, calculated to be 1,132 gpm in **Chapter 7**. A 640 Zone Phasing Analysis Technical Memorandum, prepared in August 2016 by PACE Engineers, Inc., identified the proposed 640 Zone BPS to include three identical pumps, each equipped with a VFD, and rated for 1,750 gpm at 110 feet total dynamic head (TDH). This project location is shown on **Figure 9-6**.

CIP F5: 640 Zone BPS #2 (Tacoma POD #3 Site)

**Deficiency:** The City is converting the easterly portion of the existing 590 Zone to the 640 Zone, which will be supplied by two future BPSs.

**Improvement:** Construct a 640 Zone BPS at the City of Tacoma POD #3 site. The proposed BPS will provide redundant supply to the proposed 640 Zone and the 640 Zone BPS #1 that is proposed at the Blue Boy Standpipe site (CIP F5). To provide full redundancy to the 640 Zone, it is assumed that the 640 Zone BPS #2 will be constructed with the same configuration and capacity as the 640 Zone BPS #1, with three identical pumps, each equipped with a VFD, and rated for 1,750 gpm at 110 feet TDH. This project location is shown on **Figure 9-7**.

CIP F6: 125K Tank Exterior Recoating

**Deficiency:** The exterior of the 125K Tank needs to be recoated every 15 to 20 years, based on the typical life of coatings on steel tanks.

**Improvement:** Thoroughly inspect and sample the exterior coating of the 125K Tank to determine the properties of the existing coating and the extent of the required recoating. Recoat the exterior to prevent premature corrosion of the tank exterior. This project location is shown on **Figure 9-6**.

CIP F7: Guiberson Reservoir Replacement

**Deficiency:** The Guiberson Reservoir was constructed in the 1930s and is nearing the end of its useful life. Although multiple upgrades have taken place, the Guiberson Reservoir roof and floor are deficient, and it is recommended that a replacement reservoir be constructed.

**Improvement:** Construct a new reservoir to replace the existing Guiberson Reservoir, with a usable storage volume of approximately 8 to 10 MG, which exceeds the 240 Zone storage volume requirements for the 20-year planning period, as shown in **Chapter 7**. It is anticipated that the same treatment processes that occur at the existing Guiberson Reservoir will occur at the replacement reservoir, including pH adjustment of water from the Kent Springs Transmission Main by aeration and a sodium hydroxide pH adjustment process. This project location is shown on **Figure 9-4**.

#### CIP F8: Garrison/O'Brien Treatment Plant

**Deficiency:** Water pumped from the O'Brien Well has high concentrations of iron and manganese that results in discolored water immediately downstream of the well. The City elects to not normally operate the O'Brien Well due to the poor aesthetics of the source water.

**Improvement:** Construct a packaged treatment plant capable of treating the high concentrations of iron and manganese at the O'Brien Well. It is anticipated that the treatment plant will be sized to treat the combined capacity of the Garrison Creek Well and the O'Brien Well to allow raw water from the O'Brien Well to be blended prior to treatment. This project location is shown on **Figure 9-5**.

#### MISCELL ANEOUS IMPROVEMENTS

The following improvements are planning efforts and program elements that are required to comply with various State of Washington water regulations or other miscellaneous improvements that have been identified as necessary for continued safe and reliable operation of the water system.

CIP M1: Generator Improvement Program

**Deficiency:** Not all of the City's water system facilities are equipped with temporary or permanent back-up power, and the City's existing generators require regular maintenance.

**Improvement:** Improve the back-up power capabilities throughout the water system on an ongoing basis.

CIP M2: Reservoir Maintenance and Improvement Program

**Deficiency:** The City's reservoirs require regular maintenance including, but not limited to, interior and exterior coatings, inspections, piping improvements, and seismic improvements.

**Improvement:** Maintain and improve the reservoirs as necessary.

CIP M3: Tacoma Regional Water Supply System (RWSS)

**Deficiency:** The City's interties with the City of Tacoma pipeline require ongoing improvements.

**Improvement:** Perform improvements related to the City of Tacoma interties and pipeline as necessary.

CIP M4: Transmission Main Easements/Land Acquisitions

**Deficiency:** Not all transmission mains have adequate easement width for maintenance and repair.

**Improvement:** The City will work to acquire necessary easements to allow for maintenance and repair.

CIP M5: Water System Plan Update

**Deficiency:** Washington Administrative Code (WAC) 246-290-100 requires that the City's WSP be updated every 10 years and submitted to DOH for review and approval.

**Improvement:** The City will update and submit its WSP every 10 years to comply with State requirements.

CIP M6: Watershed Control Plan, Habitat Conservation Plan, and Wellhead Protection Program

**Deficiency:** The Watershed Control Plan, Habitat Conservation Plan, and Wellhead Protection Program require ongoing management and updates.

**Improvement:** The City will update and implement the Watershed Control Plan, Habitat Conservation Plan, and Wellhead Protection Programs in accordance with State requirements.

CIP M7: Landsburg Mine Management

**Deficiency:** The Landsburg Mine is located upstream of Clark Springs and contains toxic contaminants.

**Improvement:** The City manages and coordinates Landsburg Mine clean-up plans, which are anticipated to be an ongoing effort.

CIP M8: Automatic Meter Reading System

**Deficiency:** The City desires to evaluate the feasibility of, and to implement, an automatic meter reading (AMR) system for the City's water system meters.

**Improvement:** The City will evaluate the feasibility of an AMR system, and if deemed viable, will implement and install an AMR system. Benefits of an AMR system are likely to include the following.

- Elimination of cyclical manual meter reading costs.
- Reduced billing expenses.
- Reduced fuel, fleet maintenance, and labor costs.
- Increased understanding of baseline and peak demands in smaller areas to assist with water system planning and identification of system losses.
- Identification of oversized meters that subsequently under-report consumption.
- Detection of reverse water flow and tampering.
- Information for customers regarding abnormal consumption potentially indicative of leaks, and the ability to provide customers access to their own data in hourly or daily intervals to allow customers to better understand their own usage.

CIP M9: PLC Upgrade Program

**Deficiency:** The City's programmable logic controllers (PLC) require ongoing upgrades and improvements.

**Improvement:** Maintain and improve the system's PLCs as necessary to facilitate continued connectivity and control of water system facilities.

CIP M10: SCADA System Upgrades

**Deficiency:** The City's supervisory control and data acquisition (SCADA) system software and hardware require upgrades to enhance its capabilities and reliability.

**Improvement:** Upgrade the SCADA system software and hardware as necessary to facilitate continued connectivity and control of water system facilities.

CIP M11: Well Rehabilitation Program

**Deficiency:** The City's wells require ongoing maintenance and rehabilitation to allow them to continually provide reliable supply to the City's system.

**Improvement:** Perform well maintenance and rehabilitation of approximately two wells on an annual basis. Typical tasks associated with this improvement include removing the well pump and motor from the well casing; inspecting the equipment condition and performing repairs or rebuilding equipment as necessary; performing a video inspection of the well casing; and reinstalling the equipment and returning the well(s) to service.

## **FSTIMATING COSTS OF IMPROVEMENTS**

Project costs for the proposed improvements were estimated based on costs of similar, recently constructed water projects in the City and around the Puget Sound area and are presented in 2019 dollars. The project cost estimates include the estimated construction cost of the improvement, as well as indirect costs estimated at 35 percent of the construction cost for engineering preliminary design, final design, and construction management services, permitting, legal, and administrative services. The project cost estimates include a 20-percent contingency and sales tax of 10.0 percent.

Project cost estimates for water main projects were determined from the water main unit costs (i.e., cost per foot length) shown in **Table 9-2** and the proposed diameter and approximate length of each improvement.

Table 9-2
Water Main Unit Costs

water Ma	Water Main Unit Costs						
Water Main Diameter (inches)	Project Cost per Foot Length (2019 \$ per LF)						
Stand	ard Piping						
8	\$317						
12	\$350						
16	\$383						
18	\$417						
21	\$453						
24	\$492						
Seismically F	Restrained Piping						
8	\$633						
12	\$700						
16	\$766						
18	\$833						
21	\$906						
24	\$984						

The unit costs for each water main size are based on estimates of construction-related improvements, such as materials and labor for the water main installation, water services, fire hydrants, fittings, valves, connections to the existing system, trench restoration, asphalt surface restoration, other work necessary for a complete installation, contingency, and sales tax.

Additional costs were added to some water main improvements to cover anticipated, increased costs related to the project location and degree of difficulty.

## PRIORITIZING IMPROVEMENTS

The water system improvements were prioritized from established criteria to formulate a schedule that identifies projects with the most deficiencies and greatest need for improvement to be completed prior to projects with fewer deficiencies. A description of the criteria and method for prioritizing each category of improvements is provided in the following sections.

#### WATER MAIN IMPROVEMENTS

**Table 9-3** lists criteria that were established for prioritizing the water main improvements. The criteria are based on the underlying deficiencies of the existing water main that will be replaced by the proposed water main improvements. The criteria are arranged in seven different categories with a weight factor assigned to each category. The criteria given the most weight are the Seismic Vulnerability, the Proximity to Critical Slopes, the Existing Water Main Maintenance/Breaks, and the Existing Water Main Fire Flow Capability categories.

The Seismic Vulnerability category ranks the water main improvements based on the vulnerability of the water main during a M9.0 seismic event, as identified in the *Seismic Vulnerability Assessment* prepared by Kennedy/Jenks Consultants in April 2017. The Proximity to Critical Slopes category ranks the water main improvements based on the slope of the ground surface adjacent to the water main, based on the 10-foot contour data provided by the City. The Existing Water Main Maintenance/Breaks category ranks the water main improvements based on the number of reported leaks or breaks that the City currently has on record. 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 in **Chapter 7**. The Existing Water Main Material category ranks the water main improvements based on the material of the existing water main. The Existing Water Main Year of Installation category ranks the water main improvements based on the size of the area that will benefit from the replacement.

Table 9-3
Water Main Improvements Priority Ranking Criteria

		Weight	Weighted
Points	Category	Factor	Points
	Seismic Vulnerability <sup>1</sup>		
5	High Vulnerability (Net Repair Rate > 0.27)	3	15
3	Medium Vulnerability (Net Repair Rate between 0.16 and 0.27)	3	9
0	Low Vulnerability (Net Repair Rate < 0.16)	3	0
	Proximity to Critical Slopes		
5	Steep Slopes (Slope Exceeds 30%)	3	15
3	Medium Slopes (Slopes Between 15-30%)	3	9
0	Gentle or Flat Slopes (Slopes Less Than 15%)	3	0
	Existing Water Main Maintenance/Breaks		
5	High Maintenance Requirements/High Frequency of Recent Breaks	3	15
3	Annual Maintenance/Recent History of Breaks	3	9
0	No Maintenance and No History of Problems	3	0
	Existing Water Main Fire Flow Capability		
5	Derated Fire Flow is 59% or less of Required Fire Flow	3	15
4	Derated Fire Flow is 60-69% of Required Fire Flow	3	12
3	Derated Fire Flow is 70-79% of Required Fire Flow	3	9
2	Derated Fire Flow is 80-89% of Required Fire Flow	3	6
	Derated Fire Flow is 90-99% of Required Fire Flow	3	3
0	Derated Fire Flow is 100% of Required Fire Flow	3	0
	Existing Water Main Material		
5	Galvanized or Steel	2	10
4	Asbestos Cement	2	8
3	Cast Iron or Unknown	2	6
2	Copper	2	4
1	HDPE	2	2
0	Ductile Iron or PVC	2	0
	Existing Water Main Year of Installation		
5	Before 1950	2	10
4	1950-1959	2	8
3	1960-1969	2	6
2	1970-1979	2	4
1	1980-1989	2	2
0	After 1989	2	0
	Existing Water Main Benefit Area <sup>2</sup>		
5	Large Benefit Area (greater than 500 gpm)	1	5
4	Large Area Served (250 to 500 gpm)	1	4
3	Medium to Large Area Service (100 to 250 gpm)	1	3
2	Medium Area Served (50 to 100 gpm)	1	2
1	Small to Medium Area Served (25 to 50 gpm)	1	1
0	Small or Localized Area Served (less than 25 gpm)	1	0

<sup>(1)</sup> Based on the data presented in Figure 2-4A (Estimated Pipe Repair Rate for Three Pipe Categories for the M9.0 CSZ Earthquake Scenario) of the April 2017 Seismic Vulnerability Assessment prepared by Kennedy/Jenks Consultants.

<sup>(2)</sup> Flows based on existing maximum day demands.

The water main priority ranking criteria were applied to the annual water main replacement projects, with the weighted points associated with each project ranging between 1 and 53 points. These projects were categorized as high, medium, and low priority projects, with projects scoring more than 32 points identified as high priority projects, projects scoring between 17 and 32 points identified as medium priority projects, and projects scoring less than 17 points identified as low priority projects. The City will endeavor to complete most of the high priority projects within the 20-year planning period and has grouped these projects within CIP WM1, with the schedule to complete these projects CIP Nos. 1 through 55, as shown in **Figures 9-9** through **9-15**, reflect the projects within CIP WM1, and are generally numbered from west to east throughout the water system. These projects reflect the high priority water main replacement projects necessary to meet the City's 2019 design criteria, and are presented in **Table 9-4** with their weighted point totals.

Table 9-4 High Priority Distribution System Replacement Projects to Meet 2019 Design Criteria

		Prop.			=			
CIP No.	Length (LF)	Diam. (inches)	Existing Material <sup>1</sup>	In	From	То	Estimated Cost <sup>2</sup>	Weighted Points
1	1,597	8	CI	S 262nd St, 46th Ave S	43rd Ave S	Kent Ct	\$506,000	35
2	632	16	AC	S Reith Rd	Military Rd S	38th Ave S	\$243,000	34
3	2,902	8	UNK	S 256th St, S 253rd St, 35th PI S	32nd PI S	S 252nd Pl	\$919,000	39
4	623	12	CI, UNK	42nd PI S	S 253rd St	Cul-de-Sac near Reith Road Tank	\$218,000	34
5	2,980	8	AC, CI, DI, UNK	35th Ave S	S 240th St	Military Rd S	\$944,000	43
6	898	8	DI	Between Dead-Ends	W Valley Hwy	S 266th St	\$285,000	3
7	3,247	12	CI, DI	72nd Ave S	Private Property	72nd Ave near Union Pacific Railroad	\$1,137,000	36
8	2,023	12	CI, DI	68th Ave S, W Valley Hwy, Private Property	S 188th St	72nd Ave S	\$708,000	37
9	6,499	12, 16	CI, DI	S 200th St, 81st Ave S, 78th Ave S, S 196th St	84th Ave S	84th Ave S	\$2,261,000	39
10	4,400	12	CI. UNK	Private Property	64th Ave S	Washington Ave S	\$1,540,000	36
11	2,406	12	CI, DI, UNK	W Smith St	64th Ave S	Thompson Ave N	\$842,000	44
12	1,577	12	CI, DI, UNK	68th Ave S, Private Property	S Sent Des Moines Rd	74th Ave S	\$552,000	47
13	1,126	12	DI	Naden Ave S	W Meeker St	SR 516	\$394,000	47
14	606	12	UNK	Madison Ave	W Smith St	W Meeker St	\$213,000	44
15	809	12	DI. UNK	W Harrison St. Thompson Ave N	W Meeker St	Washington Ave N	\$284.000	44
16	3.117	12	AC. CI. DI. UNK	James St	66th Avenue S	5th Avenue N	\$2,182,000	34
17	2,793	8, 12	CI, UNK	3rd Ave S	W Willis St	S 259th St	\$932,000	48
18	2,793	12	CI, UNK	5th Ave S, Private Property	3rd Ave S	S 259th St	\$802,000	42
19	818	8	CI, DI	5th Ave S	Rachael Pl	Dead-end near W Overlock	\$259,000	38
20	1.652	12, 16	CI, DI	E Willis St. W Willis St	4th Ave S	Central Ave S	\$259,000	35
21	1,652	8, 12	DI. UNK	2nd Ave S	W Meeker St	W Crow St	\$595,000	44
			UNK				1 /	
22	936	12		W Titus St	4th Ave S	1st Ave S	\$328,000	33
23	4,817	12, 16	AC, CI, DI	E Meeker St	Central Ave S	Kennebeck Ave S	\$3,412,000	50
24	2,550	12	DI, UNK	E Smith St	N Lincoln Ave	1st Ave N	\$893,000	47
25	1,955	12	CI, DI, UNK	N Lincoln Ave	W James St	W Meeker St	\$685,000	44
26	907	12	CI, DI	5th Ave N, Private Property	Private Property	W James St	\$228,000	40
27	4,103	12	CI, DI, UNK	1st Ave S, 80th Ave S	E Willis St	79th Ave S	\$1,436,000	35
28	293	10	CI	E Morton St	Railroad Ave S	Bridges Ave S	\$103,000	46
29	1,377	10	CI	Railroad Ave S	E Willis St	Dead-end near Private Property	\$482,000	47
30	1,383	12	CI	Bridges Ave S	E Willis St	Dead-end near Private Property	\$484,000	47
31	306	12	CI	E Saar St	Railroad Ave S	Central Ave S	\$108,000	44
32	748	16	DI	Central Ave S	E Titus St	E Willis St	\$287,000	47
33	1,179	12	UNK	1st Ave S	W Meeker St	W Titus St	\$413,000	38
34	1,827	8, 12	CI	State Ave N	E Smith St	Ward St	\$616,000	53
35	420	12	CI	Ward St	State Ave N	Kennebeck Ave S	\$147,000	45
36	1,632	12	AC, CI, DI, UNK	E Smith St	Railroad Ave N	Jason Ave N	\$572,000	46
37	3,239	12, 16	CI, DI	Railroad Ave N	E James St	E Willis St	\$1,155,000	48
38	3,930	12, 16	DI, UNK	4th Ave N	North of W Cloudy St	W Saar St	\$1,418,000	39
39	1,339	8, 12, 16	CI, DI	3rd Ave N	Cole St	W James St	\$449,000	46
40	1,327	8, 12	CI, DI	2nd Ave N	Cole St	W James St	\$443,000	42
41	2,018	12	CI, DI, UNK	1st Ave N	West of Cole St	W James St	\$707,000	46
42	6,685	12, 16	CI, CONC, DI	Central Ave N	S 228th St	E Titus St	\$4,764,000	47
43	717	12, 16	CI, DI	Kennebeck Ave N	E James St	E Temperance St	\$255,000	34
44	467	12	DI, UNK	N State Ave	E George St	E James St	\$164,000	33
45	1,158	12	AC, CI, DI	Clark Ave N	E James St	E Temperance St	\$406,000	37
46	8,464	8, 12, 16	CI, DI	Riverbend Industrial Area	Central PI S	S 259th St	\$2,927,000	39
47	3,739	12, 16	CI	S 259th St	5th Ave S	88th Ave S	\$1,349,000	43
48	1,939	8	CI, UNK	E Chicago St, Wynwood Dr, Marion St	Van De Vanter Ave	Van De Vanter Ave	\$614,000	43
49	297	12	CI	W Titus St	Central Ave S	Railroad Ave S	\$104,000	46
50	1,995	8	CI, DI, UNK	E Chicago St	Van De Vanter Ave	Woodland Way	\$622,000	38
51	609	12	CI, UNK	Summit Ave N, Canyon Dr	E Smith St	Weiland St	\$214,000	40
52	284	12	CI	E Pioneer St	Railroad Ave N	Central Ave N	\$100,000	46
53	1,855	12	CI	Hazel Ave N, Stetson Ave	E James St	Dead-end	\$650,000	36
54	2,037	16, 21	CI, DI, UNK	104th Ave SE	SE 234th PI	SE 240th St	\$788,000	35
55	2,914	16	CI, DI, UNK	108th Ave SE, SE 260th St	Kent Kangley Rd	SE 264th St	\$1,117,000	33
(1) LINIK	= unknown	material						

<sup>(1)</sup> UNK = unknown material
(2) Cost estimates for CIP Nos. 14, 53, and 55 include seismically restrained water main.
(3) Recommended to improve water quality and provide looping; no existing level-of-service deficiencies adjacent to proposed improvement alignment.

#### OTHER IMPROVEMENTS

The additional water main, pressure zone, and facility improvements were prioritized based on existing deficiencies, safety concerns, and maintenance and capacity requirements. The miscellaneous improvements were prioritized based on regulatory requirements, funding availability, and an assessment of other water system needs. The priority order of these improvements is reflected in the schedule of improvements presented in the next section.

Figures 9-16 through 9-22 present all City-identified and distribution system replacement projects necessary to meet the City's 2019 design criteria. Water main replacement projects categorized as medium and low priority projects are not specifically funded within the 20-year planning period only if they are developer funded and determined to be necessary for redevelopment. High priority water main replacement projects necessary to meet the City's 2019 design criteria are endeavored to be replaced by the City within the 20-year planning period, but if specific schedules for the replacement of these water mains are necessary for redevelopment, these specific projects will be developer funded.

## SCHEDULE OF IMPROVEMENTS

The improvement prioritization results were used to assist in establishing an implementation schedule that can be used by the City for preparing its 10-year CIP and annual water budget. The implementation schedule for the proposed improvements is shown in **Table 9-5**. An average allowance of approximately \$2,200,000 per year has been established for the annual replacement of high priority water mains. The City will identify and schedule the replacement of these water mains during its annual budget process. This provides the City with the flexibility to coordinate these projects with road or other projects in the same areas. Should the completion of a high priority water main replacement project be necessary for development or redevelopment at a schedule that differs from the schedule identified by the City during its annual budget process, the project shall be developer funded.

As the existing infrastructure continues to age, managing and funding the water system CIP is essential to maintaining a safe and reliable water supply for the City's customers. Based on the existing level of repair and replacement identified by the City for the water system CIP, the amount of water main in the system that is greater than 65 years old will increase from 2 percent to 19 percent by the end of the 20-year planning period, as shown in **Chart 9-2**. As funding becomes available, the City should consider a more aggressive water main repair and replacement program or continue to develop asset management strategies to address future infrastructure needs.

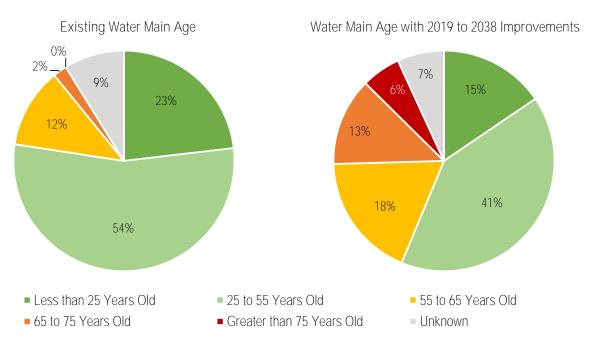


Chart 9-2 Existing and Future Water Main Age

#### FUTURE PROJECT COST ADJUSTMENTS

All cost estimates shown in the tables are presented in year 2019 dollars. It is recommended that future costs be adjusted to account for the effects of inflation and changing construction market conditions at the actual time of project implementation. Future costs can be estimated using the Engineering News Record (ENR) Construction Cost Index for the Seattle area or by applying an estimated rate of inflation that reflects the current and anticipated future market conditions.

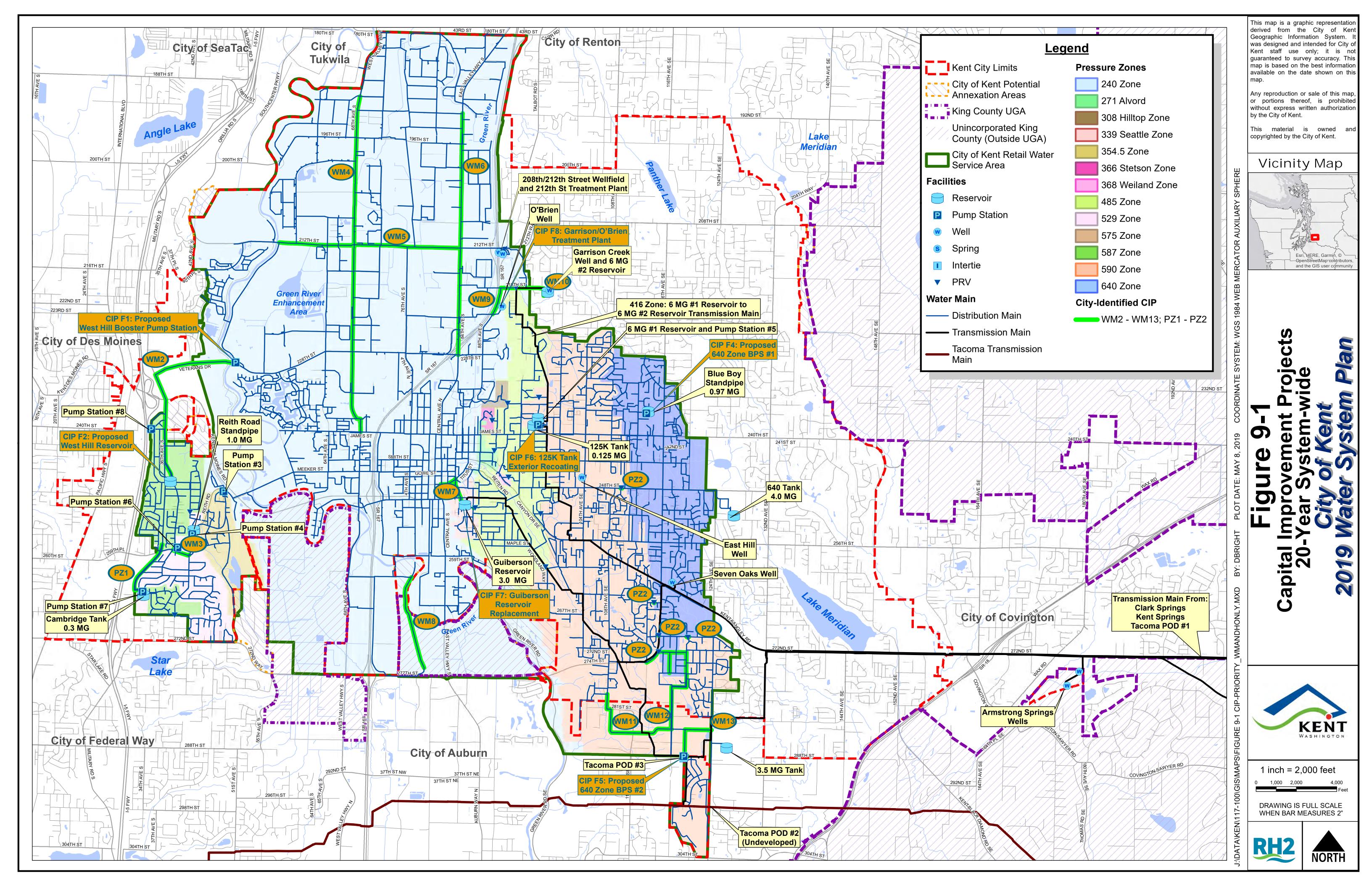
CITY OF KENT WATER SYSTEM PLAN
WATER SYSTEM IMPROVEMENTS

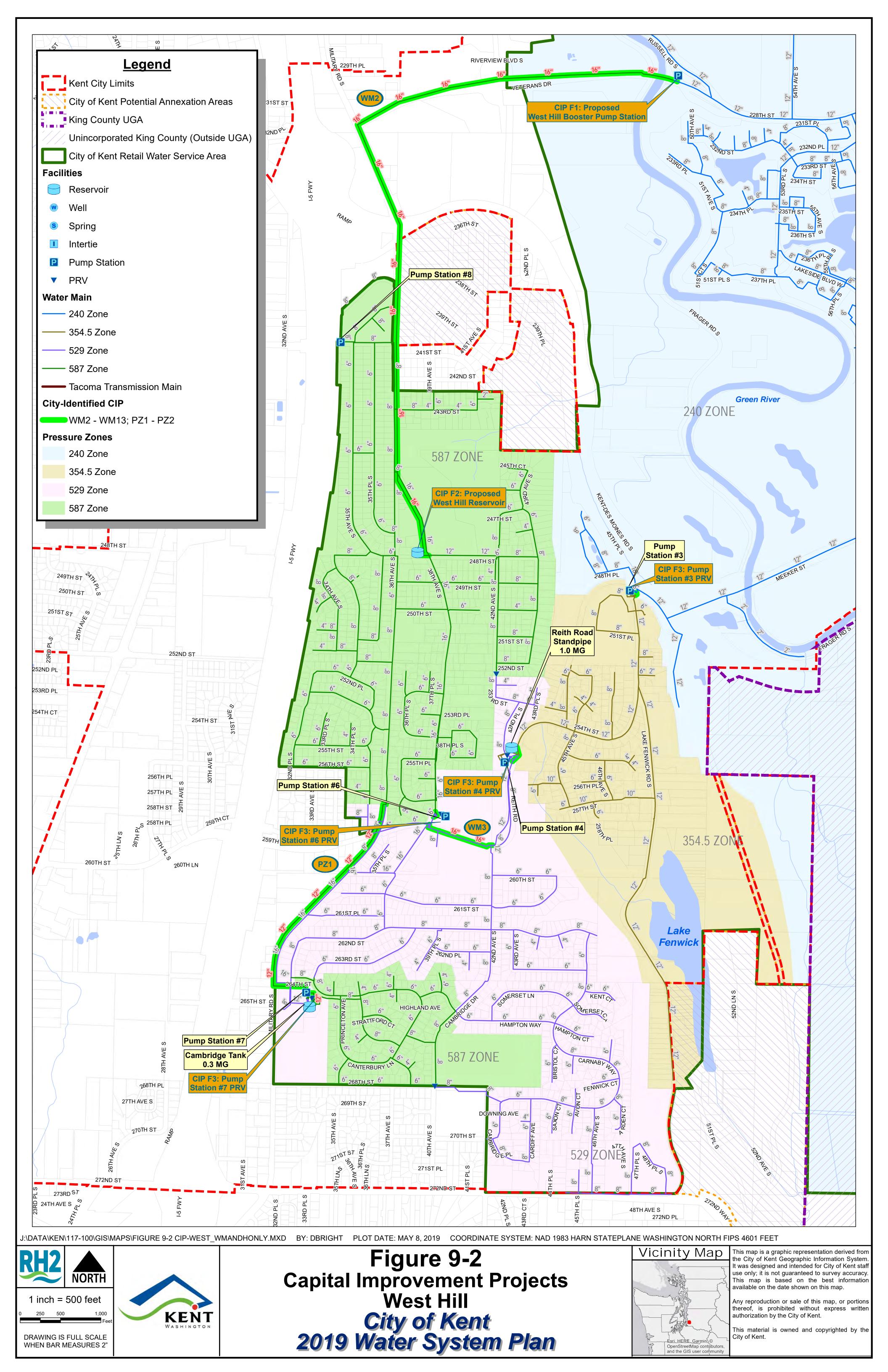
Table 9-5
Proposed Improvements Implementation Schedule

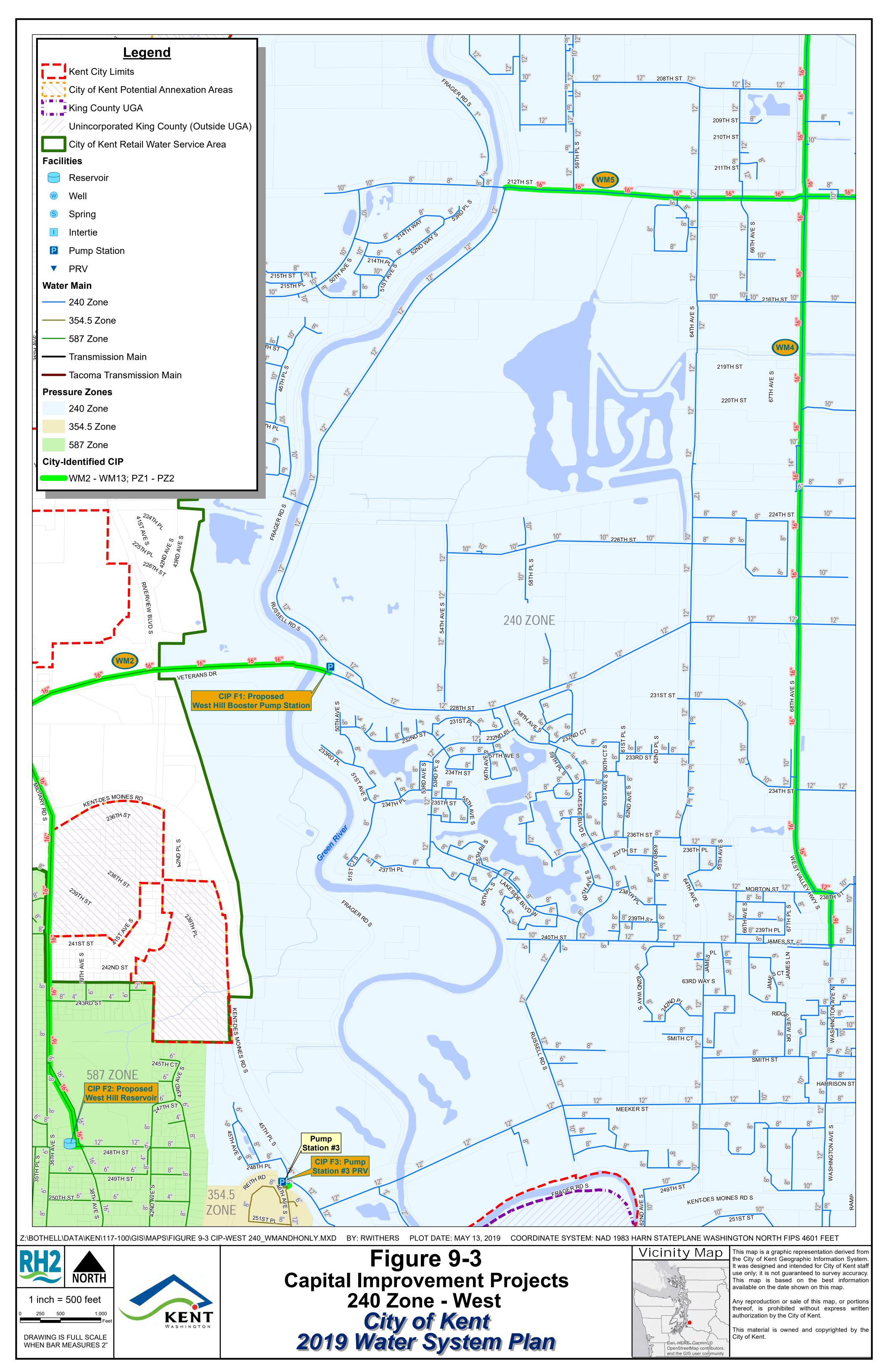
		Πορος	sea improvem	сиз шрк		ii Scricuu									
		Estimated								provement					
NI.	Description	Cost	Dui - u 4 - 2040	2040	2020	2024		•		imated Cos		2027	2020	2020 2020	Beyond 2038
No.	Description	(2019 \$)	Prior to 2019	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029-2036	Beyona 2036
	Water Main Improvements														
WM1	Annual Water Main Replacement Program - High Priority	\$44,876,000		\$1,960K	\$1,500K	\$400K	\$400K	\$698K	\$535K	\$3,365K	\$3,465K	\$2,765K	\$2,855K	\$26,433K	\$500K
WM2	Veterans Drive and Military Road Transmission Main	\$6,000,000				\$1,100K	\$1,100K	\$2,150K	\$1,650K						
WM3	Reith Road Transmission Main Improvements	\$500,000							\$500K						
WM4	68th Avenue S Transmission Main Improvements	\$12,890,000													\$12,890K
WM5	S 212th Street Transmission Main Improvements	\$6,900,000													\$6,900K
WM6	84th Avenue S Transmission Main Improvements	\$9,180,000													\$9,180K
WM7	Guiberson Reservoir Transmission Main Improvements	\$5,000,000												\$5,000K	
WM8	78th Avenue S Water Main Improvements	\$2,000,000										\$2,000K			
WM9	88th Avenue S Water Main Improvements	\$490,000	\$490K												
WM10	S 218th Street Transmission Main Improvements	\$930,000	\$930K												
	SE 284th Street Water Main Improvements	\$1,810,000											\$1,810K		
	640 Zone BPS #2 Transmission Main Improvements	\$2,230,000					\$1,115K	\$1,115K							
WM13	590 Zone Transmission Main Downstream of Tacoma POD #3	\$980,000							\$980K						
	Pressure Zone Improvements														
PZ1	Military Road Connection Between 587 and 575 Zones	\$1,220,000		•										\$1,220K	
PZ2	640 Zone Conversion	\$2,920,000	\$2,171K			\$749K								Ψ1,22011	
=-	Facility Improvements														
F1	West Hill BPS	\$2,800,000	<b>#</b> 40017	<b>#0.0001</b>		00.04016	<b>04.0501</b>	\$1,000K	\$1,400K	\$400K					
F2	West Hill Reservoir	\$12,500,000	\$132K	\$8,200K		\$2,916K	\$1,050K	\$202K		<b>#</b> 40017	<b>#</b> 40017				
F3	West Hill PRVs and Altitude Valves	\$800,000	#0.0F0I/							\$400K	\$400K				
F4	640 Zone BPS #1 (Blue Boy Standpipe Site)	\$3,250,000	\$3,250K		Φ4 <b>500</b> Ιζ		Φ4 <b>500</b> Ιζ								
F5	640 Zone BPS #2 (Tacoma POD #3 Site)	\$3,000,000	#4 000K		\$1,500K		\$1,500K								
F6	125K Tank Exterior Recoating	\$1,300,000	\$1,300K											#12.000K	
F7 F8	Guiberson Reservoir Replacement Garrison/O'Brien Treatment Plant	\$12,000,000 \$1,300,000									\$1,300K			\$12,000K	
го	Gamson/O Brieff Treatment Plant	\$1,300,000									\$1,300K				
			Miscellan	eous Impr	rovements	3									
M1	Generator Improvement Program	\$2,000,000			\$1,000K					\$1,000K					
M2	Reservoir Maintenance and Improvement Program	\$10,000,000	\$546K	\$100K		\$500K	\$500K	\$500K	\$500K	\$500K	\$500K	\$500K	\$500K	\$5,354K	
М3	Tacoma Regional Water Supply System (RWSS)	\$1,338,000	\$338K	\$50K	\$50K	\$50K	\$50K	\$50K	\$50K	\$50K	\$50K	\$50K	\$50K	\$500K	
M4	Transmission Main Easements/Land Acquisitions	\$1,000,000	\$108K	\$150K	\$50K	\$50K	\$50K	\$50K	\$50K	\$50K	\$50K	\$50K	\$50K	\$292K	
M5	Water System Plan Update	\$915,000	\$115K									\$400K	\$400K		
M6	Watershed Control Plan, Habitat Conservation Plan, and Wellhead Protection Program	\$8,000,000	\$2,964K	\$1,222K	\$413K						·			\$3,401K	
M7	Landsburg Mine Management	\$2,026,000	\$132K	\$790K	\$804K									\$300K	
M8	Automatic Meter Reading System	\$3,000,000												\$3,000K	
М9	PLC Upgrade Program	\$770,000	\$70K	\$35K	\$35K	\$35K	\$35K	\$35K	\$35K	\$35K	\$35K	\$35K	\$35K	\$350K	
M10	SCADA System Upgrades	\$500,000	\$150K						\$100K				\$100K	\$150K	
M11	Well Rehabilitation Program	\$4,087,000		\$212K	\$275K	\$200K	\$200K	\$200K	\$200K	\$200K	\$200K	\$200K	\$200K	\$2,000K	
Total I	Estimated Costs of City Funded Improvements	\$168,512,000	\$12,696K	\$12,719K	\$5,627K	\$6,000K	\$6,000K	\$6,000K	\$6,000K	\$6,000K	\$6,000K	\$6,000K	\$6,000K	\$60,000K	\$29,470K

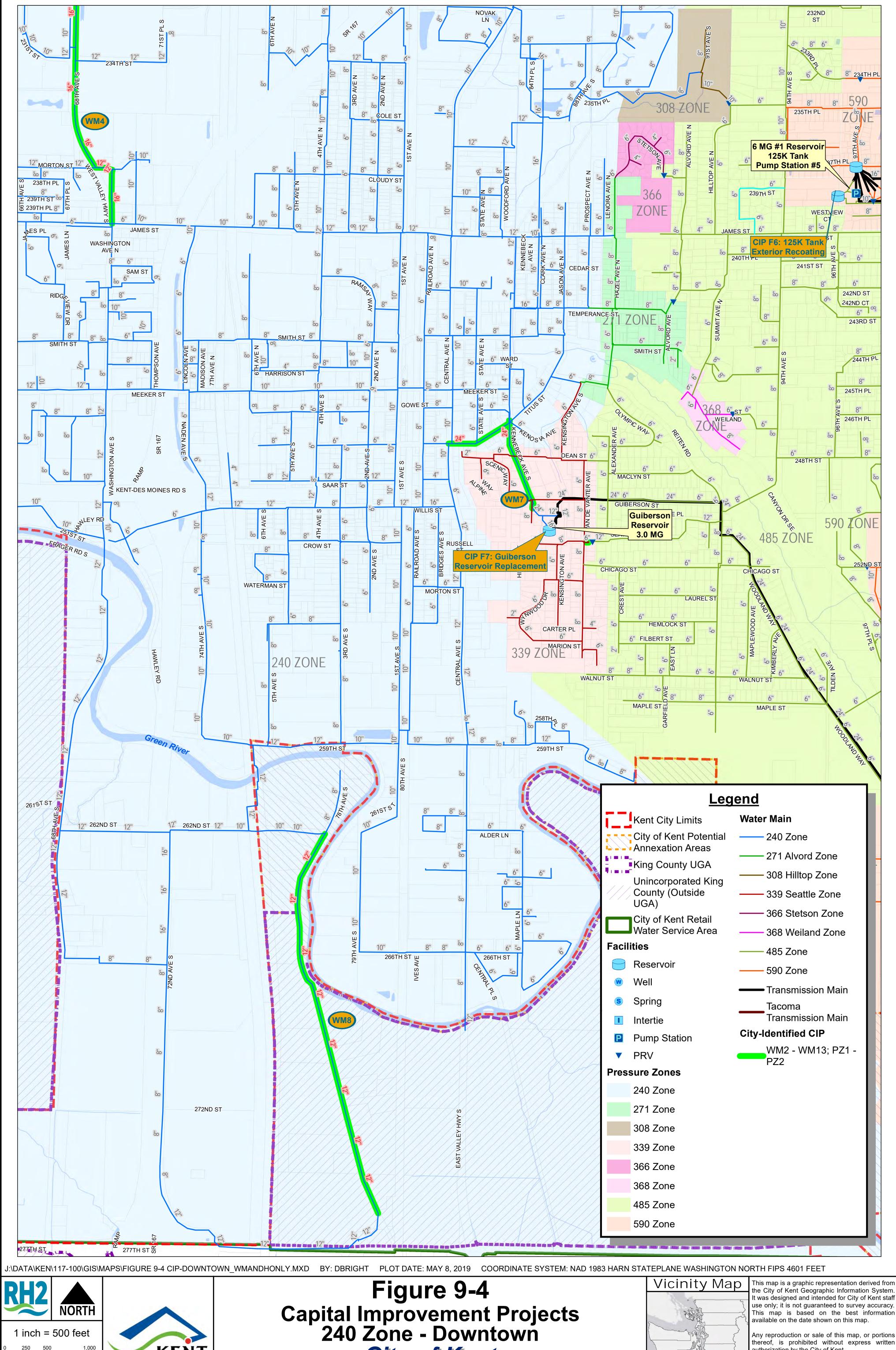
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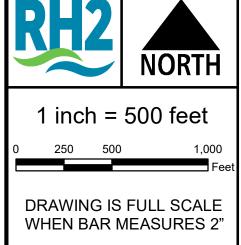












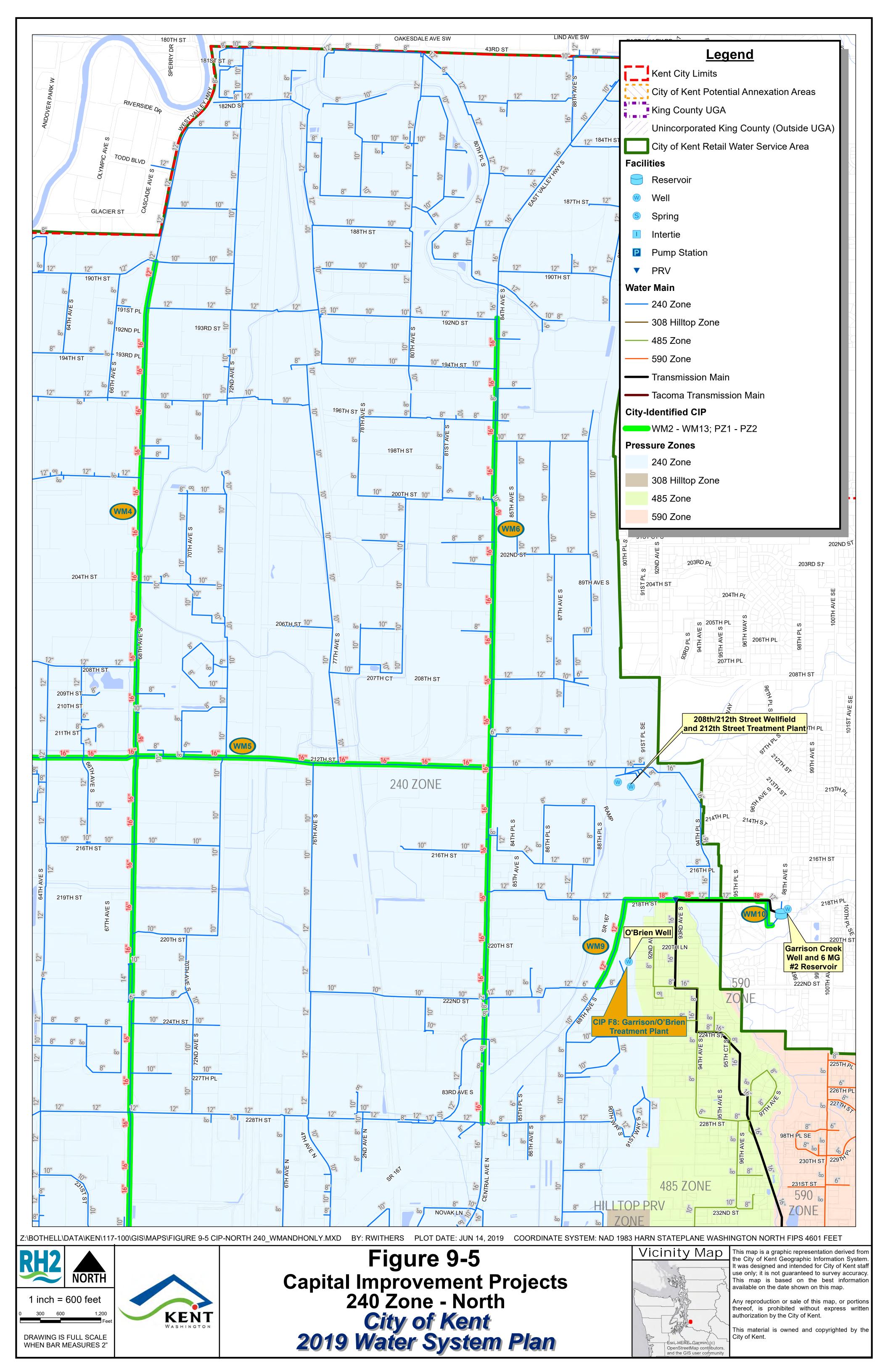


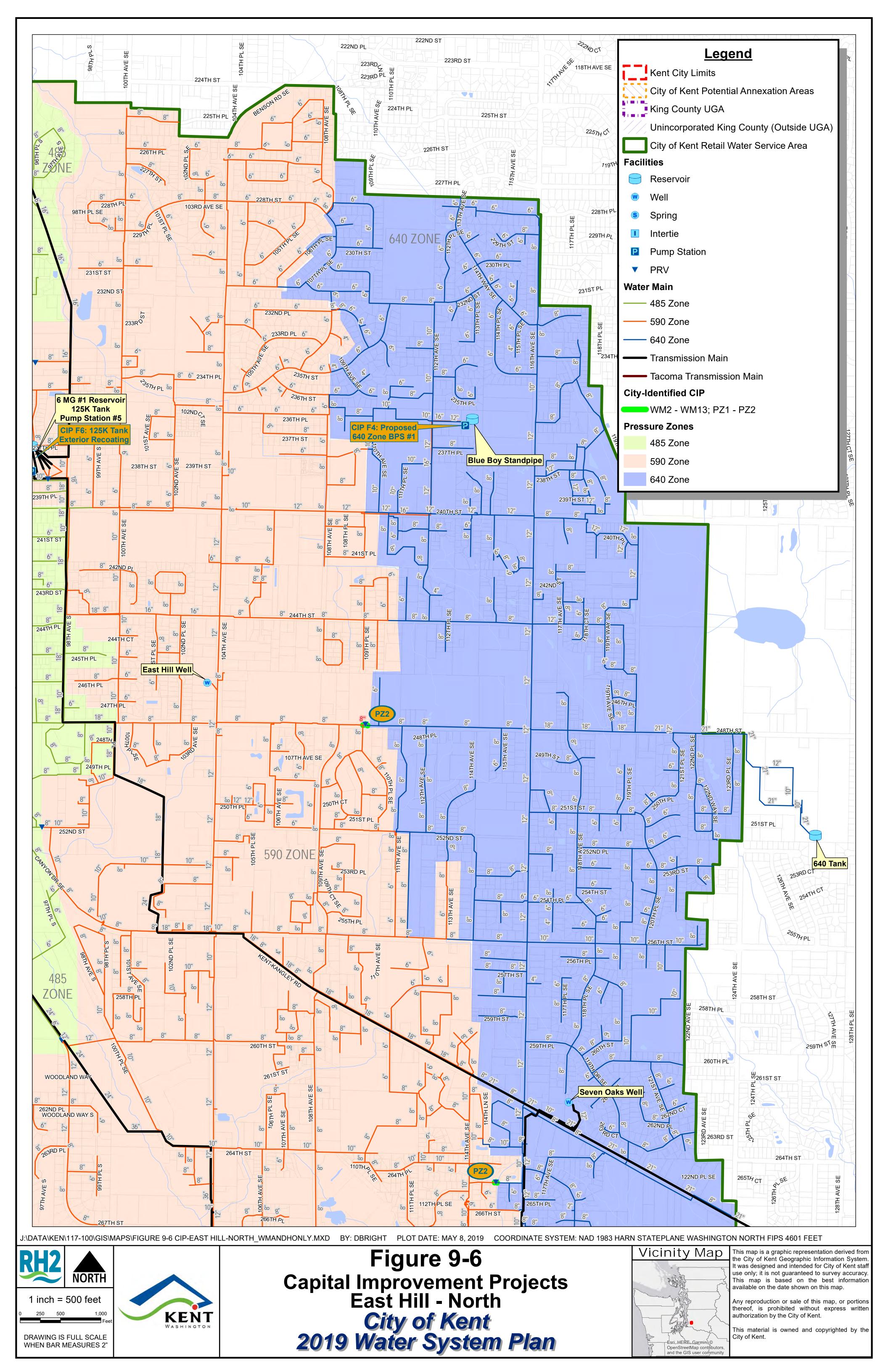
City of Kent 2019 Water System Plan

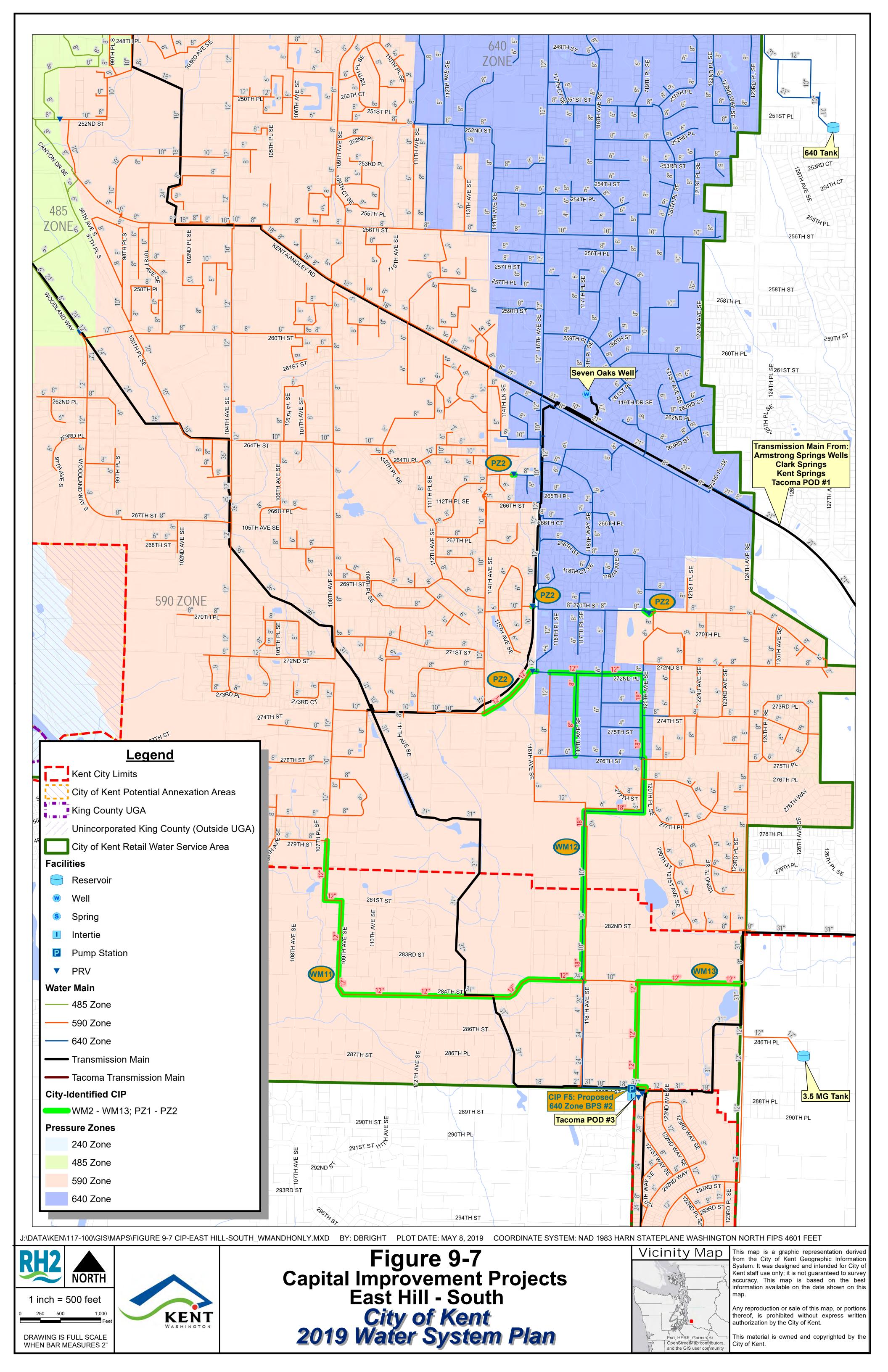


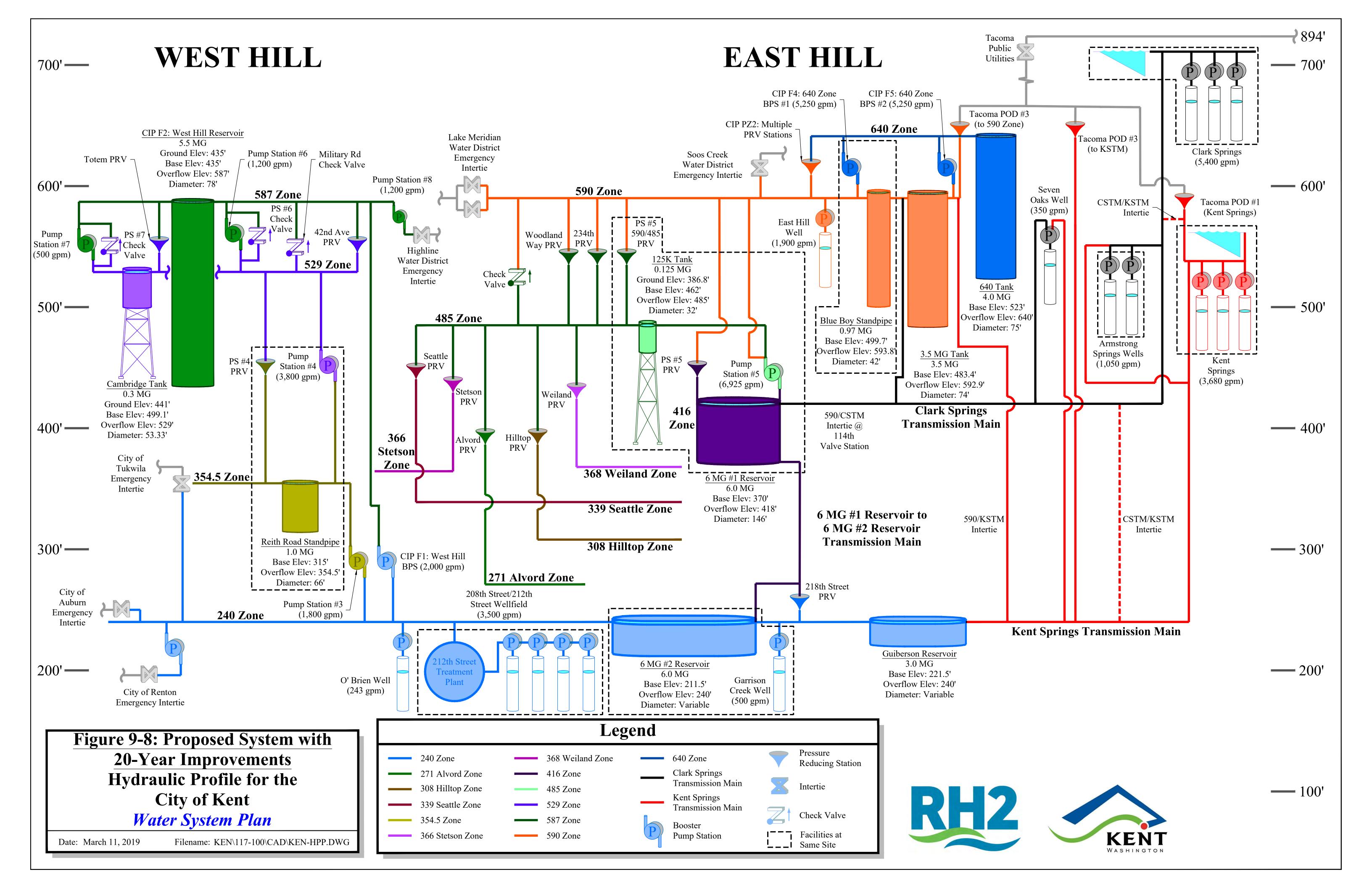
authorization by the City of Kent.

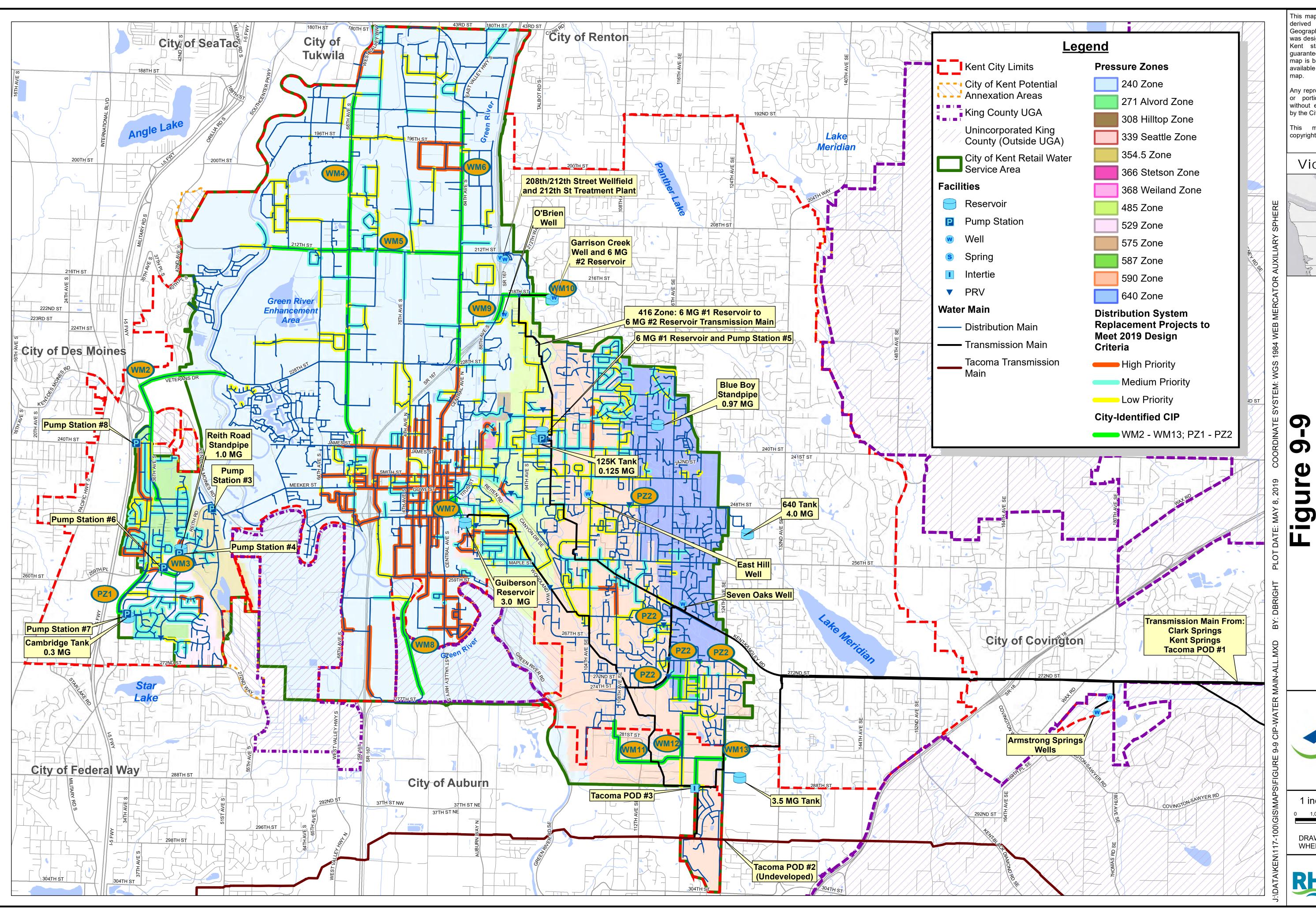
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Vicinity Map



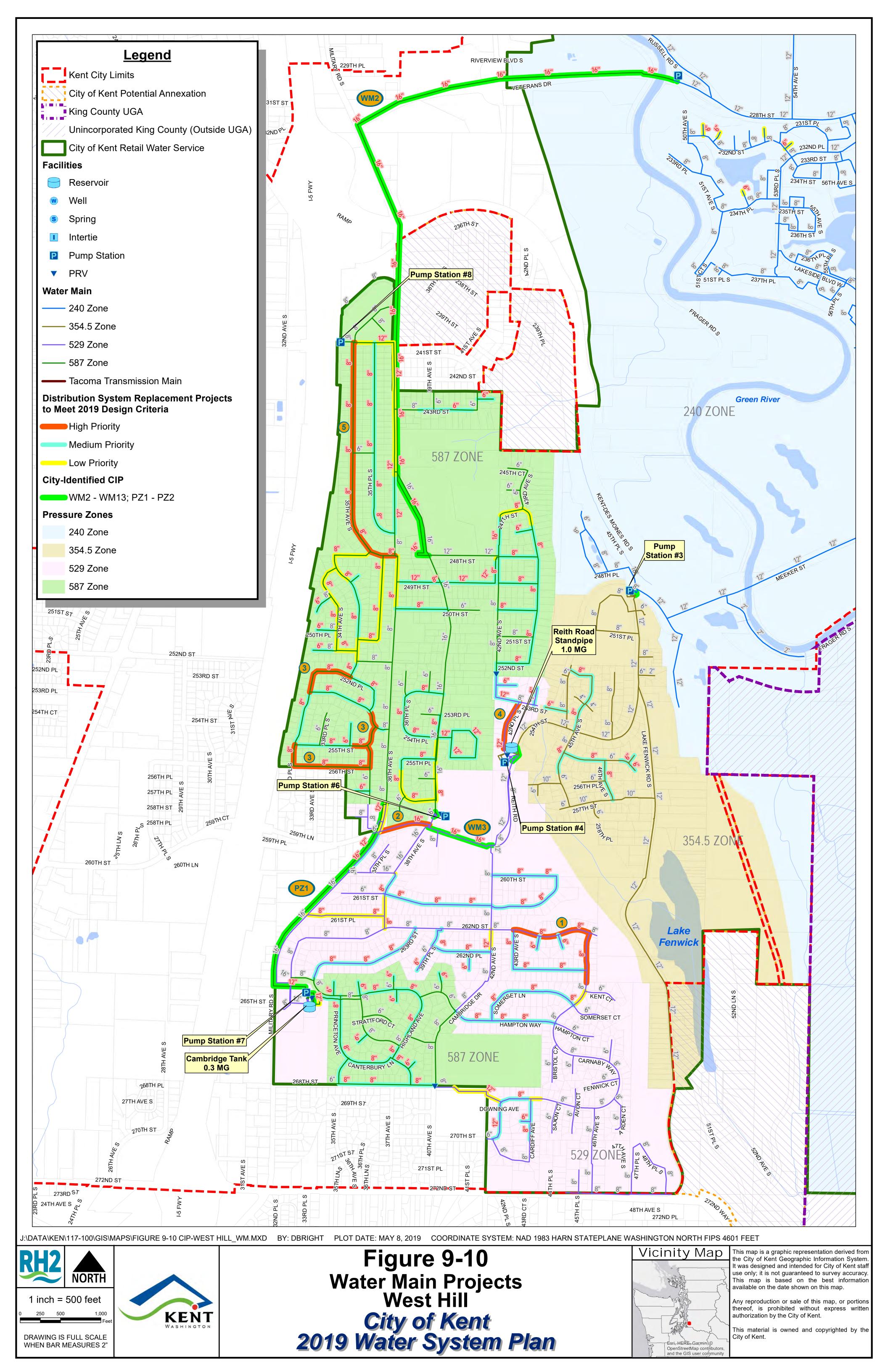
-wide cts

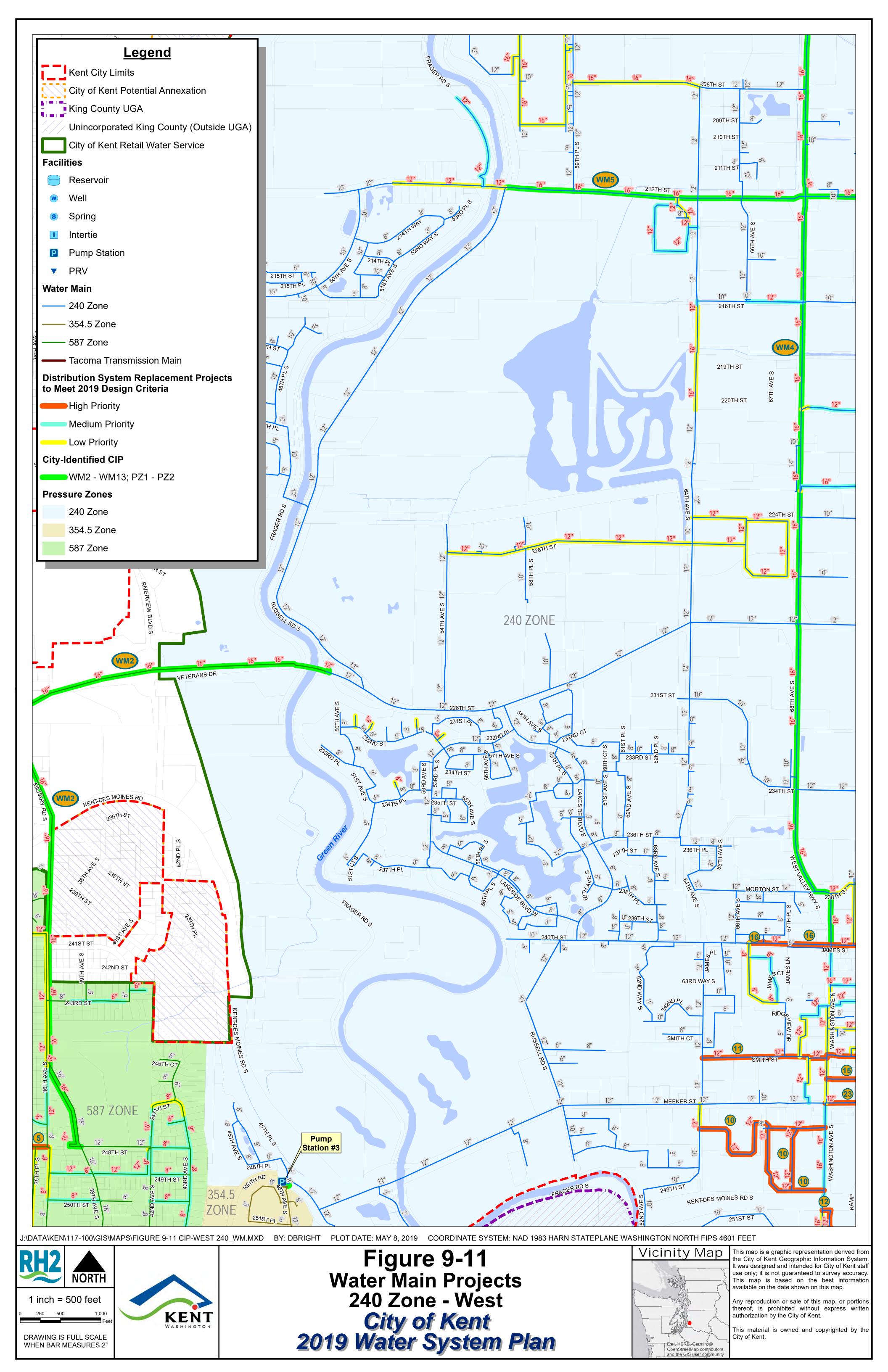
1 inch = 2,000 feet

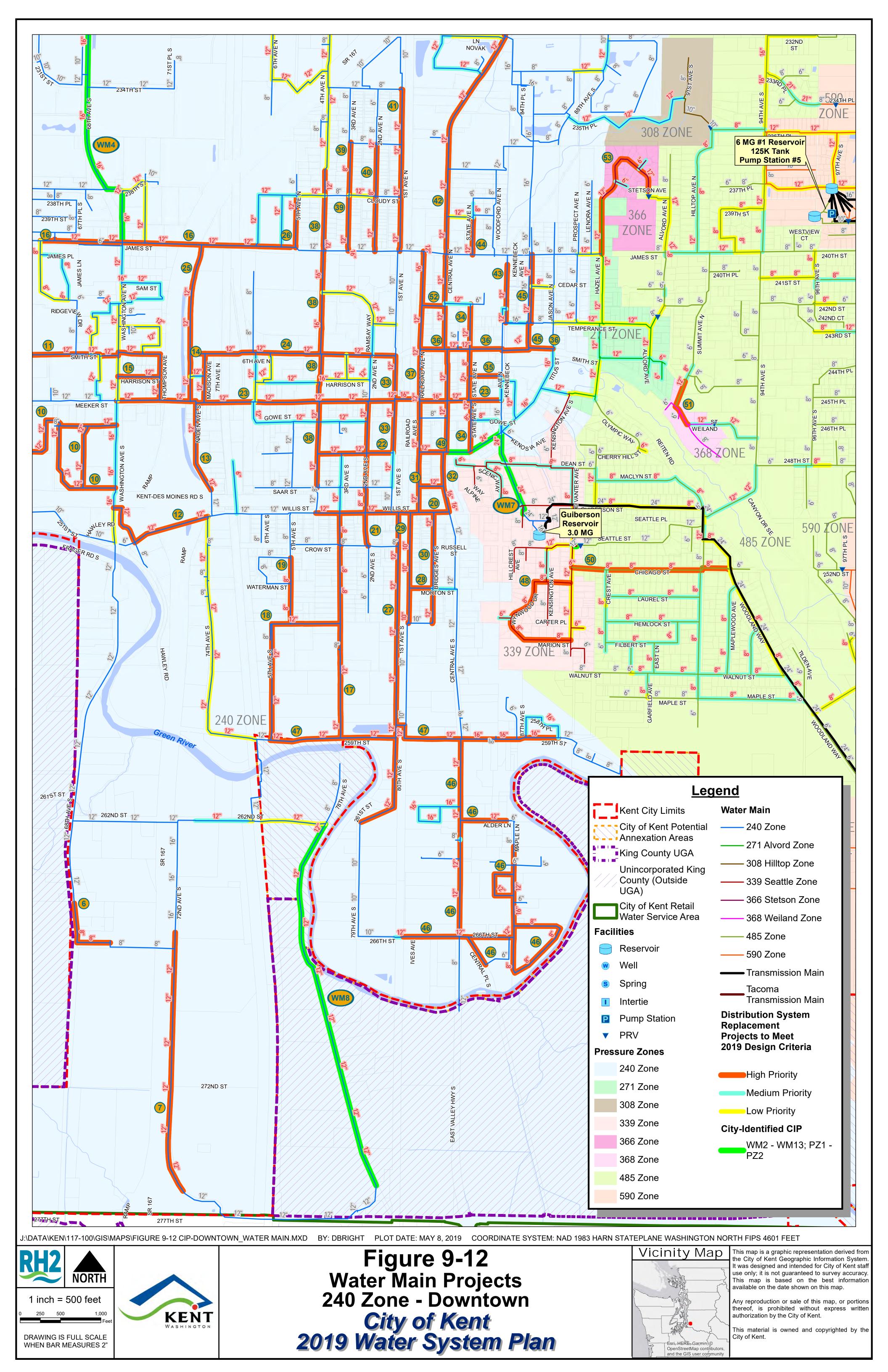
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

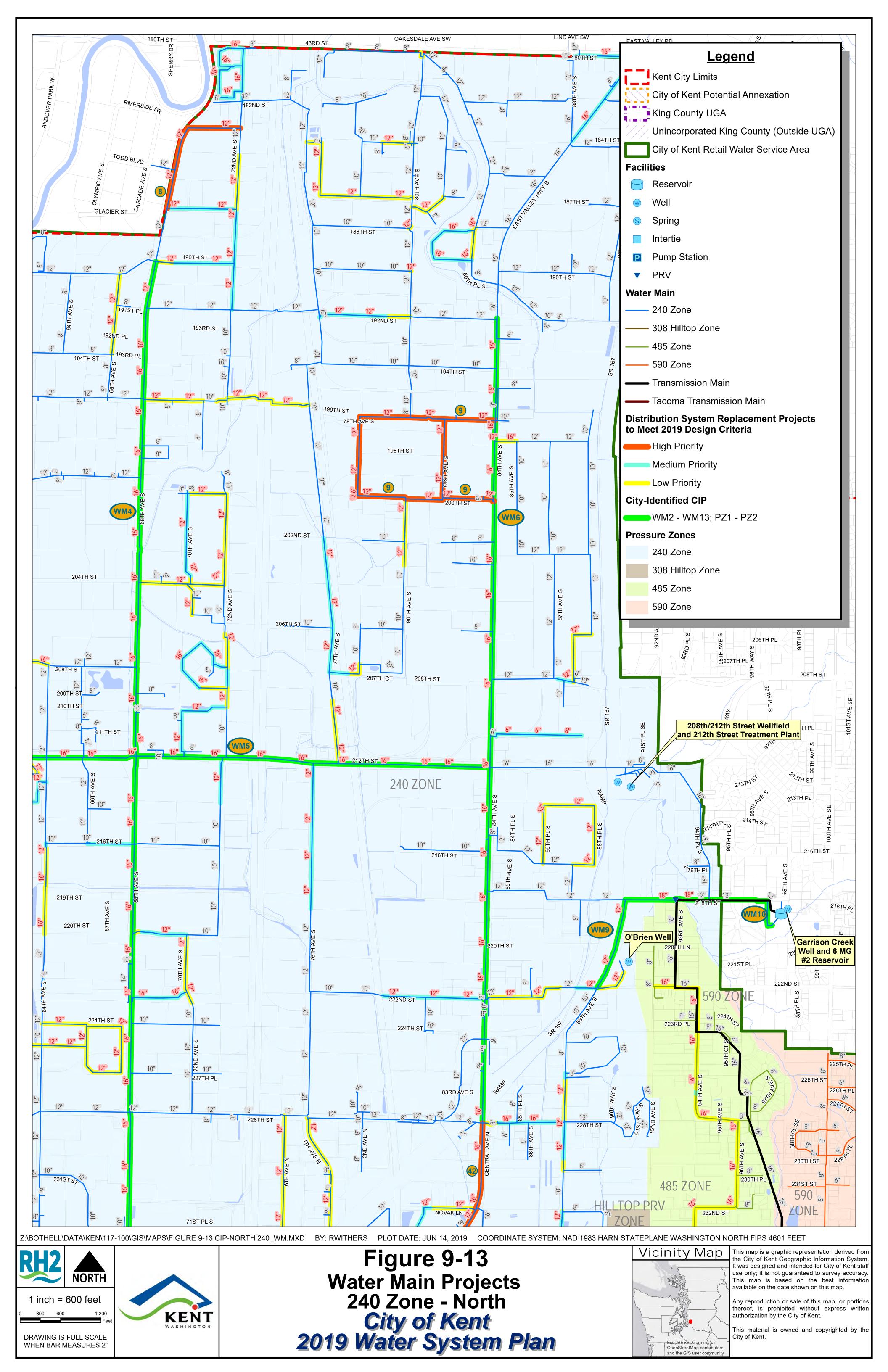


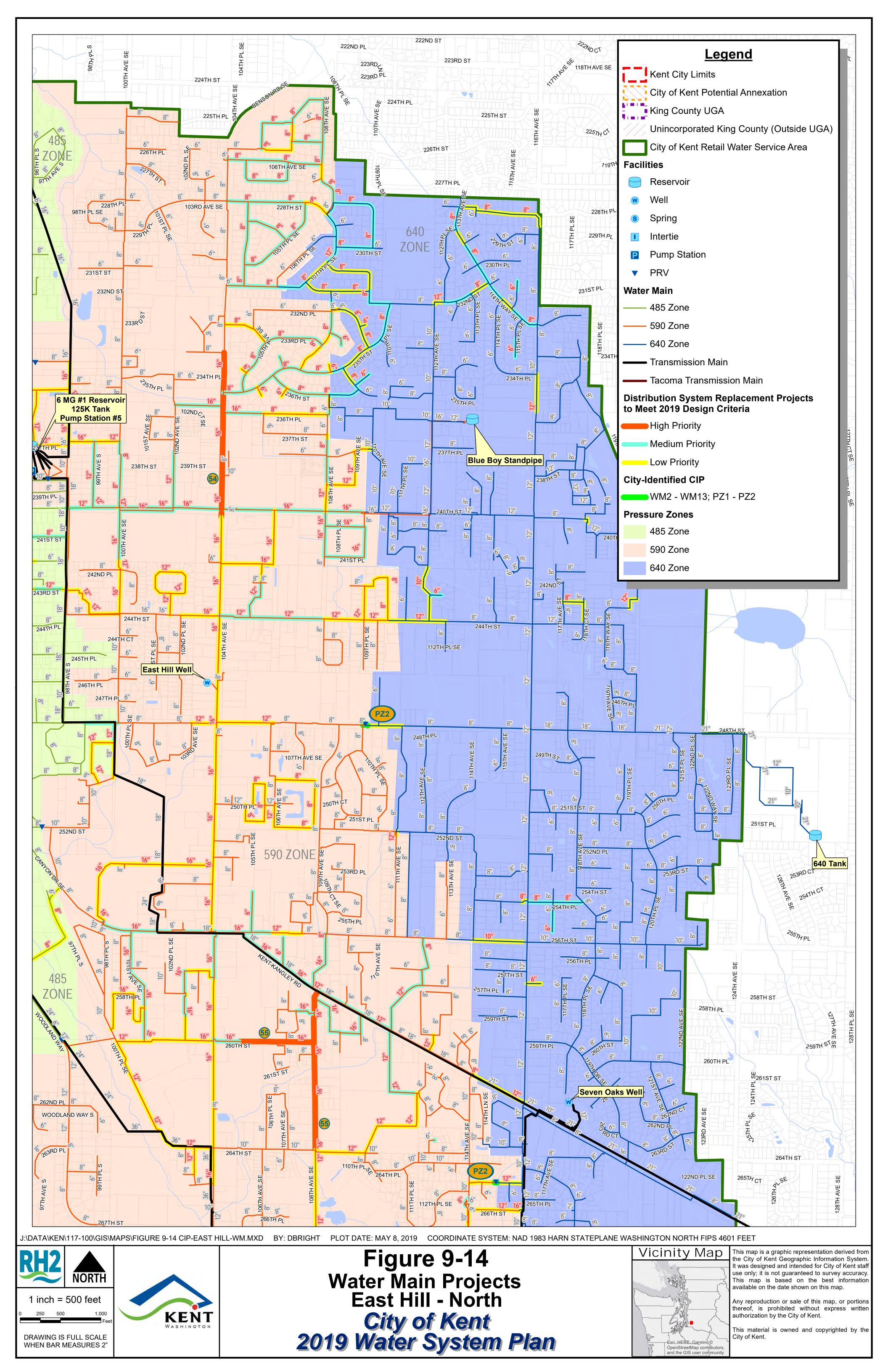


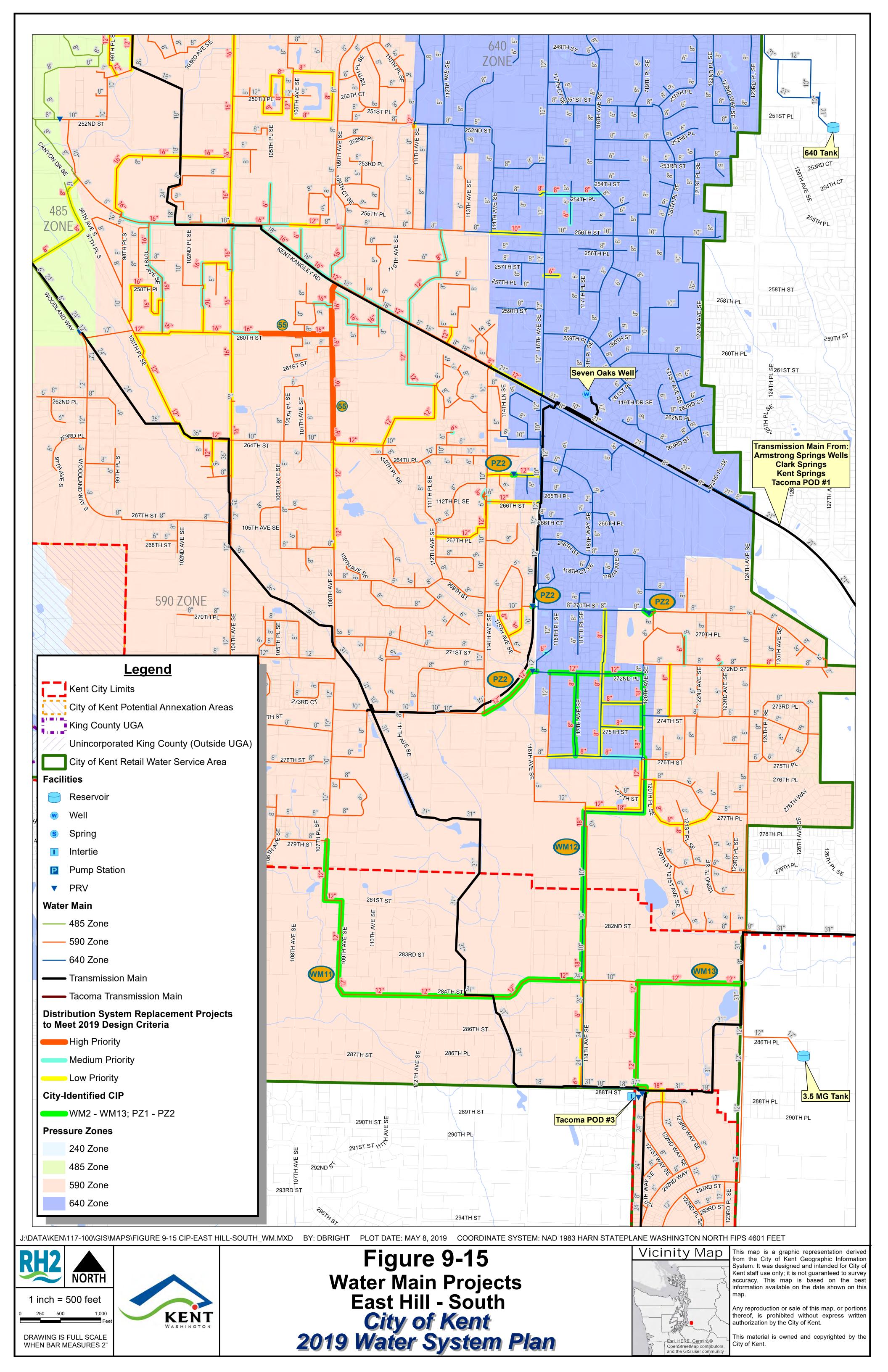


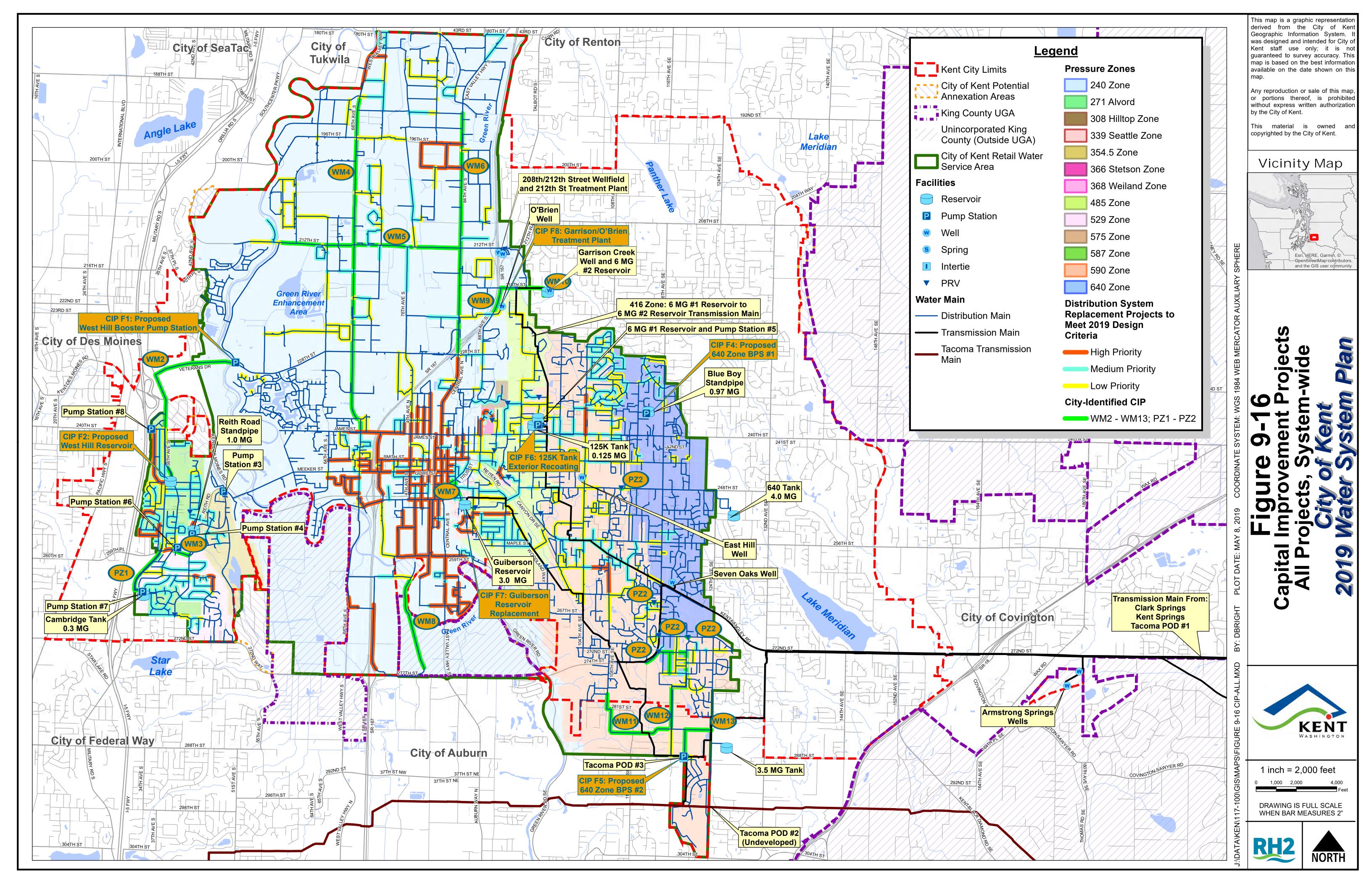


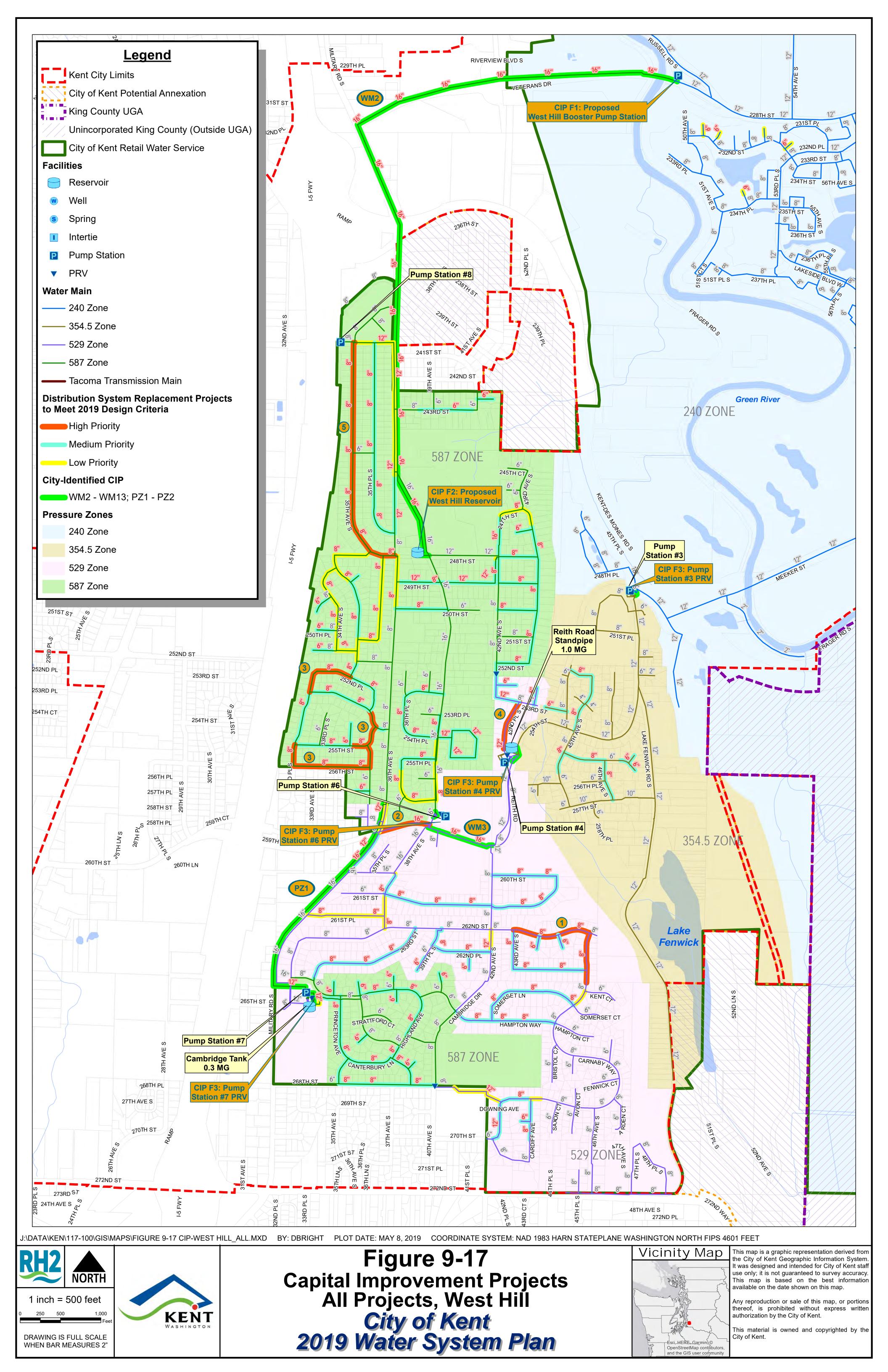


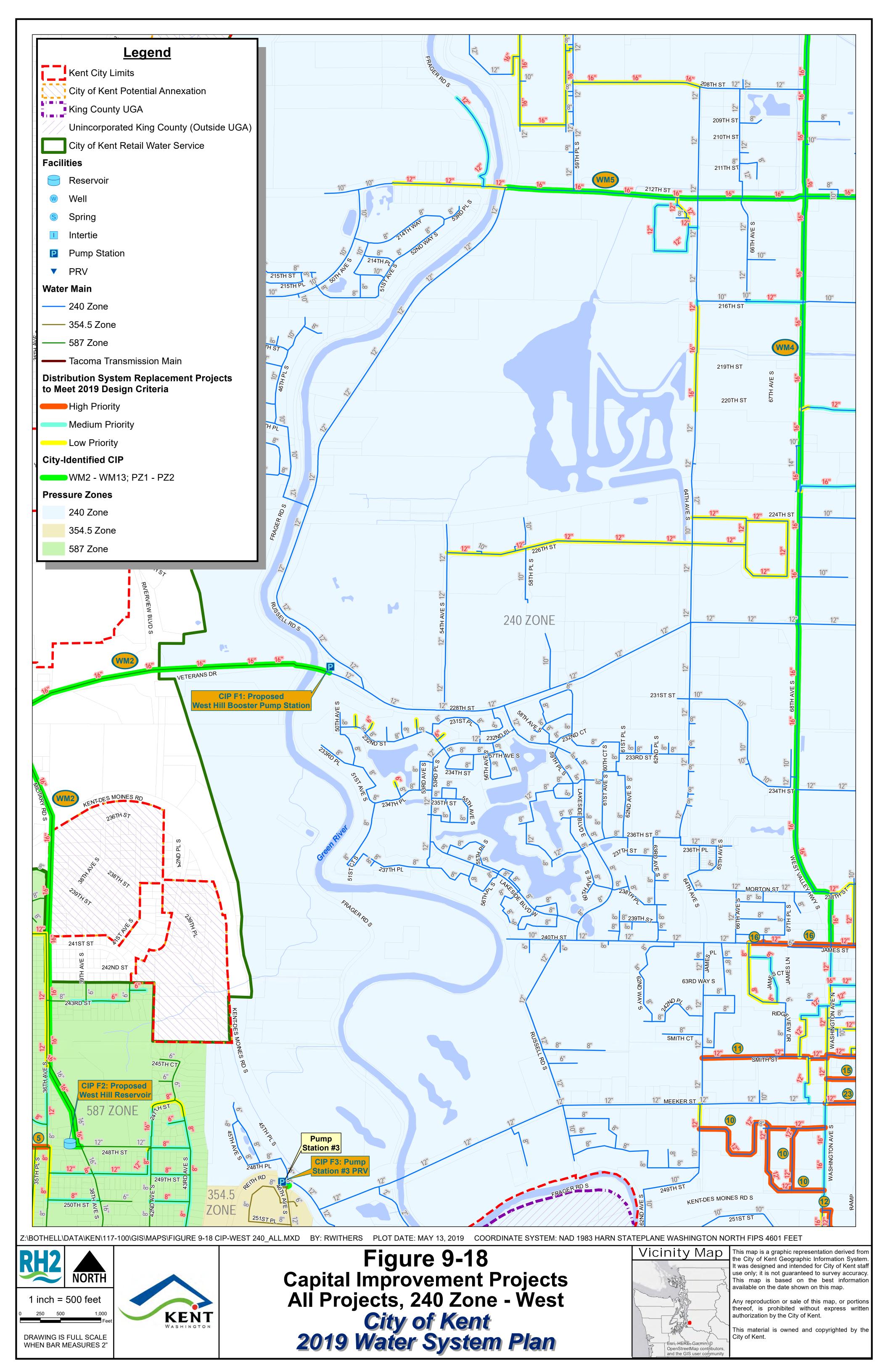


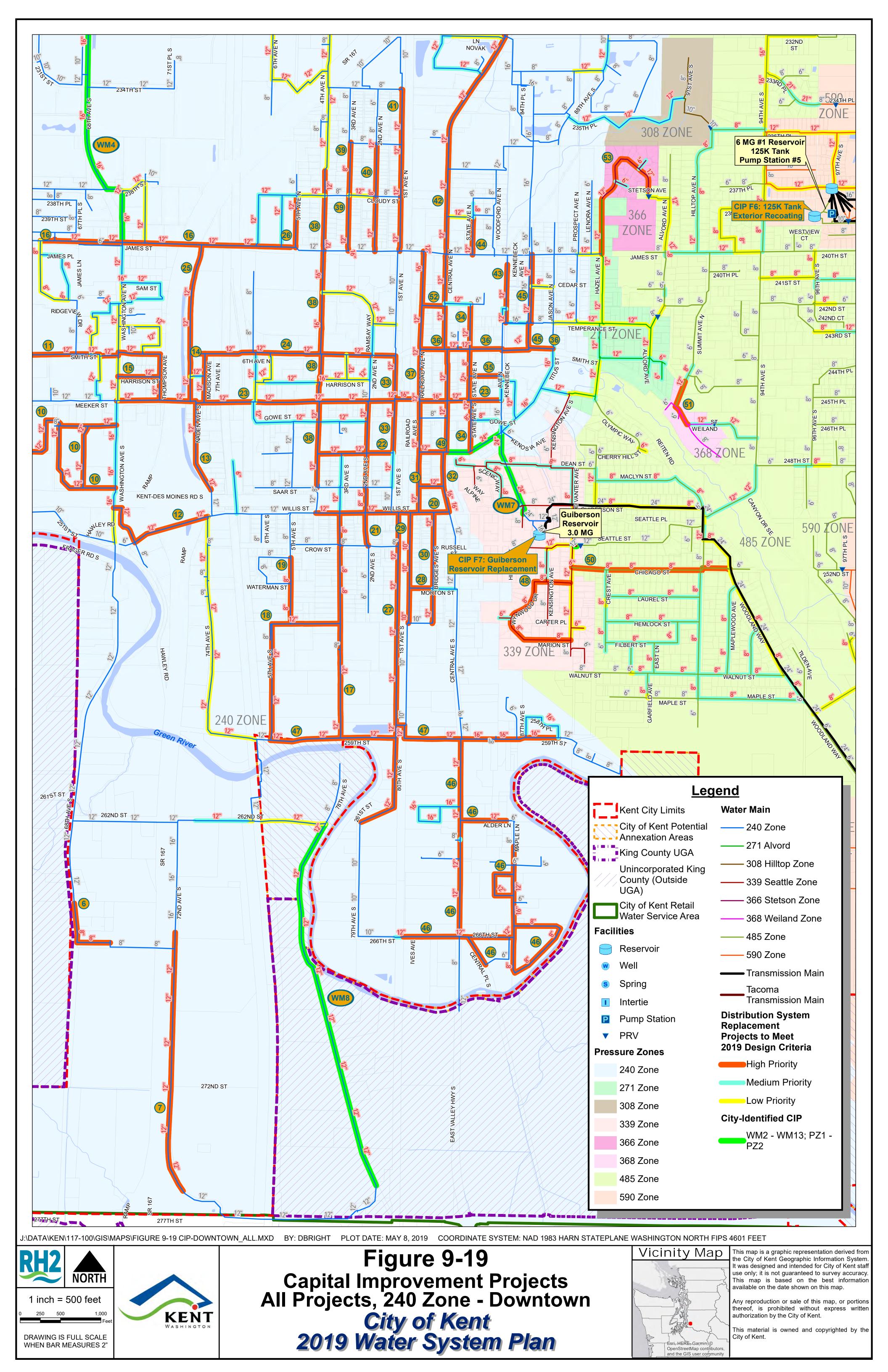


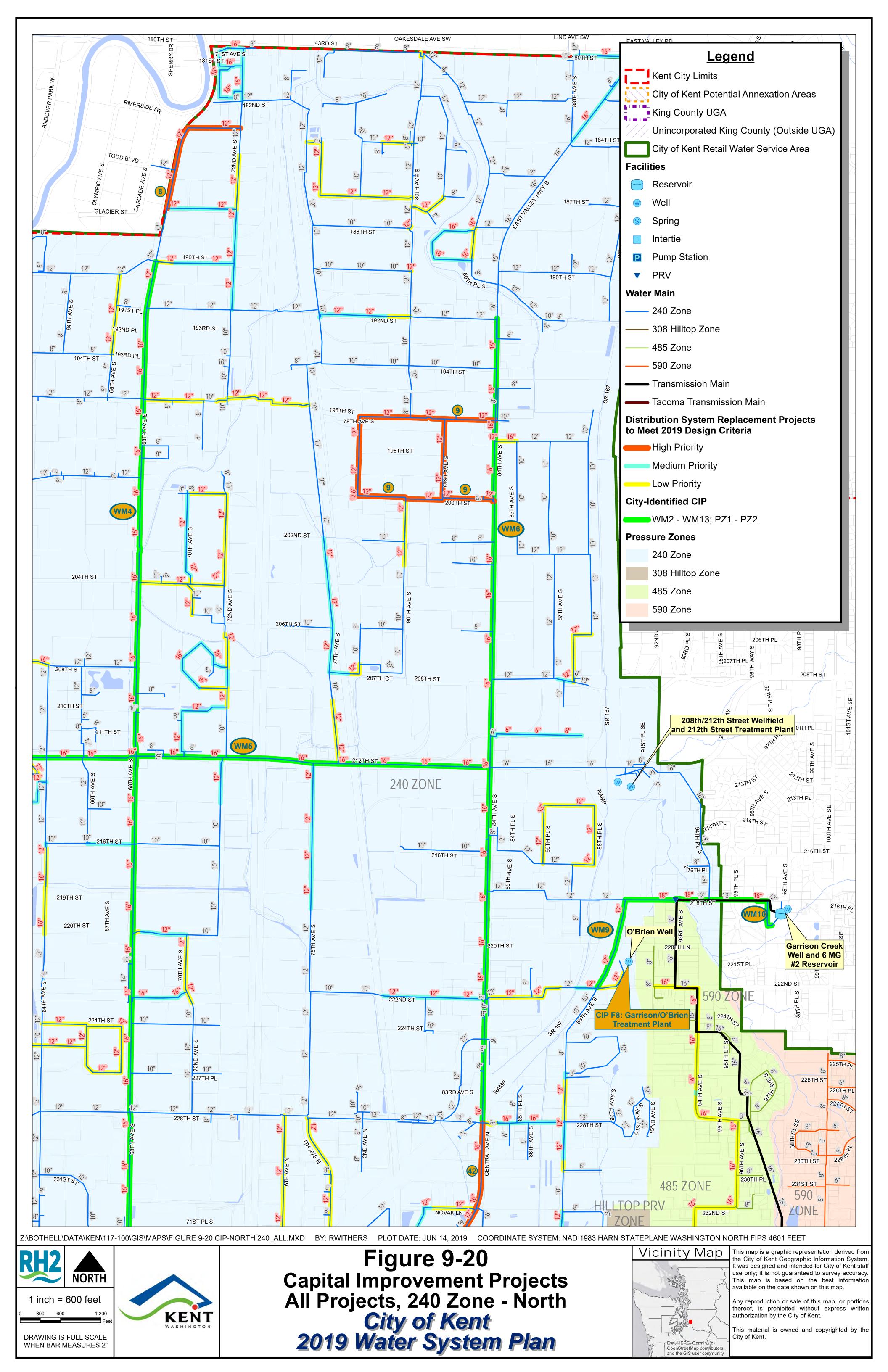


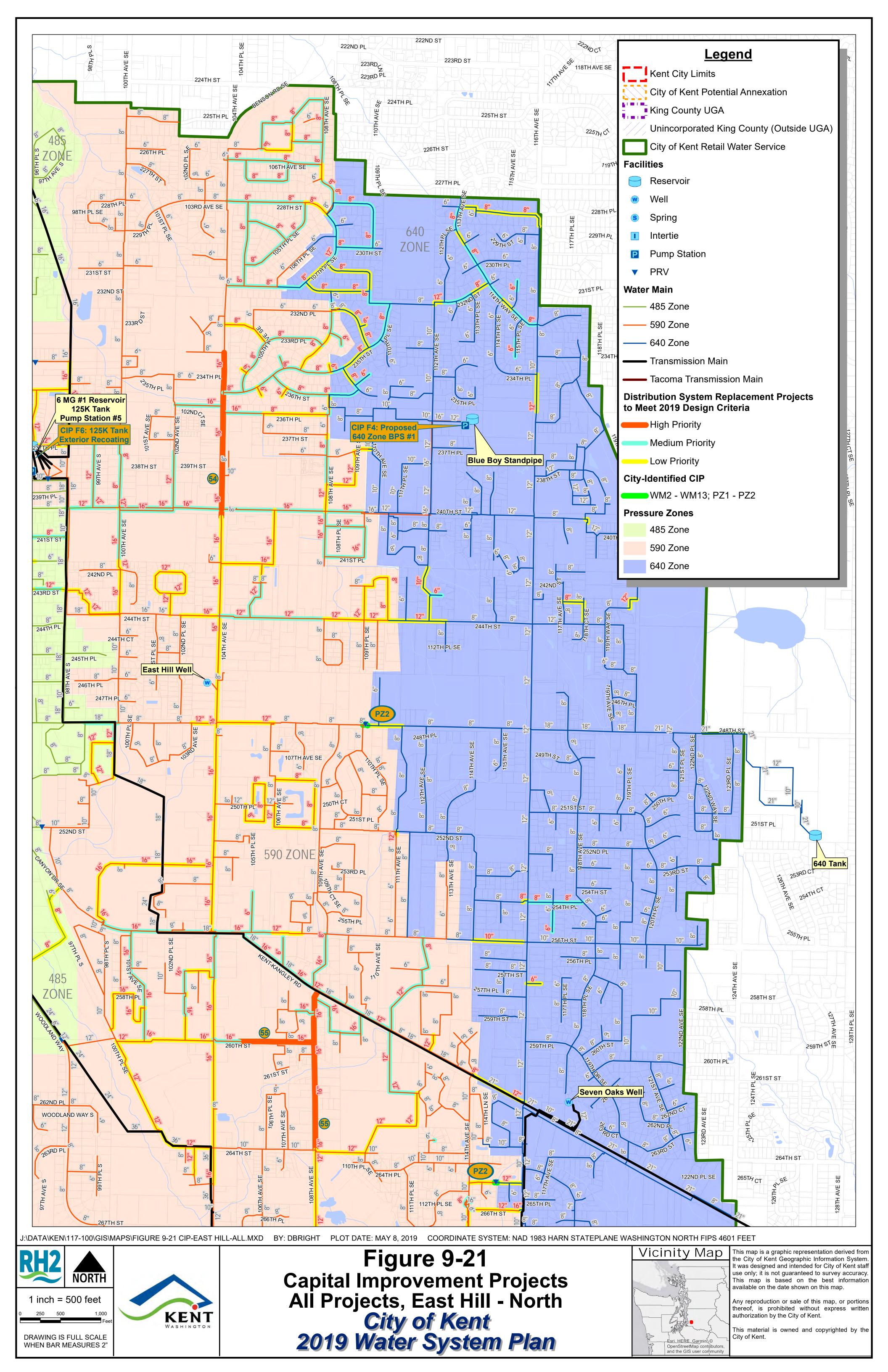


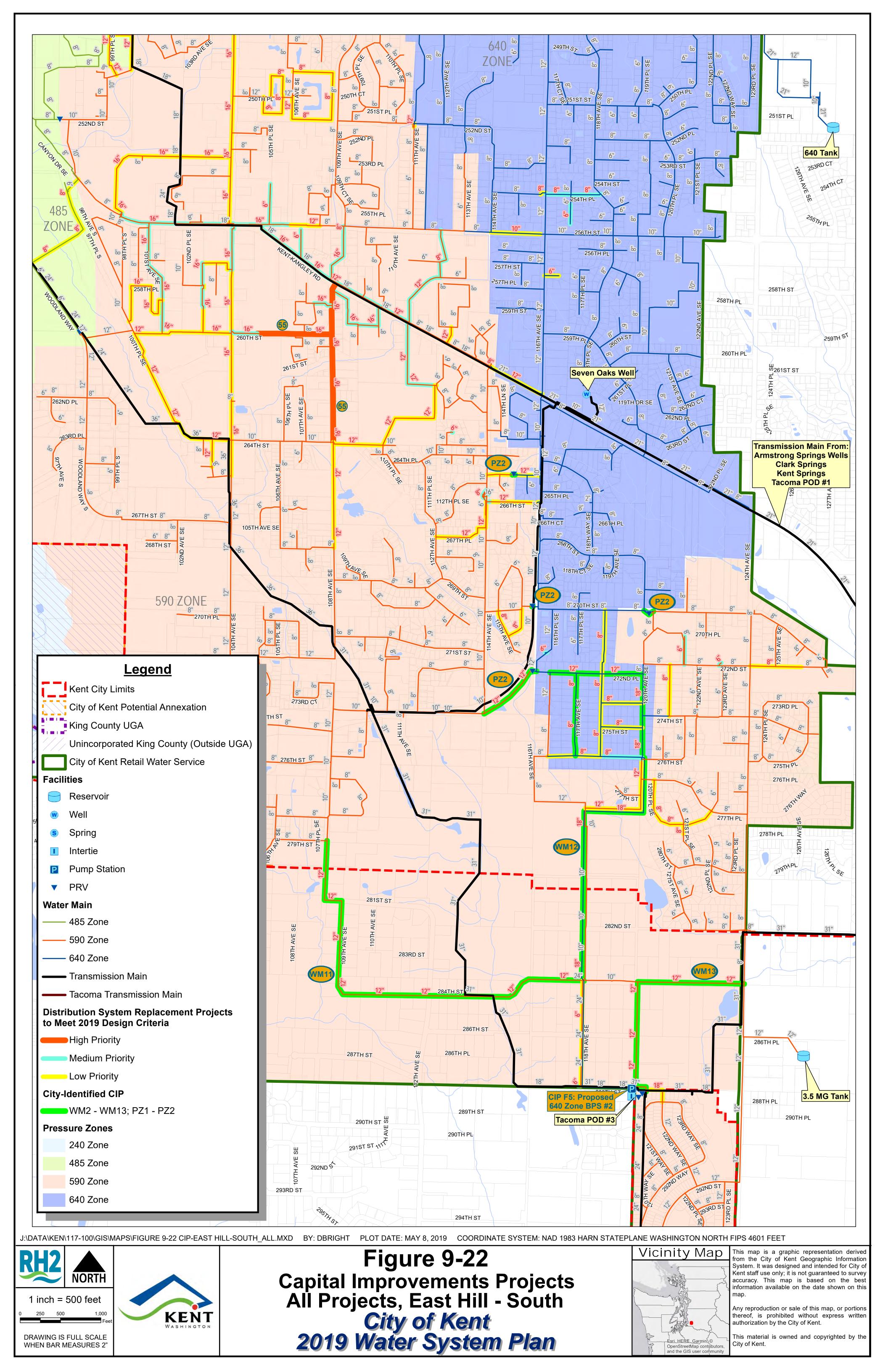












## 10 | FINANCIAL ANALYSIS

#### INTRODUCTION

This Chapter of the City of Kent's (City) 2019 Water System Plan (WSP) puts forth a strategy for implementing the capital and non-capital recommendations identified throughout the WSP. A financial analysis is presented to evaluate the ability of the City to financially support the necessary improvements to the water system identified in the Capital Improvements Plan put forth in Chapter 9. A 10-year proposed budget is provided that identifies the overall revenue requirements compared to anticipated income. This section is not intended to be a rate analysis, but is provided as a cursory review of revenue requirements and identification of potential funding sources.

#### FISCAL RESPONSIBILITY

Provision of public water service is essential to the preservation of public health, safety, and protection of the environment. Because water and other utility systems must maintain a high level of integrity, they require a much greater capital investment to operate and maintain than most other public services. Most water utility costs are fixed, due to the nature of funding large capital improvements, and the relatively stable costs of operating labor, insurance, and other expenses that do not vary with water use. Fixed costs, which are incurred regardless of customer consumption, are associated with making the service available at the point of customer use. A smaller proportion of a utility systems cost is variable and changes with the volume of water consumed and/or used (i.e. the cost of purchased water, power for pumping, etc.). The City strives to maintain reasonable water rates while maintaining the integrity of the water system and the service provided by the Water Department. The water utility is operated out of a separate utility fund, adding to the viability of the utility and ability to set water rates dedicated to the maintenance and upgrade of the water system as required to meet the public health and safety needs of current and projected system customers.

### **FUNDING SOURCES**

Funding sources available to the City for capital projects consist primarily of debt mechanisms or cash funding through various rates and fees. Historically, federal and state grant programs were available for financial assistance; however, these have been mostly eliminated or replaced by loan programs. Remaining miscellaneous grant programs are generally lightly funded and heavily subscribed. Although competitive, the benefits of low-interest loan programs in the State of Washington include relatively low administrative costs and the ability to spread costs over a period of time to reduce sudden rate impacts.

Income from water sales is the primary source of revenue and is utilized to finance Water Department expenses that are not otherwise funded by developer extensions, assessments, system development charges (SDCs), or miscellaneous fees. Typical expenses financed from water sales include: operation and maintenance; water supply and quality analysis; administrative,

accounting and collection expenses; debt service requirements; system renewal and replacement; and other general operating expenses.

The City's rate schedule as of January 1, 2019 is listed in **Table 10-1**. Water rates are subject to periodic changes, and current rates are available on the City's website at <a href="http://www.kentwa.gov">http://www.kentwa.gov</a>. Rates include a block rate structure and rebates for low-flow water fixtures as incentive to encourage water conservation and provide customers options for reducing their water bills with certain lifestyle changes. The City's rate structure is designed to encourage conservation, which reduces consumption and sales related to consumption. It is imperative that water sales and revenues are closely monitored to ensure water rates and revenues are sufficient. Revenues and expenses are monitored throughout the year to ensure operations are occurring as anticipated in the City's approved budget. Bi-annual budgets are prepared to estimate revenues and expenditures for the following years. Water rates are periodically reviewed to determine the adequacy of projected revenues to cover anticipated expenditures. It is important to review rates and system connection charges at the completion of water system plan updates, when updated population, employment, and demand projections are developed to confirm project needs during the 10-year planning horizon and beyond.

Table 10-1 Water System 2019 Rates

Water Utility Me	ter Access	Fees	Water Usage Fees per 100 cubic feet (748 gallons)							
Meter Size		Monthly								
(inches)		Fee	0-800 cf	\$	2.52					
<u>Residential</u>			800+ cf	\$	4.96					
<1	\$	24.28								
1	\$	38.01								
			Water Tap Fee	es (new cor	nnections)					
<u>Commerical</u>			Size							
<1	\$	30.52	<3/4	\$	100.00					
1	\$	44.25	3/4	\$	125.00					
1.5	\$	78.59	1	\$	175.00					
2	\$	119.80	1.5	\$	360.00					
3	\$	188.48	2	\$	500.00					
4	\$	284.63	>2		See KCC					
6	\$	422.00		7	'.02.160 [C]					
8	\$	559.36								
10	\$	696.73	System De	Fees						
Dedicated Fireline			<1	\$	7,694.19					
<1	\$	2.89	1	\$	19,234.84					
1	\$	3.37	1.5	\$	38,468.40					
1.25	\$	5.05	2	\$	61,549.70					
1.5	\$	6.73	3	\$	123,100.70					
2	\$	10.77	4	\$	192,344.60					
3	\$	26.92	5	\$	288,331.30					
4	\$	53.82	6	\$	384,689.20					
6	\$	107.65	8	\$	615,502.19					
8	\$	181.67	10	\$	846,315.22					
10	φ \$	269.14	10	ψ	040,010.22					
10	Ψ	209.14								
Backflow Fee	\$	106.71								

To establish an affordable and sustainable rate structure, the City compiled a list of current rate structures at comparable neighboring water districts. Prior to the rate study, the City was on the low to mid-range of its comparable districts. The rate increase adopted in November 2016 allowed the City to remain in the mid-range for residential and commercial rates. At this point, the City does not anticipate the need to take on additional debt for funding the capital program over the term of this WSP, as it is a balanced plan. If, during this time, circumstances change that require financing through debt or other sources beyond cash financing, there are multiple options that could be considered depending on the need. These options include:

- State-funded programs: Public Works Trust Fund Loans; and
- Bonds: Assessment Bonds; General Obligation (G.O.) Bonds; Councilmanic G.O. Bonds; and Revenue Bonds.

#### FINANCING PLAN AND PAST PERFORMANCE

In 2016, the City completed a water rate study and subsequently adopted a new structure for water rates that addressed the operating and capital needs for the system. The new rates included adopting a fee for dedicated fire lines; adding an automatic annual cost of living increase for fees associated with use, meters, and fire lines; increasing the meter fee based on size and flow; and eliminating the winter and summer rates to have one year-round rate. Additionally, the adopted rate structure started to address the imbalance of fixed and variable revenue to fixed and variable expenses by increasing meter fees, implementing the fire line fee, and reducing the use fee on the first tier. This imbalance was partially a consequence of a highly successful water efficiency and conservation effort that discouraged high water use and, therefore, sales related to that use. The implemented changes have been in place since January 1, 2017, and have proven to be a sustainable rate structure to fund the operating and capital needs of the system. The current rate structure has been set to handle emergency situations. In the event of large or small emergencies, funds can be diverted from capital projects, or the capital fund balance can be used to cover expenses. In December 2017, City Council adopted a fund balance reserve policy that requires a 20 percent of operating expenses fund balance that would be available for use in case of an emergency.

The estimated costs of proposed capital improvement projects recommended, as well as anticipated revenue and operating expenses for the 10-year planning horizon, are detailed in **Table 10-2**. It is anticipated that projects identified in this WSP will be financed from cash on hand. It is important to note that the anticipated revenue and expenses beyond the council adopted budget for 2019-2020 are estimates based on minimal growth that include a cost of living increase for the water revenues and expenses over the term of this WSP. A historical look at revenues and expenses also is provided in **Table 10-3**. The combination of the historical data, in conjunction with the financial plan for future revenues and expenditures, demonstrate the financial viability of the City of Kent's Water Utility.

The funding for capital improvements in this WSP is balanced. However, the City recognizes that the economy and other factors can change the needs of the water system. The City periodically contracts or performs rate studies to analyze changes in circumstance. The last rate study was completed and adopted in 2016, and the City anticipates beginning another rate study in 2020 to be completed in 2022.

CITY OF KENT WATER SYSTEM PLAN FINANCIAL ANALYSIS

Table 10-2 Water Operating Fund Projections

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
	Preliminary	Budget	Budget	Projection							
Revenues											
Charges for Services	22,519,154	23,363,100	23,923,790	24,497,961	25,085,912	25,687,974	26,304,485	26,935,793	27,582,252	28,244,226	28,922,087
System Dev/Connection Charges	1,852,189	1,451,100	1,480,120	1,515,643	1,552,018	1,589,267	1,627,409	1,666,467	1,706,462	1,747,417	1,789,355
Miscellaneous Revenue	1,178,818	661,350	674,580	690,770	707,348	724,325	741,709	759,510	777,738	796,403	815,517
Transfers In	-	-	-	-	-	-	-	-	-	-	-
Operating Revenues	25,550,161	25,475,550	26,078,490	26,704,374	27,345,279	28,001,565	28,673,603	29,361,769	30,066,452	30,788,047	31,526,960
Transfers In-Debt Service	3,760,718	4,113,510	3,579,390	4,604,978	4,061,511	3,515,473	4,146,464	4,130,653	4,109,197	4,093,757	4,076,208
Total Revenues	29,310,879	29,589,060	29,657,880	31,309,352	31,406,790	31,517,039	32,820,067	33,492,422	34,175,649	34,881,804	35,603,168
Expenditures											
Salaries & Benefits	3,152,687	3,500,220	3,614,120	3,722,544	3,834,220	3,949,247	4,067,724	4,189,756	4,315,448	4,444,912	4,578,259
Supplies	537,557	815,650	830,030	846,631	863,563	880,834	898,451	916,420	934,749	953,444	972,512
Services & Charges	9,281,302	10,874,800	11,224,460	11,448,949	11,677,928	11,911,487	12,149,716	12,392,711	12,640,565	12,893,376	13,151,244
Vehicles & Equipment	-	120,000	-	-	-	-	-	-	-	-	-
Cost Allocation	(371,148)	(480,000)	(480,000)	(494,400)	(509,232)	(524,509)	(540,244)	(556,452)	(573,145)	(590,339)	(608,050)
Transfers to Debt Service	46,983	-	-	-	-	-	-	-	-	-	-
Transfers to Capital Projects	7,760,420	13,119,000	5,627,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000
Debt Service - Principal	2,044,028	2,304,030	2,264,020	2,951,528	2,509,750	2,065,000	2,800,000	2,925,000	3,052,500	3,192,500	3,337,500
Debt Service - Interest	1,719,948	1,809,480	1,315,370	1,653,450	1,552,761	1,450,473	1,346,464	1,205,653	1,056,697	901,257	738,708
Operating Expenditures	24,171,777	32,063,180	24,395,000	26,128,701	25,928,990	25,732,532	26,722,111	27,073,088	27,426,814	27,795,150	28,170,174
Transfers Out - Debt Service	3,760,718	4,160,320	3,579,390	4,604,978	4,061,511	3,515,473	4,146,464	4,130,653	4,109,197	4,093,757	4,076,208
Total Expenditures	27,932,495	36,223,500	27,974,390	30,733,680	29,990,501	29,248,005	30,868,576	31,203,740	31,536,012	31,888,907	32,246,381
Change in Fund Balance	1,378,384	(6,634,440)	1,683,490	575,672	1,416,289	2,269,034	1,951,492	2,288,682	2,639,638	2,992,897	3,356,786
Ending Fund Balance	14,466,575	7,832,135	9,515,625	10,091,297	11,507,586	13,776,619	15,728,111	18,016,793	20,656,430	23,649,328	27,006,114

Table 10-3 Water Operating Fund History

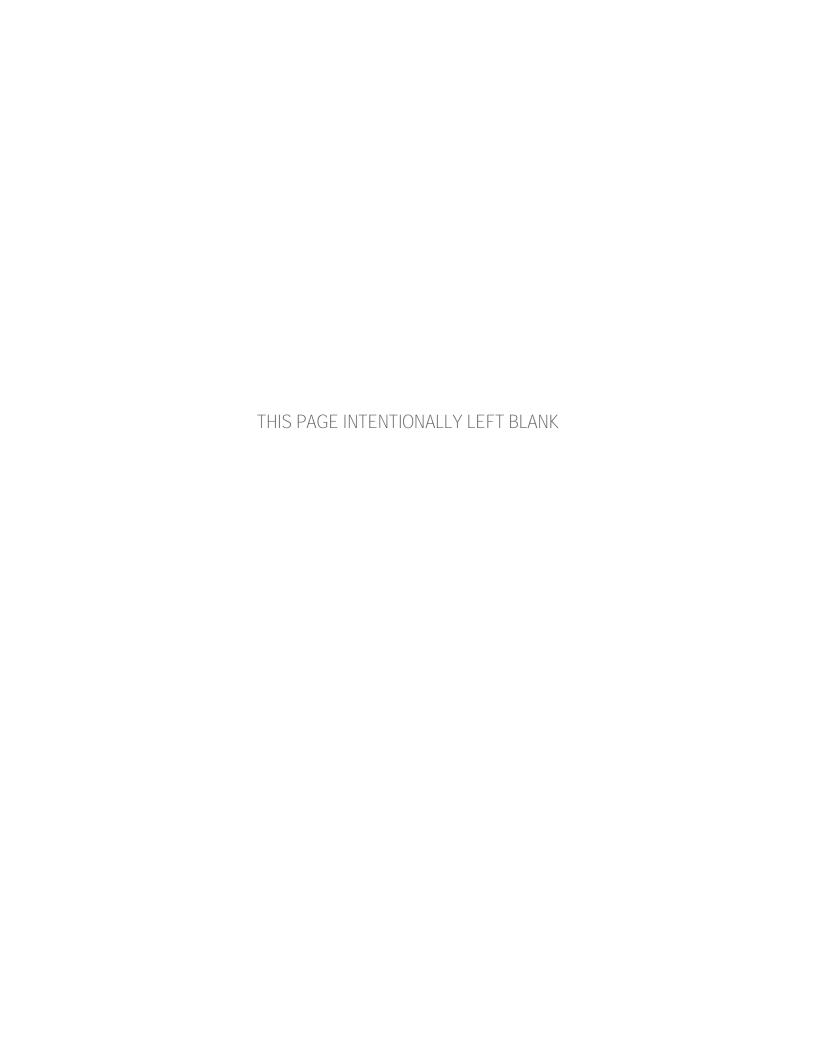
			3			
	2012	2013	2014	2015	2016	2017
	Actuals	Actuals	Preliminary	Actuals	Actuals	Actuals
Revenues						
Charges for Services	16,249,512	17,007,080	18,411,975	18,901,932	18,751,378	21,810,968
System Dev/Connection Charges	1,266,547	1,370,342	1,338,469	890,927	1,495,241	1,986,572
Miscellaneous Revenue	713,106	1,101,250	1,339,026	498,209	846,052	976,012
Transfers In	-	5,854	10,026	-	4,838	500
Operating Revenues	18,229,165	19,484,526	21,099,496	20,291,068	21,097,509	24,774,052
Transfers In-Debt Service	3,480,575	4,397,692	3,668,805	3,676,293	3,428,491	3,435,184
Total Revenues	21,709,740	23,882,218	24,768,301	23,967,361	24,526,000	28,209,236
Expenditures						
Salaries & Benefits	3,105,497	2,839,228	2,780,926	2,863,591	3,016,383	2,956,384
Supplies	541,390	585,486	530,365	575,318	745,453	621,832
Services & Charges	7,035,164	8,026,927	7,822,797	8,051,658	8,345,677	8,919,899
Vehicles & Equipment	-	-	-	144,766	-	17,661
Cost Allocation	(737,533)	(879,343)	(456,770)	(505,647)	(480,711)	(506,142)
Transfers to Debt Service	46,969	48,936	47,064	47,100	46,894	47,360
Transfers to Capital Projects	3,151,301	2,704,254	3,025,900	2,800,000	3,009,738	7,450,000
Debt Service - Principal	1,667,974	2,782,326	2,016,528	2,071,528	1,971,528	2,024,028
Debt Service - Interest	1,812,601	1,615,366	1,652,277	1,612,939	1,571,379	1,611,727
Operating Expenditures	16,623,363	17,723,180	17,419,087	17,661,253	18,226,341	23,142,749
Transfers Out - Debt Service	3,480,575	4,397,692	3,668,805	3,676,293	3,428,491	3,435,184
Total Expenditures	20,103,938	22,120,872	21,087,892	21,337,546	21,654,832	26,577,933
Change in Fund Palance	1 605 902	1 761 246	2 690 400	2 620 915	2 971 169	1 621 202
Change in Fund Balance	1,605,802	1,761,346	3,680,409	2,629,815	2,871,168	1,631,303
Ending Fund Balance	1,363,111	3,344,832	7,020,229	8,817,521	11,029,672	13,088,191

Historical information was gathered from budget documents located on the City website

<sup>2014</sup> are preliminary numbers actuals not printed in budget book.

# APPENDIX A

Water Facilities Inventory (WFI) Form



### WATER FACILITIES INVENTORY (WFI) FORM



ONE FORM PER SYSTEM

Quarter: 1

Updated: 09/17/2019

Printed: 9/26/2019

WFI Printed For: On-Demand
Submission Reason: Source Update

RETURN TO: Central Services - WFI, PO Box 47822, Olympia, WA, 98504-7822

Porchation update

1. SYSTEM ID NO.	2. SYSTEM NAME		3. COUNTY		4. GROUP	5. TYPE
38150 1	KENT WATER DEPARTMENT		KING		A	Comm
6. PRIMARY CONTAC	T NAME & MAILING ADDRESS		7. OWNER NAME & M	MAILING ADDRESS	8. OWNER NUMBE	R: 002950
220 4TH	M. BAUER [MANAGER] HAVE S WA 98032		KENT, CITY OF TIM LAPORTE 220 4TH AVE S KENT, WA 98032		PW DIRECTOR	
STREET ADDRESS IF	DIFFERENT FROM ABOVE		STREET ADDRESS IF	DIFFERENT FROM A	ABOVE	
ATTN ADDRESS CITY	STATE ZIP		ATTN ADDRESS CITY	STATE ZII	P	
9. 24 HOUR PRIMARY	CONTACT INFORMATION		10. OWNER CONTAC	TINFORMATION		
Primary Contact Daytim	ne Phone: (253) 856-5610		Owner Daytime Phone:	: (253) 856-550	00	
Primary Contact Mobile	/Cell Phone: (253) 740-7089		Owner Mobile/Cell Pho	ne:		
Primary Contact Evenin	g Phone: (xxx)-xxx-xxxx		Owner Evening Phone:			
Fax: (253) 856-6600	E-mail: xxxxxxxxxxxxxxxxxx		Fax:	E-mail: xxxxxxxxxxxx	xxxxxxxx	
	GEMENT AGENCY - SMA (check only on	ie)		S OF THE STREET	7.7	
■ Not applica     □ Owned and     □ Managed C     □ Owned On	Dnly	ME:			SMA Number:	
12. WATER SYSTEM (	CHARACTERISTICS (mark all that apply)	1 1000	The Aller			
Agricultural Commercial / Be Day Care Food Service/Fo	usiness	Hos Maind Ma	ensed Residential Facility		ial ry Farm Worker nurch, fire station, etc.)	
	WNERSHIP (mark only one)	100 mg/14			14. STORAGE CAPA	ACITY (gallons
☐ Association ☐ City / Town	☐ County ☐ Federal	☐ Investor☐ Private	☐ Spe	ecial District te	23,225,	000

- SEE NEXT PAGE FOR A COMPLETE LIST OF SOURCES -

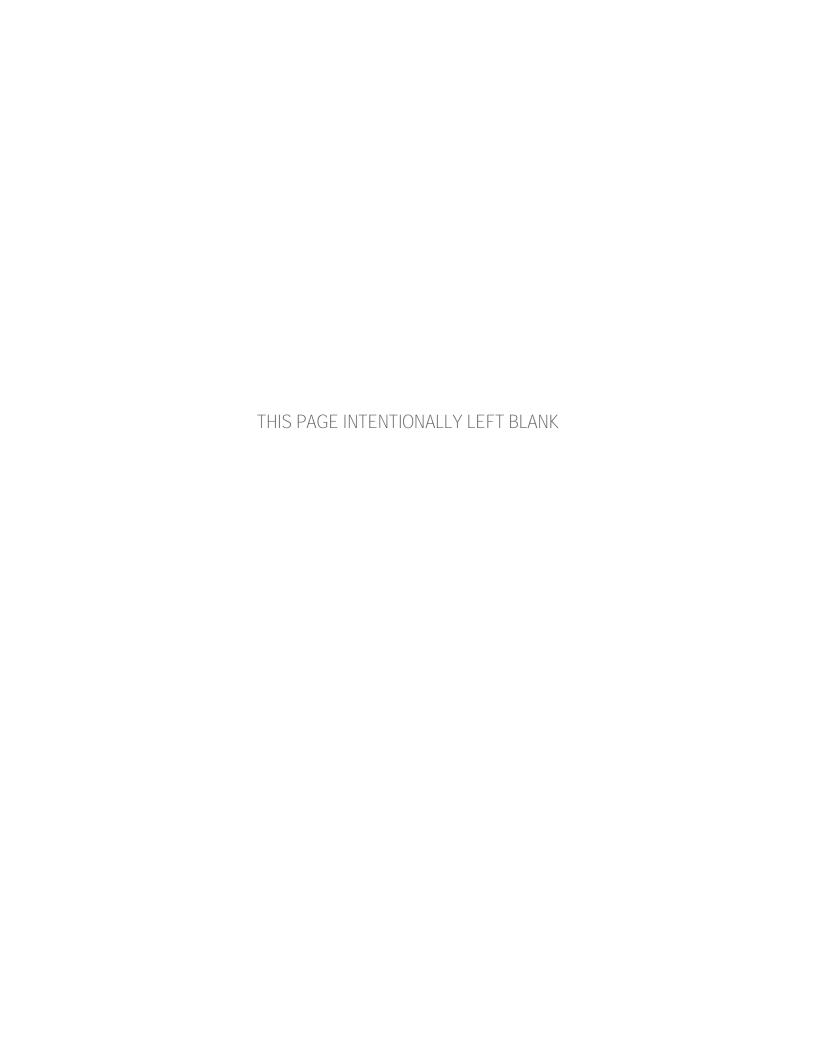
## WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
38150 1	KENT WATER DEPARTMENT	KING	Α	Comm

45		1			47 49 40 20 54									4-		00			76		00							
15	16 SOURCE NAME	17 INTERTIE		S	OL	JRC		I8 CAT	EG	OR	Y			19 JSE		20		TRI	Z EAT		NT		22 DEPTH	23	SOUR	CE L		TION
Source Number	LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456 IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL	WELL FIELD	WELL IN A WELL FIELD	SPRING	SPRING FIELD	SPRING IN SPRINGFIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	PERMANENT	SEASONAL	EMERGENCY	SOURCE METERED	NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	DEPTH TO FIRST OPEN INTERVAL IN FEET	CAPACITY (GALLONS PER MINUTE)	1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE
S01	Kent Springs 1,2,3										х		х			Υ		Х		Х				6800	SE SW	33	22N	06E
S02	Clark Springs 1,2,3										х		х			Υ		Х		Х				5400	NE SE	33	22N	06E
S03	InAct 06/01/1989 Clark Springs 2			х									х			Υ	х							1800	NE SW	33	22N	06E
S04	InAct 06/01/1989 Clark Springs 3			х									х			Υ	х							2700	SW NW	33	22N	06E
S05	East Hill Well 1		×										х			Υ		х		Х			225	1950	SWNW	20	22N	05E
S06	InAct 03/30/2018 Garrison Well 1		×												х	Υ	х						422	500	NE SE	07	22N	05E
S07	Seven Oaks Well		×											х		Υ		х		х			373	900	SWNW	28	22N	05E
S08	Armstrong Springs A1				х								X			Υ		х		х			80	420	NE NE	36	22N	05E
S09	Armstrong Springs A2				х								х			Υ		Х		х			66	680	NE NE	36	22N	05E
S10	N Kent Wellfield (212th & 208th)		Г	х				Г						х		Υ		х	х	х			180	5000	SE NW	07	22N	05E
S11	208th Street Well				Х							П	٦	х		Υ		х	х	х			180	1200	SE NW	07	22N	05E
S12	OBrien Well	2	х									П	٦	х		Υ		x		х			192	243	SE SW	07	22N	05E
S13	Well 1 - 212 ST				х				I					х		Υ		х	х	х			336	1200	SE NW	07	22N	05E
S14	Well 2 - 212 ST				х									х		Υ		х	х	х			248	1200	SE NW	07	22N	05E
S15	Well 3 - 212 ST				Х									х		Υ		х	×	х			290	1300	SE NW	07	22N	05E
S16	Garrison Well 2		х		V									x		Υ		х		х			422	600	NE SE	07	22N	05E
§17	Pre-Active 06/24/2002 East Hill Well		х								ì		x			Υ		х		х			216	600	SWNW	20	22N	05E
318	Armstrong Wells 1 & 2			Х							П		x	٦		Υ		х		х	П		66	1300	NE NE	36	22N	05
519	Tacoma Water (2nd supply)	86800 N									7		х			Υ	х							8778	= 0		00N	00E
520	Highline Intertie (1)	40650 6											1		х	Υ	X					1		1040			00N	00E
521	Auburn Intertie (1)	03350 V					Г						1		x	Υ	х					1		200			00N	00E
522	Renton Intertie (1)	71850 L					Г								х	Υ	X					7		1800			00N	00E
523	Soos Creek Intertie (1)	40100 8									T		1	1	х	Υ	х					1		700			00N	00E
524	Lake Meridian Water Dist 💢 (2)	41900 B													х	Υ	х							1400			00N	00E
325	Tukwila (1)	89500 F											1	-	х	$\rightarrow$	x			7		1		2360			DON	00E

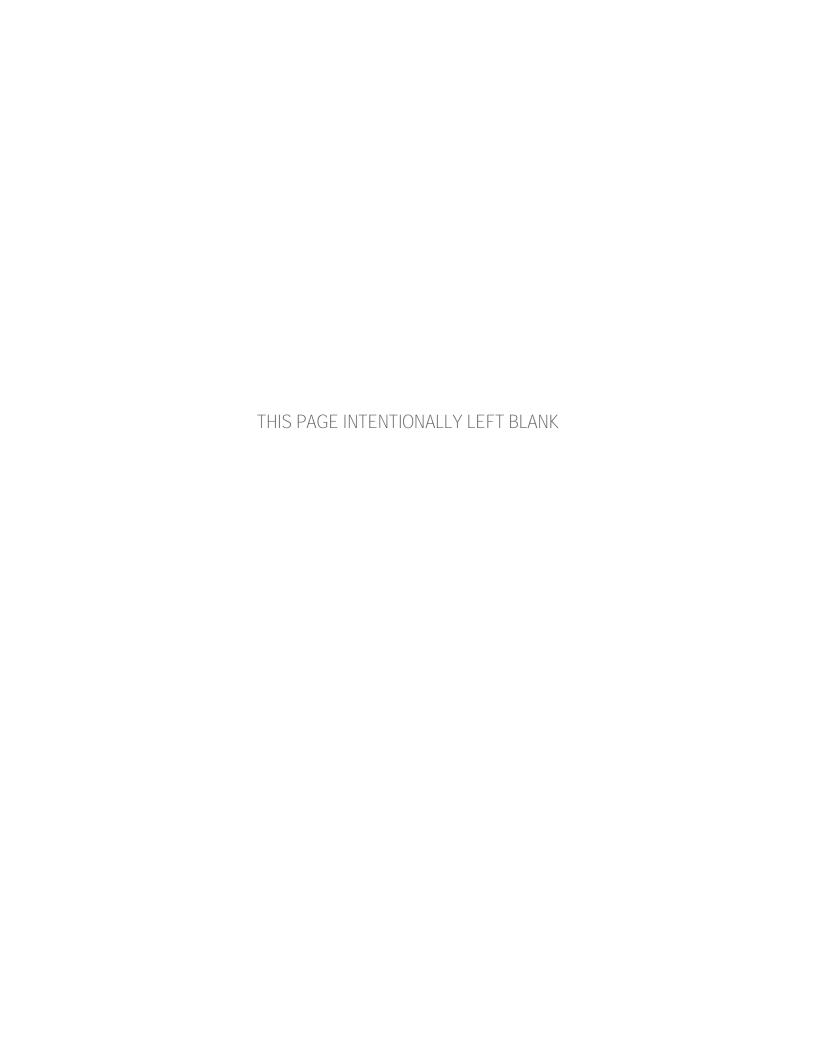
### WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	6.			3.	COUNTY	773	100		4. GR	OUP	5. TYI	PE
38150 1	KENT WATER DEPARTMENT	KIN	IG					Α	C	omm			
25 CINCLE FAMILY DE								ACT SER\ CONNE		CALCU ACT CONNE	IVE CTIONS	APPR CONNE	SE ONLY ROVED ECTIONS
	SIDENCES (How many of the following							1		308	539	Unsp	ecified
	ly Residences (Occupied 180 days or more							113					
	ily Residences (Occupied less than 180 da	, , ,						С					
	IDENTIAL BUILDINGS (How many of the	tollowing	g do you	have?)									
	condos, duplexes, barracks, dorms							160	_				
	Units in the Apartments, Condos, Duplexes							192					
	Units in the Apartments, Condos, Duplexe				ss than 18	30 days/ye	ear	0					
	CONNECTIONS (How many of the followed or Transient Assertment of the followed or Transient Assertment of the followed or Transient or Trans			-									
	and/or Transient Accommodations (Camps al/Business, School, Day Care, Industrial S			motel/ove	rnight uni	ts)		1:		1			
D. Mottational, Commercia	and daniess, condoi, bay care, industrial of	Jei vices, e	1	TOTAL OF	DVICE C	ONNECT	ONE	230	J6	23			
29. FULL-TIME RESIDEN	ITIAL POPULATION		20.	OTAL SE	RVICE	ONNECT	ONS	-		328	330		
	re served by this system 180 or more days	per year?			69841								
			_	Γ	_	1		1					_
30. PART-TIME RESIDE	NTIAL POPULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ОСТ	NOV	DEC
A, How many part-time re	esidents are present each month?	0	0	0	0	0	0	0	0	0	0	0	0
B. How many days per m	onth are they present?	0	บ	0	0	0	0	0	0	0	0	0	D
31. TEMPORARY & TRA	NSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ОСТ	NOV	DEC
	s, attendees, travelers, campers, patients to the water system each month?	69 <sub>[10]</sub>	69,700	CA,700	(A) 760	4,700	69700	191,7ac	<b>С</b> 9,7¢	o 69.70	И,7a o	, 69,70	69,700
B. How many days per m	onth is water accessible to the public?	31	28	31	30	31	30	31	31	30	31	30	31
32. REGULAR NON-RES	SIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ОСТ	NOV	DEC
	ycares, or businesses connected to your tudents daycare children and/or ch month?	61200	61200	6700	biza	6,200	6700	6200	6200	6700	6200	4200	6,200
B. How many days per mo	nth are they present?	31	28	31	30	31	30	31	31	30	31	30	31
33. ROUTINE COLIFORM	SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ОСТ	NOV	DEC
Requirement is exception	from WAC 246-290	70	70	70	70	70	70	70	70	70	70	70	70
34. NITRATE SCHEDULE			QUART	TERLY			ANNU	ALLY		ON	CE EVER	Y 3 YEA	RS
(One Sample per source	by time period)												
35. Reason for Submittin	g WFI:												
Update - Change	Update - No Change Inac	tivate	☐ Re-A	ctivate	☐ Nar	ne Chang	e 🗆	New Syst	em [	Other			
36. I certify that the info	rmation stated on this WFI form is corre	ect to the	best of n	ny knowie	edge.	q	12/-1	19					
PRINT NAME:	EAN BAUER				TITLE:	Wh	TER	Syst	iem	MA	MAGI	ee	



## APPENDIX B

Retail Water Service Area and Other Agreements



ORIGINAL

#### RESOLUTION NO. 2 5 6 8

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25 26 A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF AUBURN, WASHINGTON, AUTHORIZING THE MAYOR AND CITY CLERK TO EXECUTE SOUTH KING COUNTY REGIONAL WATER ASSOCIATION JOINT OPERATING AGREEMENT BETWEEN PARTICIPATING CITIES OF KENT, BLACK DIAMOND, COVINGTON WATER DISTRICT COUNTY AUBURN, AND KING DISTRICT NO. 111.

WHEREAS, pursuant to RCW 39.34 entitled the "Interlocal Cooperation Act", the City of Auburn is authorized to enter into agreements with other public agencies to provide for the most efficient services; and

WHEREAS, an adequate and safe water supply for South King County Regional Water Association (SKRWA) is vital to both existing citizens and the long-term comprehensive plans of SKRWA; and

WHEREAS, the State and SKRWA have prepared a Coordinated Water System Plan (CWSP) for South King County; and

WHEREAS, projects that provide for the joint use and operation of supply, transmission, storage, treatment, and pumping facilities to minimize cost, provide for improved water quality, protect the environment, provide for emergency needs and maximize the best use of the resource is in the best interest of the citizens of the region.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF AUBURN, WASHINGTON, IN A REGULAR MEETING, DULY ASSEMBLED, HEREWITH RESOLVES AS FOLLOWS:

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<u>Section 1</u>. The Mayor and City Clerk of the City are hereby authorized to execute South King County Regional Water Association Joint Operating Agreement. A copy of said Agreement is attached hereto, denominated as Exhibit "A", and made a part hereof as though set forth in full herein.

**Section 2.** The Mayor is hereby authorized to implement such administrative procedures as may be necessary to carry out the directives of this legislation.

DATED and SIGNED this 5th day of June, 1995.

CITY OF AUBURN

Charles G. Booth Mayor

ATTEST:

Covinwallecter

Robin Wohlhueter,

City Clerk

APPROVED AS TO FORM:

Michael J. Reynolds,

24 City Attorney

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Resolution No. 2568 May 15, 1995

Page 2



## SOUTH KING COUNTY REGIONAL WATER ASSOCIATION JOINT OPERATING AGREEMENT

#### January 1995

WHEREAS, an adequate and safe water supply for South King County Regional Water Association (SKCRWA) is vital to both existing citizens and implementing the long-term comprehensive plans of SKCRWA; and

WHEREAS, the State and SKCRWA prepared a Coordinated Water System Plan (CWSP) for South King County; and

WHEREAS, projects that provide for the joint use and operation of supply, transmission, storage, treatment, and pumping facilities to minimize cost, provide for improved water quality, protect the environment, provide for emergency needs, and maximize the best use of the resource is in the best interest of the citizens of the region;

WHEREAS, the current and near-term water needs of the local governments and SKCRWA require steps to establish a cooperative subregional water supply system; and

WHEREAS, the SKCRWA is committed to cooperate toward regional solutions for long range water supply needs.

NOW THEREFORE, the SKCRWA members as the initial developers of this Joint Operating Agreement (JOA), agree as follows:

#### 1. **GENERAL**

- A. The Members acknowledge the requirement to incorporate land use planning as defined by the Growth Management Act with water supply planning; and
- B. The Members recognize the benefits of developing a subregional water supply system that will allow the optimum use of surface and groundwater to better manage and protect the area's water resources; and
- C. The Members will hold a joint meeting at least annually about September 30th to review the status of this JOA and any Amendments as well as other problems of mutual concern. The specific date, time, and location of the meeting will be set by mutual agreement.

#### 2. INTENT

- A. The general intent of the Members is to cooperatively provide the additional facilities needed to develop a South King County Subregional Water Supply System (Subregional System). The Members may choose by Interlocal Agreement to produce additional water and distribute it within the Subregional System, with or without change to their retail service area.
- B. The JOA provides a framework for joint development of specific projects that may include two or more of the Participants. Each facility project and/or intertie shall be developed under a separate Interlocal Agreement (IA) consistent with this JOA subject to approval by appropriate affected city council and/or water district boards. The specific intent of this JOA is to make provisions for a standardized method to create or expand the Subregional System to meet the public water supply needs for both emergency and long-term use, and to establish a basis for agreement between the Participants for financing, ownership, construction, and operation of projects required for the Subregional System. These projects may include common facilities with other Agencies outside the SKCRWA.

It is further the specific intent of this JOA to preserve existing water rights and protect the established or planned interest and needs of each Participant with respect to sources of water.

Exhibit A is a suggested content of what should be included in each Interlocal Agreement.

- C. It is the desire of the Members that this JOA be incorporated into the South King County CWSP at the next update.
- D. The term "Participant" as used in this JOA shall mean all the signatories of an IA consistent with and implemented subsequent to this JOA.
- E. The term "members" as used in this JOA shall mean all the members of the SKCRWA whether they have signed this JOA or not.

#### 3. SUBREGIONAL SUPPLY SYSTEM AND SERVICE AREA

- A. "Subregional System" shall mean:
  - (a) that portion of the Participants' sources, interties, transmission, and storage systems required to supply water to the service area of the Participants or new facilities as defined by a separate IA.

- (b) those designated capacities within a Participant system as specifically defined in the appropriate IA.
- B. "Service Area of the Subregional System" shall mean the Participants' Designated Water Service Areas identified in the CWSP as shown on Exhibit B or as approved by amendments to the CWSP or the Participants' Comprehensive Water Plan.
- C. "Facility Ownership". Ownership of the physical facilities that exist on the date of this JOA shall remain with the individual Participants. Unless otherwise agreed to within a specific IA, ownership and operational responsibilities of new facilities shall be based generally on location in designated service areas, with capacity rights defined by appropriate IA.

#### 4. WATER SUPPLY - CAPACITY RIGHTS

- A. <u>Capacity Rights</u> Each Participant may purchase capacity in planned improvements to the Subregional System. Any changes in these capacity rights shall be recognized by an IA, approved by the appropriate affected city councils and/or water district boards.
- B. <u>Additional JOA Participants</u> Other agencies may purchase capacity rights in the Subregional System with consent of the SKCRWA. Such consent shall not be unreasonably withheld. If other agencies become a JOA Participant in future projects, past costs recognized by the JOA including, but not limited to cost associated with development of this JOA, Water Rights, negotiations, and any Feasibility Studies will be assessed to the new agency..
- C. Wholesaling Water The Participants may wholesale water through lease or otherwise, delivered through the Subregional System to areas outside of Participant's respective Service Area, so long as the other Participants' capacity rights are not negatively impacted. Members of the SKCRWA shall have right of first refusal for excess capacity which would be sold to non-members.
- D. <u>Conservation and Curtailment</u>. All Participants will develop and implement a conservation plan that is consistent with State guidelines and will incorporate guidance to ensure that their program is compatible with the Conservation Plan implemented by the source of supply agency. In addition, if a source of supply agency develops and implements a curtailment plan all purchasers shall develop and implement a compatible curtailment plan.
- E. Quality An objective of the Members is to maintain the quality of the water in the Subregional System at or above the quality required by the State drinking water standards. The purchasing Participant will be responsible for ensuring water quality blending analyses and other water quality issues are resolved to their own

satisfaction. The Participants will meet periodically to ensure that water quality and operational issues are addressed, and that needed information is exchanged in a timely fashion. The written results of these meetings will be circulated in a timely manner to all members and participants and reviewed at the annual meeting.

- F. Additional Facilities Projected needs will be identified by the Participants based on the Participant's designated service areas. As five or more years may be needed to bring major new source capacity capabilities on line, five-year and ten-year forecasts are required, and must be updated whenever a Participant becomes aware of any significant change in their forecast demand. These will be discussed jointly as they arise, and reviewed at the annual meeting.
- G. <u>Financing</u> Each Project IA will include pertinent details of financing for that project. Financial participation in existing and additional facilities will be based on each Participant's projected need for each facility, as designated capacity rights.
- H. Cost of Service Charge The Members and Participants will establish wholesale water sales charges for both emergency and long-term supply that include: (1) capital cost, (2) fixed operating cost, and (3) a variable operating cost based on quantity of water delivered based on actual costs of providing the service.

Fixed and variable operating and maintenance costs payments will be made monthly per meter and use rates. Projected annual rate adjustments and documentation shall be provided at the annual meeting. Any rate increase will be effective beginning January 1, of the following year.

- (1) The Rates and Charges for the capital, operation, and maintenance of the system shall be based on the following:
  - (a) <u>Capital Cost</u> Those construction related costs incurred for Capacity Rights. Capital Costs for facilities contracted solely for a specific project (described in an IA) are allocated based on designated capacity to be purchased.

Capital costs shall include the debt service for each Participant. Such debt service shall be defined as the actual debt service on debt issued for the Participant's proportionate share of capacity rights, or if no debt is issued for the Participant's costs by the financing Participant, the amortized value at the interest rate of the most recent revenue bond issued by the financing Participant over 20 years. However, should all capital costs be paid in full by any Participant purchasing capacity rights prior to the time of the financing Participant incurring the costs, no interest charges shall be assigned to the Participant purchasing capacity rights.

Capital Costs associated with a supplying Participant's construction of their internal water system facilities may be included in the fixed and variable operating costs as appropriate, using cost of service principles, in the same manner as those costs are included in the supplying Participant's customer rate base.

- (b) <u>Fixed Operating Cost</u> The cost of labor, supervision, supplies, utilities, services, taxes, insurance, and all other costs required to operate and maintain the system other than those items included under Variable Operating Cost. The operating cost will include an allocation for renewal and replacement.
- (c) <u>Variable Operating Cost</u> Those costs directly proportionate to the volume of water produced, including chemicals, electric power, and other costs required to meet customer and system needs not included in (a) and (b) above.

#### (2) Accounting

Subregional System accounting shall be documented in accordance with generally accepted accounting practices acceptable to the Participants.

#### 5. <u>ADMINISTRATIVE, LEGAL AND OTHER PROVISIONS</u>

- A. Each Participant shall designate in writing their representative responsible for coordination and implementation of the JOA and the subsequent IAs. The designated individuals will be the primary contact for all project approvals and communication and shall prepare and publish a schedule and plan to facilitate the planning, design and day-by-day operation of facilities associated with the JOA.
  - An Annual Meeting of the Members and Participants shall be held to review past activity and to propose efforts that may lead to further Amendments to this JOA.
- B. This JOA shall remain in full force unless terminated by mutual agreement. Any Member may request Amendment to this JOA at any time with approval subject to SKCRWA Bylaws.

IN WITNESS WHEREOF, the SKCRWA executed by their proper Officers on the	members hereto have caused this agreement to be
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20	and a Rule
	By: Charles a loos 1
	Title: Mayor Charles A. Booth City of Auburn
•	-
Attest:	
By: Robin Wohlhueter, City Clerk	ς
Approved As To Form:	
By: Michael J. Reynolds,	
City Attorney	( Constant
,	By: The Control of th
	Title: NA COR City of Black Diamond
Attest:	
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	$\Lambda$ $\Lambda$
	By: Les Hornby
	Title: Board President
	Covington Water District
Attest:	
By:	
Approved As To Form:	
By:	

Attest: Approved As To Form: By: Title: /num King County Water District #111 By: Approved As To Form: By:\_\_\_\_\_ By:\_\_\_\_\_ Title: Date: Attest: By:\_\_\_\_\_ Approved As To Form:

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#### **EXHIBIT A**

# SOUTH KING COUNTY REGIONAL WATER ASSOCIATION JOINT OPERATING AGREEMENT CHECKLIST FOR INTERLOCAL AGREEMENTS

1.	Project Title
2.	General
	☐ List of Utilities to be Parties to the Interlocal Agreement (IA) and approval of appropriate city councils and/or water district boards.
	☐ Consistency with Joint Operating Agreement (JOA).
	☐ Description of need for project.
	☐ Listing of potential Wholesale customers for water per Section 4.C of the JOA.
	□ Recognition of assessment of costs associated with development of JOA per Section 4.B of the JOA.
	☐ Recognition South King County Regional Water Association (SKCRWA) members have right of first refusal on excess capacity per Section 4.C of the JOA.
	☐ Recognition that capacity and water rights are available to meet the needs of the IA.
3.	Description of the Project
	Inclusion of a drawing (or description) which identifies all the facilities to be considered within the IA. Included within the description should be all jointly and solely owned facilities that are to be operated or paid for by a Party to the IA.
	The information within the description should include the following:
	☐ Long-term ownership of the facility
	☐ Party responsible for long-term maintenance of the facility
	☐ Party responsible for payment for design and construction for the facility
4.	Project Costs, Financing, and Capacity Rights
	☐ Description of all project costs and the allocation to each Party.
	☐ Definition of Capacity rights for all facilities.

	☐ Definition of cost sharing for long-term maintenance for each facility.
	Definition of methods of reimbursement for monies expended (if required).
	☐ Description of any applicable latecomer fees or hook-up charges.
	☐ Description of requirements for record keeping and monitoring of costs.
	Description of manner to finance project and to pay for purchased water including initial costs and method to adjust costs over time.
5.	Project Design and Construction Management
	☐ Definition of overall project management responsibilities.
	☐ Definition of design and construction management responsibilities for individual facilities.
	☐ Description of basic periodic meeting schedule for project review.
6.	Conditions of Service
	☐ Limitations to source sharing or delivery of water (if any).
	☐ Design Criteria for full project.
	☐ Minimum and maximum flow rates and pressures.
	☐ Items specifically excluded from the project.
7.	Term of Duration of the Agreement
	Discussion of the length of time the agreement is in effect as well as the method to terminate the agreement and succeeding agencies' obligations.
8.	Amendments
	Methods by which the agreement could be amended.
9.	Hold harmless, liability language, etc.

#### **WATER SUPPLY AGREEMENTS**

# CITY OF TACOMA AND SECOND SUPPLY PARTNER AGREEMENTS

### MEMORANDUM OF AGREEMENT AMONG

## THE SECOND SUPPLY PROJECT PARTICIPANTS, THE WASHINGTON STATE DEPARTMENT OF ECOLOGY, AND

# THE WASHINGTON STATE DEPARTMENT OF HEALTH CONCERNING COORDINATED PLANNING AND MANAGEMENT OF WATER RESOURCES

#### **RECITALS**

WHEREAS, the Cities of Tacoma, Kent, and Seattle, the Covington Water District, and the Lakehaven Utility District (hereafter "Project Participants") have entered or intend to enter a series of agreements concerning the Second Supply Project Agreement; and

WHEREAS, said Agreement will involve diversion and use of water under Tacoma's Second Diversion Water Right, as well as additional water storage at Howard Hanson Dam, and inclusion of a branch pipeline to connect the Second Supply Pipeline to the Seattle water system; and

WHEREAS, the connection of the Project Participants' supply systems will make possible more efficient use of existing water supply sources, and provide opportunities for the development of regional water supply, water conservation, and fish enhancement programs; and

WHEREAS, the Washington State Departments of Ecology (DOE) and Health (DOH) have responsibilities for management of water resources to meet a variety of public needs, including environmental protection, and protection of public health and well-being by assurance of safe, adequate, and reliable supplies of drinking water; and

WHEREAS, all of the Parties to this agreement, which include the Project Participants and DOH and DOE, believe that coordinated planning and management of water resources will contribute to their responsibilities for meeting the future needs of both fish and people;

#### **AGREEMENT**

NOW, THEREFORE, the Parties agree as follows:

- 1. The Project Participants commit to coordinated management and planning of their water resources within an area that encompasses the authorized place of use of water under Tacoma's Second Diversion Water Right, as shown in the third permit extension.
- 2. The Project Participants agree to work with the Central Puget Sound Water Suppliers' Forum (hereafter "Forum"), or similar mechanism, to develop regional water supply and demand projections and to continue to work with the Forum's conservation work group, or similar mechanism, to develop and implement effective conservation methodologies and to establish data reporting and performance measurements.

- 3. The Project Participants agree to coordinate in developing their water system plans, and participate in other regional water supply planning activities in central Puget Sound.
- 4. The Project Participants agree to promote increased water use efficiency, including achieving a cumulative aggregate (total retail and wholesale) reduction in water use by 10% over a ten year period beginning January 1, 2000. This requires a 10% reduction in projected levels of consumption by January 1, 2011 using the year 2000 consumption rates as a basis for projections. The Project Participants' conservation program will:
  - a) Be measured using accepted professional practices for conservation evaluation, including normalizing for weather, assessing large or atypical new demands, and accounting for economic and demographic changes.
  - b) Be reviewed on a biennial basis by the parties to this agreement except that the utility conservation program may be reviewed more often by DOH if required under chapter 246-290 WAC.
  - c) Provide verifiable evaluation results that include detailed documentation, full disclosure of data and methodology, and professional peer review.

The procedures and requirements for review and evaluation of the conservation program and the specific methodologies to be used to calculate the 10% reduction are included in Attachment A to this Agreement. Attachment A is incorporated into this Agreement by reference as if fully set forth herein.

The Project Participants will conduct a conservation potential assessment, if they have not already done so, within the boundaries of their respective planning areas, and will collaborate to identify and quantify the cost of water conservation opportunities in the aggregate area.

The Project Participants will, as necessary, amend their individual water system plans pursuant to WAC 246-290-100 to reflect these conservation activities, as supported by the conservation potential assessments, and submit the amendments to DOH. They will submit conservation plan amendments, conservation potential assessments, and consumption and use data to DOH for review as water system plan amendments. The initial amendments will be submitted to DOH prior to the first biennial review. They will also continue to report annually to DOH their source water production and use data, as required in WAC 246-290-480. The Parties agree that DOH will be the lead agency for monitoring performance pursuant to this Section 4.

As described in Section III.C of the attached Methodology, the Project Participants will submit the final report of evaluation results to DOH. After conferring with DOE, DOH will respond in writing to the Project Participants with its assessment of fulfillment of the terms of this Section 4.

During the period of this MOA and thereafter, the Project Participants remain committed to meet all water conservation obligations set forth by state statute and regulations, including any changes to those statutes and regulations.

5. The Parties to this agreement agree to work jointly to develop practical and effective local and regional alternatives to resolve identified streamflow problems resulting from water supply operations that adversely impact threatened or endangered fish. The Parties also agree to participate in a biennial review to assess and report progress in implementing specific projects and/or solutions to identified problems.

Further, the parties believe that within the place of use of the Second Supply project, potential solutions for these problems may include applying as appropriate the beneficial results of conservation and reuse programs, conjunctive use of surface and ground water, regional transmission and delivery systems, and water storage projects. The parties further agree to cooperate in identifying and addressing regulatory, financial, and other obstacles that may hinder or prevent implementation of appropriate solutions.

- 6. Nothing in this Agreement limits or supplants the regulatory authorities of the state agencies.
- 7. In the event of any dispute arising between or among Parties to this agreement concerning its implementation, the Parties agree to work together in good faith to resolve such disputes, using the dispute resolution procedures set forth in this section, or such other procedures upon which the parties may later agree
- a) Any Party wishing to resolve a dispute under this Agreement shall notify the other Parties by setting forth its position in writing, including a specific description of the situation it wishes to address, the reasons why it believes certain actions or conditions constitute a violation of the Agreement (if that is the contention), and the actions it wishes a Party or Parties to take. The state agencies shall meet and confer with each other before either agency initiates dispute resolution.
- b) The Party or Parties from whom action is requested will have 60 calendar days, or such other time as may be agreed, to respond. During this time the Party or Parties responding may seek clarification of the information provided in the initial notice. The initiating Party will use its best efforts to provide responsive information.
- c) Within 60 calendar days after a response is provided or was due from the responding Party or Parties, whichever occurs first, representatives of the Parties having authority to resolve the dispute will meet and negotiate in good faith toward a solution satisfactory to all Parties, or will establish a specific process and timetable to seek such a solution.
- d) If any issues cannot be resolved through such negotiations, the Parties will consider non-binding mediation or other alternative dispute resolution processes and, if a dispute resolution process is agreed upon, will make good faith efforts to resolve all remaining issues through that process. In the event that mediation is pursued, the mediator shall be selected by the Parties within 30 calendar days of the Parties' agreement to pursue mediation, and the process concluded within an additional 60 calendar days, unless the Parties otherwise agree. Costs shall be shared equally by all Parties to the dispute.

- e) Any Party to this agreement may enforce its provisions by initiating an action for arbitration pursuant to chapter 7.04 RCW. No such action may be initiated until the party has exhausted the informal dispute resolution procedures of a) throughd) above. The parties to the dispute agree to share equally the cost of the arbitrator(s). Regulatory compliance and enforcement matters that may arise between the Project Participants and the state agencies are not part of this Agreement and are not subject to and shall not be submitted to arbitration.
- 8. This MOA shall take effect on the effective date of the third permit extension to Tacoma's Second Diversion Water Right. Performance of the Parties relative to Sections 1 through 5 shall remain in effect until January 1, 2011 except that the Project Participants reporting requirement will remain in effect pursuant to Appendix A. Before or after the close of the reporting period described in Appendix A, III.C, DOH will evaluate performance regarding fulfillment of the terms of Section 4 of the MOA and provide a letter to the Project Participants indicating either satisfactory or unsatisfactory results. In the event DOH finds results to be unsatisfactory, dispute resolution procedures may be initiated by DOH or the Parties may agree upon appropriate measures to be taken by the Project Participants to address the deficiencies identified. The MOA may be amended or reviewed by written agreement of all of the Parties.

This Memorandum of Agreement executed by the following parties on October 24, 2001:

Covington Water District

City of Tacoma

Approved as to form:

City of Kent  By:	Lakehaven Utility District  By: Land LYM W
Approved as to form:	Approved as to form:  By:
City of Seattle  By: Approved as to form:  By: Min Klow	
Washington State Department of Health  By: Accept  Approved as to form:  By: Liuly	Washington State Department of Ecology  By:  Approved as to form:  By:

).

# ATTACHMENT A TO MEMORANDUM OF AGREEMENT AMONG THE SECOND SUPPLY PROJECT PARTICIPANTS, THE WASHINGTON STATE DEPARTMENT OF ECOLOGY, AND THE WASHINGTON STATE DEPARTMENT OF HEALTH CONCERNING COORDINATED PLANNING AND MANAGEMENT OF WATER RESOURCES

## Procedures, Requirements, and Methodology for Demonstrating Compliance with Water-Use Efficiency Provision

As part of the discussions with respect to Tacoma's Second Supply Project (SSP), the Cities of Tacoma, Kent and Seattle, Covington Water District, Lakehaven Utility District ("Project Participants"), and the Washington State Departments of Ecology and Health entered into a Memorandum of Agreement <sup>1</sup> (MOA) with regard to planning and management of water resources. Section 4 of the MOA addresses increased water use efficiency and achievement of "a cumulative aggregate (total retail and wholesale) reduction in water use by 10% over a ten year period beginning January 1, 2000."

This document sets forth the procedures and requirements for review and evaluation of the conservation program and the specific methodologies to be used to calculate the 10% reduction. It is an attachment to and an integral part of the MOA. This document was developed collaboratively through a series of discussions among the MOA parties during April – June 2001. Attachment 1 to this document lists the individuals who participated in these discussions.

#### I. General Assumptions

In the course of developing this document, the following general assumptions were identified. These assumptions shall be used to guide the analysis ultimately carried out to document the 10% reduction in water use.

A. The 10% reduction is understood to apply to the five partners' "cumulative, aggregate" water use. Cumulative, aggregate water use is understood to mean total water use by all five Project Participants together, and is the sum of their total system uses, including all retail billed sales, wholesale billed sales, and non-revenue uses or losses. The combined water production of the five partners may provide a convenient measure of cumulative, aggregate water use.

September 25, 2001

<sup>&</sup>lt;sup>1</sup> "Memorandum of Agreement Among the Second Supply Project Participants, the Washington State Department of Ecology, and the Washington State Department of Health Concerning Coordinated Planning and Management of Water Resources"

- B. The Project Participants may use the simplest, lowest-cost method necessary to demonstrate achievement of the 10% cumulative aggregate reduction in water use, so long as that method is consistent with accepted professional practices.
- C. Because conditions may change in unforeseen ways between the time this methodology was developed and the year 2010, it is reasonable and desirable to permit flexibility in the methodology ultimately used to demonstrate achievement of the 10% reduction. Therefore, this document identifies various options in the evaluation methodology. Any one of the options identified (see below) will be deemed acceptable in demonstrating achievement of the 10% reduction, so long as it conforms with accepted practices and incorporates the major influences on water use in the Project Participants' service areas. At the time the evaluation is performed, the Project Participants may select the desired option, based on service area conditions and changes, availability of data to perform the measurement, and cost-effectiveness of collecting and analyzing data under the various options listed. It is noted that Peer Review will be used to validate the methodology, unless this requirement is waived under Section III.B.
- D. The parties to the MOA recognize that in some cases changes in water use by individual customers that purchase large quantities of water may have a disproportionate effect on the measures of overall water-use efficiency (e.g. water use per capita, or water use per employee). These large changes in water use may be caused by events such as a service to a new customer with high water use; discontinuation of service to an existing customer; an increase or decrease in production by an existing customer, with a concomitant change in water use; or a change in production methods or equipment within a customer's facility. Changes in water use associated with individual, large customers may be relevant to water-use efficiency, or may be unrelated to water-use efficiency. Because of the potential impact associated with such changes, and because each large customer has unique attributes, water use data on large-water using accounts (e.g. those using 100,000 gallons per day or more) will be separated from the rest of the water use data used in this methodology (see further discussion below).
- E. It is recognized that statutes, rules, codes, ordinances and guidelines established by the federal government, Washington State, and/or local jurisdictions may contribute towards reductions in water use. For example, both the 1992 Washington State and the 1993 Federal Plumbing Codes contain efficiency standards for certain types of plumbing equipment. Any water savings attributable to such statutes, codes, etc. may be included in the cumulative, aggregate savings in water use discussed by this document.
- F. It is recognized that the 10% reduction refers to decreased water use resulting from improved water-use efficiency.

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- G. The Project Participants will work together to produce a single analysis and a single report documenting the reduction in cumulative, aggregate water use. It is acknowledged that the data collected by each Project Participant may vary due to the nature of the water systems involved and the billing systems used. The analysis will document significant differences in the data collected for the five Project Participants, to the extent such differences may have an impact on the results of the evaluation.
- H. Nothing in this document or the remainder of the MOA establishes the methodology or decisions that DOH or Ecology must use or make in determining appropriate conservation activities for future review of water system plans or water right decisions.

#### II. Evaluation Methodology

#### A. Time Period for Measuring Results

The parties to the MOA concur that reductions in summer season water use are the most important aspect of regional water conservation programs, both in terms of managing water production and delivery systems and in terms of potential environmental benefits. Therefore, for the purposes of demonstrating the 10% reduction, "cumulative, aggregate water use" will be measured in terms of seasonal, average day water use, computed for the 4-5 month peak season from late spring through early fall. The parties to the MOA concur that achieving a 10% reduction in summer season water use will serve the overall purposes of the MOA. While 10% savings may also be achieved in year-round, average day water use, this is not required to satisfy the terms of the MOA. However, the year-round, average day water use in years 2000 and 2010 will be calculated and reported for informational purposes.

In accordance with Section 4 of the MOA, the only responsibility defined for the Project Participants after the term of this MOA is that they "remain committed to meet all obligations set forth by State statute and regulations."

#### B. Normalizing for Growth

It is anticipated that the service areas of the five Project Participants will experience considerable growth in population and related demographic variables from year 2000 to 2010. Therefore, the measure of water use to be used in calculating the 10% reduction will be normalized for growth. Normalization may be performed by measuring overall water use per capita; or water use in different customer categories per capita, per household, per employee, per dollar of economic production, etc. If these measures are calculated by the Project Participants in performing the evaluation, they will be included in the report.

#### C. Changes in Use by Large Water-using Customers

Significant changes in water use associated with individual large customers may occur during the 2000 – 2010 time period. For purposes of this evaluation, such customers are defined as those using 100,000 gallons per day or more at a single location or facility (whether served by one service connection or multiple service connections). Such changes in water use (increases or decreases) may occur due to initiation of new service to an individual customer; discontinuation of service to an individual customer; changes in the level of production by an individual industrial customer; changes in production methods and equipment; specific water-use efficiency initiatives; or other factors. Depending on the circumstances, such changes may count towards the 10% reduction in water use by the Project Participants, or may be considered a separate event that is unrelated to achievement of the 10% reduction. Therefore, water use data associated with large water-using customers will be provided separately from the remaining water use data provided for biennial and final reviews. Changes in water use by these customers during the 2000 – 2010 time period will be evaluated on a case-by-case basis to determine their impact on achieving the 10% reduction in water use.

#### D. Statistics to be Reported

In order to verify conservation savings, the Project Participants will employ and report certain statistics for year 2000 and for year 2010. Generally, each statistic will be reported as an aggregate value for all five systems together. However, in some cases, the nature and availability of the data may require reporting statistics separately by utility.

The statistics to be used and reported will depend to some extent on the final choice of method (see Computational Methods, below). However, regardless of which method is selected, the following statistics will be reported to document and facilitate understanding of the results:

- Total water use
- Total population
- Per-capita water use (total use divided by population)
- Total Residential water use
- Single-family residential water use
- Multi-family residential water use
- Total non-residential water use
- Total Commercial water use
- Total Industrial water use
- Total Government water use
- Water use by individual large customers (defined herein as customers using at least 100,000 gallons per day at a single facility, on an average annual basis.
   In some cases, this may involve reporting total consumption measured by multiple meters serving a single facility)
- Total non-revenue water (water that is produced but not included in metered sales)

A breakdown of non-revenue water into "accounted-for" and "unaccounted-for" categories (it is recognized that these categories will require estimation, since they are generally not directly measurable).

The additional statistics listed below will be reported, only if they are used in the calculation of the 10% savings:

- Total number of households served
- Number of single-family and multi-family households served
- Average residential water use per household
- Average water use per single-family household
- Average water use per multi-family household
- Total number of non-residential accounts
- In the non-residential category, average water use per employee or per capita (if per capita, the non-residential water use will be divided by the residential population)
- Changes in the nature of non-residential accounts that have significant effects on non-residential water use.
- Percent non-revenue water, expressed as a percentage of total system water use (i.e. [non-revenue] divided by [retail plus wholesale plus non-revenue]).

Where significant and necessary to understand the analysis performed, a narrative description will be provided of differences among the five Project Participants regarding the way these statistics are defined or calculated (e.g. differences in how single-family and multifamily customer categories are defined with respect to duplexes, mobile home parks, group housing, etc., if significant to understanding the analysis and results).

The demographic information will be derived from U.S. Census data, and/or an accepted source that processes Census Data for regional applications (e.g. the Puget Sound Regional Council). It is desirable that information derived from year 2010 Census data be included. However, in the event such information is not available in a timely fashion, other generally accepted sources may be used (e.g. data or projections produced by the State of Washington, or documented in approved water system plans of the Project Participants, etc.) so long as the information used reflects conditions in year 2010. Demographic data will be processed as needed to cover the respective retail and wholesale service areas of the five Project Participants, using an accepted professional methodology.

Following the effective date of the MOA, the Project Participants will work together to collect the applicable data and statistics for year 2000. The Project Participants will store this information in a format and location that ensures it will be readily available when the evaluation is performed (i.e. after year 2010).

#### E. Factors Affecting Water Use

Water use is affected by a number of factors. With regard to the retail and wholesale service areas of the five Project Participants, some of these are under the direct control of the Project Participants, while others are not. The following set of factors will be addressed explicitly in the analysis. For each factor, the Project Participants will determine whether they believe the factor has a significant impact on achievement of the 10% reduction, and whether analysis is feasible and relevant given available data and the evaluation method selected for the analysis. Each factor deemed both significant and feasible/relevantwill be included in the analysis. Evaluation of the significance and appropriateness of each factor and a description of how they were used in adjusting water use values will be included in the report. If a factor is deemed significant but not feasible or relevant, then the Project Participants will explain why this is so, and will provide a narrative describing the effects of that factor in qualitative terms.

#### Factors Affecting Water Use:

- Weather conditions;
- Population and employment (or related demographic factors);
- Large new residential loads (such as Master Planned Developments)
- Changes in use by large customers (e.g. those with average daily consumption of 100,000 gallons or more);
- Large changes in the nature of non-residential water use, including large new customer loads
- Water rates (e.g. weighted average of rates paid by a "typical" household or business)
- System practices (e.g. main flushing, reservoir management, etc. for water quality or system operation requirements; significant repairs and replacement of mains or transmission lines, other infrastructure impacts, etc.)

The Project Participants may also address additional factors not on this list, if the Project Participants believe they have a significant impact on achievement of the 10% reduction. If additional factors are included, the Project Participants shall clearly define them and explain why they are appropriate for this evaluation.

If the results of the evaluation show that water use was not reduced by 10%, and if the Project Participants believe that factors outside their control precluded achievement of the 10% reduction, they shall provide a detailed explanation of these factors, and how they affected water use during the time period reviewed. If Ecology and Health concur with this explanation, an allowance may be made for these factors, taking into account the level of water savings actually achieved, and the good faith efforts of the Project Participants in implementing conservation efforts, including the scope and magnitude of conservation programs.

September 25, 2001

#### F. Computational Methods

It is generally understood that the Project Participants will use the simplest and most costeffective methodology possible to verify the savings achieved and meet standards of
accepted professional methods. The Project Participants may use any one of the
following approaches. Regardless of the methodology used, the Project Participants will
provide statistics adequate to illustrate the savings achieved, and will address the factors
described above as necessary to compute savings. In addition, the results of Method 1
will be reported, regardless of which method is used to document achievement of the
10% reduction.

Method 1: Simple comparison of water use per capita. If this method is selected, the Project Participants will compare total, aggregate water use per capita in year 2000 with that in year 2010 and document the percent change. Supporting documentation will be provided with regard to the data used and factors employed in the methodology.

Method 2: Comparison of actual water use in year 2010, with projected water use in 2010 assuming no conservation efforts and other significant factors. The approach will estimate what consumption would have been in the absence of conservation efforts. If Method 2 is selected, the adjustment will be based on simple mathematical techniques, rather than detailed statistical methods. Supporting documentation will be provided with regard to the data used, factors employed in the methodology (see "Factors Affecting Water Use," above), and calculations.

Under Method 2, if A represents actual use, and E represents the estimate of what consumption would have been, the percent reduction in water use will be calculated as follows:

Reduction = 
$$(E-A)/E$$

Method 3: The same as Method 2 except that if Method 3 is selected, statistical techniques such as regression analysis may be used to estimate what consumption would have been.

#### III. Procedures Related to the Evaluation

- A. The evaluation will include detailed documentation, disclosure of data and methodology, and will utilize accepted professional practices prevailing at the time the evaluation is performed. The Project Participants will provide citations from the professional literature, State-approved Water System Plans, and/or similar sources to document that the methodology conforms with accepted practices.
- B. A peer review of the evaluation methodology will be performed, unless this requirement is waived by all of the parties to the MOA. Peer review may be

conducted by either a single reviewer or a panel of up to three reviewers. All of the parties to the MOA must agree on the peer reviewer or peer review panel selected for this activity. If conducted, the peer review will address the technical aspects of the evaluation, comprising the following points:

- Whether the technique applied conforms with accepted professional practices, given the nature of this evaluation and the premises set forth in this document;
- Whether the data used is appropriate to support the technique applied;
- Whether appropriate documentation of methods and data was provided;
- Whether the factors considered are appropriate and complete;
- Whether the computations were carried out correctly; and
- Whether the conclusions reached are valid and supported by the analysis and data presented.

The peer reviewer or review panel will submit a written report of their findings to all parties to the MOA.

- C. The evaluation will be performed retrospectively, when applicable data for year 2010 becomes available. The Project Participants will complete the evaluation expeditiously and deliver a single report documenting findings to DOH no later than December 31, 2012 (this amount of time may be necessary to allow for 2010 Census data to be used). Within 120 days of receipt of the evaluation report, DOH, after consultation with Ecology, will provide a letter either confirming that the evaluation is satisfactory and terms of Section 4 of the MOA have been met, or indicating otherwise and describing any deficiencies. However, in the event a peer review process is conducted, the 120-day time period will be extended to a time period agreed to by the Parties.
- D. The individual Project Participants will perform the analysis of their respective systems at their own cost and will cooperate to compile the information into a single report. If outside resources are needed to compile the report, the costs will be shared equitably among the Project Participants, proportional to their respective percentage of cumulative, aggregate water use. If a peer review process is utilized, 50% of the associated costs shall be borne by DOH and Ecology together, subject to availability of funding; and 50% of the associated costs shall be borne by the five Project Participants together.
- E. In the event of any dispute arising between or among the parties to the MOA regarding implementation or completion of Section 4, the dispute resolution provisions contained in Section 7 of the MOA shall apply.

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# Attachment 1 Participants in Development of Methodology for Demonstrating Compliance with Water-use Efficiency Provision

Name	Organization
Robyn Bartelt	City of Kent
John Bowman	Lakehaven Utility District
David Brock	City of Kent
Lynn Coleman	Washington State Department of Ecology
Jane Evancho	Tacoma Water
Andrew Graham	EES, representing Covington Water District
John Kirner	Tacoma Water
Judy Nelson	Covington Water District
Don Perry	Lakehaven Utility District
Jim Rioux	Washington State Department of Health
Tim Skeel	Seattle Public Utilities
Anna Thurston	Tacoma Water
Don Wickstrom	City of Kent

#### KING COUNTY FRANCHISE No. 13083

(To Operate, Maintain, Repair, and Construct Water Mains

within County Roads)

**April 20, 1998** 

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## 13083

## FRANCHISE NO. 13083

In the matter of the application for a franchise to operate, maintain, repair, and construct water mains and service lines, and appurtenances in, over, along, and under County roads and rights-of-way in King County, Washington.

The application of the City of Kent for a franchise to operate, maintain, repair and construct water mains and service lines, and appurtenances in, over, along, and under County roads and rights-of-way located within the area described in attached Exhibit "A" has been heard on this day of APRIL , 19 98. All of the property described in Exhibit "A" lies outside the limits of any incorporated Town or City.

Legal notice of the franchise application and of the hearing has been given as is required by law.

The King County Council, having considered the interests proposed and advanced, and finding that the granting of this franchise is in the public interest, ORDERS that a franchise be granted to the City of Kent, the Grantee, subject to the conditions set forth in Exhibit "B" attached hereto, this franchise and Ordinance No. 1308.3 This franchise grants the right, privilege, authority and franchise to operate, maintain, repair and construct mains and service lines and appurtenances as a part of its distribution system in, over, along, and under County roads and rights-of-way located within the area described in Exhibit "A".

This franchise is granted subject to all of the Ordinance No. 13083 and Exhibit "B", and shall e	terms and conditions contained herein, within expire in twenty-five years on 4/20, 2023
Dated this 1 day of May,	1998
3	KING COUNTY, WASHINGTON
	$\bigcirc$
	BY Mus
	TITLE King County Executive
The undersigned accepts all the rights, privileges, conditions, stipulations, and obligations contained "B".	, and duties of this franchise subject to all terms, herein, within Ordinance 13083 and Exhibit
	CITY OF KENT GRANTEE
	TITLE SENIOR DESIGN ENLINEER
	TITLE SENIOR DESIGN ENGINEER
Dated this 5 <sup>TH</sup> day of JUNE	, 19 <i>98</i> .

#### Exhibit "A"

#### AREA 1 (SEE MAP # 1)

Those portions of Sections 23, 26, 27, Township 22 North, Range 4 East, W.M., lying westerly, southerly, easterly and northerly of Kent city limits, AND that portion of the Northeast quarter of Section 35, Township 22 North, Range 4 East, W.M. lying north of the center line of South 277th Street, EXCEPT that portion lying within Kent city limits.

#### AREA 2 (SEE Map # 1)

That portion of Section 25, Township 22 North, Range 4 East, W.M. lying between the Green River and the Kent city limits.

#### AREA 3 (SEE MAP # 2)

Those portions of Sections 31, 32, 33, Township 22 North, Range 5 East, W.M., lying easterly of the center of the Green River, lying southerly, easterly, westerly and northerly of the existing Kent city limits and lying westerly and northerly of the following described line. Beginning at the intersection of the center of the Green River with the south line of said Section 32 being the beginning of line herein described; Thence east along the south line of said Section 32 and east along the south line of said Section 33; Thence north along said center line to a point 30 feet south of the south line of the north half of the north half of the south half of said Section 33, being the terminus of the line herein described.

#### AREA 4 (SEE MAP # 3)

Portion of Section 16, Township 22 North, Range 5 East, W.M., lying northerly and easterly of the Kent city limits and lying southerly, westerly and northerly of the following described line. Beginning at a point on the south right-of-way margin of S E 240th Street lying 180 feet west of the intersection of said south right-of-way margin and the north/south center line of Section 21, Township 22 North, Range 5 East, W.M. being the beginning of the line herein described; Thence north to the southwest corner of the east 180 feet of the southwest quarter of the southwest quarter of said Section 16; Thence north along the west line of the east 180 feet of the southwest quarter of the southwest quarter of said Section 16 to a point on the north line of said southwest quarter of southwest quarter; Thence west along the north line of the southwest quarter of the southwest quarter of said Section 16 to the southeast corner of the west half of the northwest quarter of the southwest quarter of said Section 16; Thence north along the east line thereof to a point on the south line of the northwest quarter of said Section 16; Thence west along the south line thereof to the east right-of-way margin of 116th Avenue S E; Thence north along the said east margin of the northwest corner of Lot 41 Terra Heights, Volume 125 page 7 through 9; Thence east along the north line thereof to northeast corner of Lot 31 in said Terra Heights; Thence east along the north line of said Terra Heights to a point 530.50 feet west of the east line of the southwest quarter of the northwest quarter in said Section 16; Thence north parallel with said east line to a point on the south line of the plat of Hunter Run Too in Volume 151, page 54 through 56; Thence west along the south line thereof to the southwest corner of Tract "A" in said Hunter Run Too; Thence north

along the east right-of-way margin of 116th Avenue S E to the intersection with the center of S E 228th Place; Thence west along said centerline to the west line of northwest quarter of said Section 16 being the terminus of the line herein described.

#### AREA 5 (SEE MAP # 3)

Portion of Section 17, Township 22 North, Range 5 East, W.M. lying northerly, westerly, easterly of the Kent city limits and lying southerly and westerly of the following described line. Beginning at the southwest corner of the northeast quarter of the northeast quarter of said Section 17; Thence north along the east line of the northwest quarter of the northeast quarter of said Section 17 to the northeast corner of the south one half of the northwest quarter of the northeast quarter of said Section 17; Thence west along the north line thereof a distance of approximately 1280.54' to the east line of the northwest quarter of said Section 17; Thence north along the east line of the northwest quarter of said Section 17 to the northeast corner thereof; Thence west along the north line of said Section 17 to the intersection of S E 224th Street and Benson Road (aka SSH Number 5-C); Thence in a southwesterly direction along the center line of said Benson Road to a point of intersection with the south line of the northeast quarter of the northwest quarter of the

#### AREA 6 (SEE MAP # 3)

Portion of Section 17, Township 22 North, Range 5 East, W.M. lying northerly and easterly of the Kent city limits and lying southerly and westerly of the following described line beginning at the southeast corner of the northwest quarter of the northwest quarter of said Section 17; Thence north along the east line of the south one half of the northwest quarter of the northwest quarter of the northwest quarter of the northwest corner thereof; Thence west along the south line of the north one half of the northwest quarter of the northwest qua

#### AREA 7 (SEE MAP # 1)

Those portions of Sections 25, 36, Township 22 North, Range 4 East, Section 30, Township 22 North, Range 5 East, and Section 31, Township 23 North, Range 5 East, W.M. and including therein all Land Donation Claims and all recorded plats described as follows:

Beginning at a point on the left bank of the Green River and the north line of the George E. King Donation Claim Number 40 being the TRUE POINT OF BEGINNING of property herein described; Thence heading downstream along said left bank of said river to a point on the east right-of-way line of the Chicago-Milwaukee-St. Paul and Pacific Railroad right-of-way; Thence southerly along the east line thereof to a point on the south right-of-way margomof South 277th Street; Thence easterly along the south line thereof to a point on the east line of the Northern Pacific Railroad right-of-way and the Burlington Northern Railroad right-of-way; Thence north along the east line thereof to a point on the north margin of said street; Thence east along the north margin thereof to a point on the east line of the R. H. Beatty Donation Claim Numbers 37 and 44; Thence south along the east thereof to the southeast corner of said Beatty Donation Claim which point is also the northwest corner of the said King Donation Claim; Thence east along the north line thereof to the TRUE POINT OF BEGINNING.

# EXHIBIT "B" TERMS AND CONDITIONS APPLICABLE TO UTILITIES FRANCHISES GRANTED BY KING COUNTY

THIS FRANCHISE is subject to the following terms and conditions:

### 1. DEFINITIONS

References to any County official or office also refers to any office that succeeds to any or all of the responsibilities of the named office or official. References to laws or "applicable laws" include federal, state, and local laws and regulations adopted pursuant to those laws; unless otherwise stated, references to laws include laws now in effect, as the same may be amended from time to time during the operation of this franchise. In addition, the following definitions shall apply:

Cable Services. The term "Cable Services" is used as defined in 47 United States Code 522 (5), as amended.

<u>Cable System</u>. The term "Cable System" is used as defined in 47 United States Code 522 (6), and King County Code 6.a.010 (J) as amended.

County Road Rights-of-Way. The term "County Road Rights-of-Way" includes any road, street, avenue, or alley located within the area described in the attached Exhibit "A", it does not include recreational or nature trails except where the trails intersect or are within roads, streets, avenues or alleys.

<u>Director</u>. The term "Director" refers to the chief executive of the King County Department of Transportation.

<u>Grantee.</u> The term "Grantee" refers to the CITY OF KENT its successors and those assignees approved pursuant to paragraph 16 herein.

<u>Utility</u>. The term "utility" refers either to the Grantee or, depending on the context, to any other person, firm, or corporation, public or private, which may hold a franchise to maintain and operate similar facilities in, under, over, across, and along any of the County property described in Exhibit "A".

Council. The term "Council" refers to the King County Council, acting in its official capacity.

Other Governing Body. The term "Other Governing Body" refers to any public official or other public board or body as may have the power and jurisdiction to permit or regulate the installation and maintenance of utilities and other facilities in, under, over, across, and along any of the county property described in Exhibit "A".

# 2. ACCEPTANCE BY GRANTEES OF TERMS AND CONDITIONS

The full acceptance of this franchise and all of its terms and conditions shall be filed with the Clerk of the Council within thirty (30) days from \_\_\_\_\_\_, 19\_\_\_\_, by the Grantee. Full acceptance of this franchise is a condition precedent to its taking effect, and unless this franchise is accepted within the time specified, this grant will be null and void and have no force or effect.

# 3. NON-EXCLUSIVE FRANCHISE

This franchise is not exclusive. It does not prohibit King County from granting franchises for other public or private utilities, in, under, over, across, and along any County property, including County road rights-of-way.

This franchise does not prevent or prohibit King County from constructing, altering, maintaining or using any County road rights-of-way covered by this franchise. King County retains full power to make all changes, relocations, repair, maintenance, etc. as it may deem fit.

#### 4. JURISDICTION

This franchise is intended to convey limited rights and interest only as to those roads and rights-of-way in which King County has an actual interest. It is not a warranty of title or of interest in County road rights-of-way.

Whenever any of the County road rights-of-way as designated in this franchise, by reason of the subsequent incorporation of any Town or City or extension of the limits of any Town or City, shall later fall within the City or Town limits, this franchise shall continue in force and effect until such time as the incorporation and/or annexation is complete according to applicable State law, after which time the County will no longer have any responsibility for maintenance of any County roads, rights-of-way or other County property within the area of annexation/incorporation.

None of the rights granted to the Grantee shall affect the jurisdiction of King County over County road rights-of-way or the County's power to perform work upon its roadways, rights-of-way or appurtenant drainage facilities including by constructing, altering, renewing, paving, widening, grading, blasting or excavating.

All of the rights herein granted shall be subject to and governed by this franchise; provided, however, that nothing in this franchise may be construed in any way as limiting King County's rights to adopt ordinances which are necessary to protect the health, safety and welfare of the general public.

# 5. REGULATION OF USE AND CONTROL

This franchise does not deprive King County of any powers, rights, or privileges it now has or may later acquire in the future to regulate the use of and to control the County road rights-of-way covered by this franchise.

This franchise authorizes the use of County rights-of-way solely for the delivery by the Grantee of water to it customers. Additional uses of County rights-of-way by the Grantee, including for cable

communication services, shall first require a separate franchise from King County which conforms to the requirements of K.C.C. 6.27 as amended, or K.C.C. 6.27A as amended, and other applicable law.

Any use of the Grantee's equipment of facilities in County rights-of-way by others, including for telecommunication or cable communication services, is prohibited unless separately authorized and approved in writing by King County. The Grantee agrees that prior to authorizing any person to use the Grantee's equipment or facilities located in County rights-of-way, the Grantee will require the user to provide the Grantee with an affidavit that it has obtained the necessary franchise or other approval from the County to operate and provide the proposed service in County rights-of-way. At least thirty (30) day prior to executing any agreement with a potential user for the use of the Grantee's equipment or facilities, the Grantee shall fax the affidavit to the King County Office of Cable Communication at 206-296-0842.

# 6. EMINENT DOMAIN

This franchise and the limited rights and interests for the operation, maintenance, repair, and construction of Grantee's transmission and service lines and appurtenances are subject to the exercise of eminent domain. In the event of an exercise of eminent domain by King County, the value to be attributed to all the rights and interests granted under this franchise shall not exceed the actual amount the Grantee paid to King County in obtaining this franchise.

# 7. ENFORCEMENT

Failure of King County, on one or more occasions to exercise a right or to require compliance or performance under this franchise or any applicable law, shall not be deemed to constitute a waiver of such right or a waiver of compliance or performance, unless such right has been specifically waived in writing. Failure of King County to enforce or exercise its rights under any provision of this franchise or applicable law does not constitute a waiver of its rights to enforce or exercise a right in any other provision of this franchise or applicable law.

# 8. INDEMNITY AND HOLD HARMLESS

The Grantee agrees to indemnify and hold harmless King County as provided herein to the maximum extent possible under law. Accordingly, the Grantee agrees for itself, its successors, and assigns to defend, indemnify and hold harmless King County, its appointed and elected officials, and employees from and against liability for all claims, demands, suits, and judgments, including costs of defense thereof, for injury to persons, death, or property damage which is caused by, arises out of, or is incidental to Grantee's exercise of rights and privileges granted by this franchise. The Grantee's obligations under this section shall include:

- (a) Indemnification for such claims whether or not they arise from the sole negligence of the Grantee, the concurrent negligence of both parties, or the negligence of one or more third parties.
- (b) The duty to promptly accept tender of defense and provide defense to the County at the Grantee's own expense.
- (c) Indemnification of claims made by the Grantee's own employees or agents.

(d) Waiver of the Grantee's immunity under the industrial insurance provisions of Title 51 RCW, which waiver has been mutually negotiated by the parties.

In the event it is necessary for the County to incur attorney's fees, legal expenses, or other costs to enforce the provisions of this section, all such fees, expenses and costs shall be recoverable from the Grantee.

In the event it is determined that RCW 4.24.115 applies to this franchise agreement, the Grantee agrees to defend, hold harmless and indemnify King County to the maximum extent permitted thereunder, and specifically for its negligence concurrent with that of King County to the full extent of Grantee's negligence. Grantee agrees to defend, indemnify and hold harmless the County for claims by Grantee's employees and agrees to waiver of its immunity under Title 51 RCW, which waiver has been mutually negotiated by the parties.

King County shall give the Grantee timely written notice of the making of any claim or of the commencement of any such action, suit, or other proceeding covered by the indemnity in this section. In the event any such claim arises, the County or any other indemnified party shall tender the defense thereof to the Grantee and the Grantee shall have the duty to defend, settle, or compromise any claims arising hereunder and the County shall cooperate fully therein.

Notwithstanding the above, the County shall have no obligation to tender a defense as a condition of the indemnity where there is a material conflict between the interests of the Grantee and King County.

# 9. VACATION

If at any time King County vacates any County road rights-of-way covered by this franchise, King County will not be held liable for any damages or loss to the Grantee by reason of such vacation. King County may, after giving thirty (30) days written notice to the Grantee, terminate this franchise with respect to any County road rights-of-way vacated.

### 10. REPAIR, REMOVAL OR RELOCATION

The Grantee hereby covenants, at its own expense, to repair, remove, or relocate existing facilities including all appurtenant facilities and service lines connecting its system to users, within King County road rights-of-way if such repair, removal, or relocation is required by King County for any County road purpose. Such repair, removal, or relocation shall not be unreasonably required.

The grantee shall, at no expense to the County, adjust, remove or relocate existing facilities within County road rights-of-way, including all appurtenant facilities and service lines connecting its system to users, if the County determines such adjustment, removal or relocation is reasonably necessary to allow for an improvement or alteration planned by the County in such road right-of-way. The County shall give the Grantee written notice of such requirement as soon as practicable, at the beginning of the pre-design stage for projects that are part of the County's capital improvement program, including such available information as is reasonably necessary for the Grantee to plan for such adjustment, removal or relocation.

For projects that are a part of the County's capital improvement program, in addition to any other

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notice given to the Grantee, the County shall provide a vertical and horizontal profile of the roadway and drainage facilities within it, both existing and as proposed by the County, and the proposed construction schedule; notwithstanding any permit conditions that may later be applied to the County project, this initial design information shall be given at least 180 days before construction is scheduled to begin, except in cases of urgent construction or emergencies. The Grantee shall respond to this notice, and to any later notices of revised designs based on permit conditions, within no more than thirty (30) days by providing to the County the best available information as to the location of all of the Grantee's facilities, including all appurtenant facilities and service lines connecting its system to users and all facilities that it has abandoned, within the area proposed for the public works project.

The County shall offer the Grantee the opportunity to participate in the preparation of bid documents for the selection of a contractor to perform the public works project as well as all required adjustments, removals or relocations of the Grantee's facilities. Such bid documents shall provide for an appropriate cost allocation between the parties. The County shall have sole authority to choose the contractor to perform such work. The Grantee and the County may negotiate an agreement for the Grantee to pay the County for its allocation of costs, but neither party shall be bound to enter into such an agreement. Under such an agreement, in addition to the Grantee's allocation of contractor costs, the Grantee shall reimburse the County for cost, such as for inspections or soils testing, related to the Grantee's work and reasonably incurred by the County in the administration of such joint construction contracts. Such costs shall be calculated as the direct salary cost of the time of County professional and technical personnel spent productively engaged in such work, plus overhead costs at the standard rate charged by the County on other similar projects, including joint projects with other County agencies.

# 11. REQUIREMENT OF CONSTRUCTION PERMITS

The Grantee, its successors or assigns, has the right, privilege, and authority to enter the County road rights-of-way for the purpose of operating, maintaining, repairing or construction its transmission and service lines and appurtenances on the condition that it obtains permits approved by the Director and Property Services Division and, when applicable, by the Department of Development and Environmental Services. Applications for work permits shall be presented to the Property Services Division which may require copies of plans, blueprints, cross-sections, or further detailing of work to be done. In the event of an emergency, the Grantee may immediately commence the necessary work and shall apply the next business day for the work permit. Any work done, whether by Grantee, its contractors, or third parties will include necessary paving, patching, grading and any other reasonably necessary repair or restoration to the County road rights-of-way. All work shall be done to the satisfaction of the Director.

All equipment, lines and appurtenances which are used in the operation, maintenance, repair or construction of the Grantee's service and which are located within the County road rights-of-way shall be considered to be part of the Grantee's system and shall be the responsibility of the Grantee. All permits for the operation, maintenance, repair or construction of said system shall be applied for and given in the name of the Grantee, who will be responsible for all work done under the permit. The Grantee remains responsible whether the work is done by the Grantee, its contractors, or by third parties.

The Grantee shall, at no expense to the County, assume the following obligations with respect to the facilities connected to its system that are within County road rights-of-way and which it does

not own, including appurtenant facilities and service lines connecting its system to users:

- (a) The Grantee shall apply for, upon request and on behalf of the owner of the facilities, a County right-of-way construction permit for any repairs required for such facilities; provided such owner agrees to reimburse the Grantee for all costs incurred by the Grantee and any other reasonable conditions the Grantee requires as a precondition to applying for the permit. All work to be performed in the County right-of-way shall comply with all conditions of the County permit and all applicable County requirements. The Grantee may at its option perform any part of the repair with its own forces or require the owner to employ a contractor for that purpose, provided such contractor is approved by the County;
- (b) In the event that the County determines emergency repair of such facilities is necessary to halt or prevent significant damage to County road rights-of-way or significant threats to the health, safety and welfare of parties other than the owner or the occupants of the building served by such facilities, the Grantee shall take prompt remedial action to correct the emergency to the County's approval, which the County shall not unreasonably withhold;
- (c) When the County or its contractor provides notice to the Grantee, pursuant to RCW 19.122, of its intent to excavate within County road rights-of-way, the Grantee shall provide to the County or its contractor the best information available from the Grantee's records or, where reasonable, from the use of locating equipment as to the location of such facilities, including surface markings where these would reasonably be of use in the excavation. If the Grantee fails to make good faith efforts to provide the above information within the deadlines provided by RCW 19.122, the Grantee shall hold the County harmless for all reasonable costs that result from damage to such facilities if such damage occurs as a result of the failure to provide such information. Nothing in this subsection is intended or shall be construed to create any rights in any third party or to form the basis for any obligation or liability on the part of the County or the Grantee toward any third party, nor is anything in this subsection intended to be construed to alter the rights and responsibilities of the parties under RCW 19.122, as amended.

## 12. RESTORATION OF COUNTY ROAD RIGHTS-OF-WAY

After work on, under or adjacent to County road rights-of-way, the Grantee is responsible for and will leave all County road rights-of-way in as good a condition as they were in before any work was done. In the event that the Grantee, its contractors, or third parties working under permit should fail to restore County road rights-of-way to the satisfaction of the Director, King County may make such repairs or restorations as are necessary to return the County road rights-of-way to its pre-work condition. Upon presentation of an itemized bill for repairs or restorations, including the costs of labor and equipment, the Grantee will pay the bill within thirty (30) days. If suit is brought upon the Grantee's failure to pay for repair and restoration, and if judgment in such a suit is entered in favor of King County, then the Grantee shall pay all of the actual costs, including interest from the date the bill was presented, disbursements, and attorney's fees and litigation related costs incurred.

# 13. PERFORMANCE OF WORK

The Grantee covenants that in consideration for the rights and privileges granted by this franchise, all work performed by the Grantee on County road rights-of-way shall conform to all County requirements including, but not limited to, the requirements of the current edition of the County Road Standards in force when the work is performed and all traffic control shall also conform to the current edition of the Manual of Uniform Traffic Control Devices in force when the work is performed.

# 14. BLASTING REQUIREMENTS

The right to operate, maintain, repair and construct Grantee's distribution and service lines and appurtenances granted by this franchise does not preclude King County, its agents or contractors from blasting, grading, or doing other road work to the Grantee's lines and appurtenances. Except in the case of an emergency, the Grantee will be given ten (10) business days written notice of any blasting so that the Grantee may protect its lines and appurtenances. If the Grantee notifies the County within ten (10) business days that the facilities will have to be relocated to protect them from blasting, the County will defer the blasting for up to ninety (90) days from the date of the original notice. In no event will the Grantee be given less than two (2) business days written notice of any blasting. Notification of any excavation shall be provided through the One-Call System as provided by RCW 19.122, as hereinafter amended.

# 15. SURVEY MARKERS AND MONUMENTS

It shall be the responsibility of the Grantee performing any construction work in the County road rights-of-way to restore any survey markers or monuments disturbed by such construction in accordance with RCW 58.09.130, and as hereinafter amended.

#### 16. ASSIGNMENT

The Grantee shall not have the right to assign this franchise without the consent of the Metropolitan King County Council given by Ordinance. No assignment shall be effective unless an acceptance by the assignee of all rights, conditions, terms, provisions, and responsibilities contained within the franchise, as well as surety bonds which the Council deems necessary to be posted are received. Council approval of the assignment may be made subject to the assignee's acceptance of new or modified terms of the franchise.

# 17. EXPIRATION AND RENEWAL

To the extent described in Exhibit "A", all rights granted by this franchise to County road rights-ofway outside incorporated Towns and Cities apply to all existing County road rights-of-Way improved and unimproved and to all County road rights-of-way acquired by King County during the term of this franchise.

If the Grantee has initiated a renewal of this franchise before it expires, the County may, at its sole discretion, extend the term of the franchise on a month to month basis for up to one year. Should the County elect to extend the franchise, written notice shall be provided to the Grantee before the franchise expiration date.

If the Grantee has not applied for a renewal of this franchise before it expires, King County has the right to remove or relocate any lines and appurtenances of the Grantee as is reasonably necessary for the public's health, welfare, safety, or convenience including, but not limited to, the safe operation of County roads, franchise holders, or for the construction, renewing, altering, or improving of any County road right-of-way, or for the installation of lines and/or facilities of other franchise holders. Grantee shall be liable for the costs incurred in any removal or relocation of its lines and appurtenances under this section. Costs include the expense of labor and equipment.

Upon expiration of this franchise, the Grantee shall continue to be responsible for the operation and maintenance of existing facilities in the County road rights-of-way until removed, assigned to another franchised utility or abandoned; however, the Grantee shall not have the right to provide additional services or construct new facilities. King County will issue permits required for the repair and maintenance of the existing facilities in accordance with K.C.C. 14.44.055 as amended and Section 11 of this franchise. This section and sections 8, 10-13 and 15 of this franchise shall continue in force until such time as the lines are removed from County road rights-of-way, assigned to another franchised utility, or abandoned in place with the approval of the Manager of the Department of Transportation, Road Services Division.

#### 18. RESERVATION OF RIGHTS

King County specifically reserves for itself the right to impose a utility tax on the Grantee if such taxing authority is granted by State of Washington and the local option is exercised by the King County Council.

King County also specifically reserves the right to exercise authority it has or may acquire in the future to secure and receive fair market compensation for the use of its property, pursuant to an ordinance. If King County elects to exercise such authority, the fair market compensation requirement for Grantee shall be imposed by ordinance not less than one hundred eighty (180) days after written notice ("Compensation Notice") is delivered to the Grantee, said Compensation Notice identifying with specificity the definition, terms and/or formula to be used in determining such fair market compensation. Acceptance of King County's definition terms and/or formula identified in the Compensation Notice will occur if the Grantee accepts in writing within thirty (30) days of receipt of the Compensation Notice; or, if Grantee takes no action in writing within thirty (30) days of receipt of the Compensation Notice; in which case the applicable ordinance that the King County Council passes will be determinative.

Nothing in this section shall be construed as an agreement by the Grantee of King County's right to exercise authority it has or may acquire in the future to secure and receive fair market compensation for the use of property. Nothing in this section shall be construed to prohibit the Grantee from challenging, in King County Superior Court or a court of competent jurisdiction, the legality of such right.

Grantee's rejection of the definition, terms, and/or formula identified in the Compensation Notice will only occur if such rejection is in written form, identifying with specificity the grounds for such rejection, and delivered to King County within thirty (30) days after receipt of the Compensation Notice, in which case the below identified arbitration terms will apply:

(a) The Grantee and King County will select one arbitrator each, and the two selected

arbitrators will select a third arbitrator. If the two arbitrators have not selected a third arbitrator within thirty (30) days after the selection of the last selection of the two, either the Grantee or King County may apply to the presiding judge of the King County Superior Court for the appointment of a third arbitrator. The three arbitrators will determine the method for determining the fair market compensation for the County property used by the Grantee. The arbitration procedure employed shall be consistent with the rules and procedures of the American Arbitration Association. The decision of a majority of the arbitrators will bind both the Grantee and King County. At the conclusion of the arbitration, the arbitrators will submit written reports to the Grantee and King County which shall contain all pertinent evidence that led to their conclusion together with an explanation of their reasoning for such conclusion.

- (b) The fees of the arbitrators selected by each party shall be paid by that party, and the fees of the third arbitrator shall be paid one-half by the County and the Grantee. The other costs of the proceeding shall be shared equally by the County and the Grantee.
- (c) In event that the question of fair market compensation is not resolved prior to the effective date specified by the ordinance authorizing said compensation, the arbitration decision will be applied retroactively to the effective date in the ordinance. The Grantee will pay the retroactive sum plus interest in the amount of twelve percent (12%) per annum.

Nothing in this franchise may be construed to limit the exercise of authority now or later possessed by the County or any other governing body having competent jurisdiction to fix just, reasonable and compensatory rates or other requirements for services under this franchise. Nothing in this section shall be construed to prohibit the Grantee from challenging, in King County Superior Court or a court of competent jurisdiction, the authority of the County or any other governing body to fix rates or other requirements for services.

# 19. COMPLIANCE WITH LAWS

Grantee shall conform to all applicable federal, state and local laws and regulations including, but not limited to, the State Environmental Policy Act and King County environmental standards and ordinances.

# 20. NON-DISCRIMINATION CLAUSE

In all hiring or employment made possible or resulting from this franchise agreement, there shall be no discrimination against any employee or applicant for employment because of sex, sexual orientation, age, race, color, creed, national origin, marital status or the presence of any sensory, mental, or physical handicap, unless based upon a bona fide occupational qualification, and this requirement shall apply to but not be limited to the following: employment, advertising, lay-off or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.

No person shall be denied, or subjected to discrimination in receipt of the benefit of any services or activities made possible by or resulting from this agreement on the grounds of sex, sexual

orientation, race, color, creed, national origin, age except minimum age and retirement provisions, marital status, or the presence of any sensory, mental or physical handicap.

Any violation of this provision shall be considered a violation of a material provision of this agreement and shall be grounds for cancellation, termination or suspension in whole or in part, of the agreement by the County and may result in ineligibility for further County agreements.

The Grantee shall make the best efforts to make opportunities for employment and/or contracting services available to women and minority persons. The Grantee recognizes that King County has a policy of promoting affirmative action, equal opportunity and has resources available to assist Grantee in these efforts.

#### 21. PENALTY FOR VIOLATION OF CONDITIONS

If the Grantee shall violate or fail to comply with any of the material terms, conditions, or responsibilities of this franchise through neglect or failure to obey or comply with any notice given the Grantee under the provisions of this franchise or if the Grantee abandons its franchise, the Council may revoke this franchise. King County shall give written notice of its intent to revoke this franchise. A public hearing shall be scheduled within forty-five (45) days following the notification. The decision to revoke this franchise will become effective ninety (90) days following the public hearing if the County, by ordinance, finds:

- A. That the Grantee has not substantially cured the violation or failure to comply which was the basis of the notice; or
- B. that the violation or failure to comply which was the basis of the notice is incapable of cure; or
- C. that the Grantee has repeatedly violated or failed to comply with any of the material terms, conditions, or responsibilities of the franchise, even though the individual violations have been cured; and
- D. that the revocation of the franchise is in the public interest.

During the forty-five (45) days following the notification, the Grantee shall have the opportunity to remedy the failure to comply.

#### 22. RIGHT OF APPEAL

Decisions, requirements, or approvals of the Director are binding on the parties to this document. Appeals from the Director's determinations will be made by filing a complaint with the King County Superior Court.

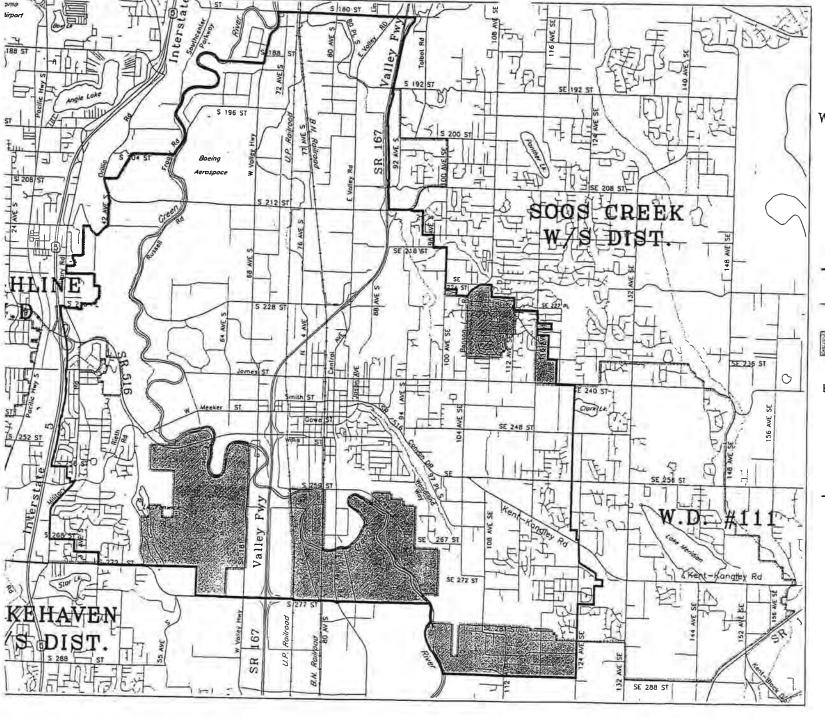
#### 23. SEVERANCE

This franchise gives effect to purposes and uses which are consistent with economical and efficient services rendered in the public interest. If any provision of this franchise, or its application is determined to be invalid by a court of law, then the remaining provisions of this franchise shall continue and remain valid unless the dominant purpose of the franchise would be prevented or the

public interest is no longer served.

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Revised 07/25/96



CITY OF KENT
WATER SERVICE AREA



KENT WATER SERVICE AREA BOUNDARY

KENT CITY LIMITS



CITY OF KENT WATER FRANCHISE

Printed 09-11-97

# VICINITY MAP

# INTERLOCAL AGREEMENT WITH KING COUNTY WATER DISTRICT #111, CITY OF KENT, AND CITY OF AUBURN

(Water Service Area)

September 5, 2006

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# CITY OF KENT, KING COUNTY WATER DISTRICT NO. 111 and CITY OF AUBURN INTERLOCAL AGREEMENT ESTABLISHING WATER SERVICE BOUNDARIES

THIS AGREEMENT ("Agreement"), made and entered into this day of corporation, 2006, by and between the City of Kent, a Washington municipal corporation ("Kent"), King County Water District No. 111, a Washington municipal corporation ("WD #111"), and the CITY OF AUBURN, a Washington municipal corporation, ("Auburn"), all being duly organized and existing under and by virtue of the laws of the State of Washington (individually a "Party" and collectively the "Parties).

#### WITNESSETH:

WHEREAS, pursuant to RCW 35.A.11.040, Aubum has the legal authority to exercise its powers and perform any of its functions as set forth in RCW 39.34, and

WHEREAS, pursuant to Chapter 39 34 RCW, the Interlocal Cooperation Act, Auburn has the legal authority to cooperate with other localities and utilities on the basis of mutual advantage and the efficient provision of municipal services, and

WHEREAS, pursuant to Chapter 39 34 RCW, the Interlocal Cooperation Act, Kent has the legal authority to cooperate with other localities and utilities on the basis of mutual advantage and the efficient provision of municipal services, and

WHEREAS, pursuant to Chapter 39 34 RCW, the Interlocal Cooperation Act, WD #111 has the legal authority to cooperate with other localities and utilities on the basis of mutual advantage and the efficient provision of municipal services, and

WHEREAS, the parties recognize the responsibility of public water utilities to provide efficient and reliable service to their customers at reasonable cost; and

WHEREAS, Kent owns, and desires to be the water service provider for a property currently within the corporate limits of Kent, and within the service areas of Auburn and WD #111, and

WHEREAS, pursuant to Chapter 70.116 RCW, Public Water System Coordination Act, the Parties determined and agreed upon the water service areas between the Parties as set forth in the South King County Coordinated Water System

Plan ("Plan") and the Parties now desire to modify their water service area boundaries as agreed in this Agreement.

**NOW**, **THEREFORE**, in consideration of the terms and conditions set forth herein, the Parties agree as follows:

- 1. Water Service Area. WD #111 and Auburn agree to relinquish to Kent the water service area depicted on the map attached hereto as Attachment 1 and legally described in Attachment 2, which are by this reference incorporated herein. The Parties agree that the South King County Coordinated Water System Plan and the water service area boundaries as set forth in the Plan shall be modified to be in accordance with the Parties' water service area boundaries as set forth in Attachment 1
- 2. Management, Regulation and Control of Water System. Kent, WD #111 and Auburn shall have the sole responsibility and authority to construct, maintain, manage, conduct and operate their water systems within their designated water service areas as depicted in Attachment 1, together with any additions, extensions and betterments thereto.
- **3. Future Annexations.** The Parties agree that Kent shall provide water service to the area depicted in Attachment 1 without regard to the present corporate boundaries of the Parties and without regard to future corporate boundaries as they may be periodically altered through annexation
- **4. Kent Comprehensive Water Planning.** The terms of this Agreement will be included as an amendment to Kent's Comprehensive Water System Plan. Kent will submit to Auburn and WD #111 its Comprehensive Water System Plans and amendments thereto.
- **5. WD #111 Comprehensive Water Planning.** The terms of this Agreement will be included as an amendment to WD #111's Comprehensive Water Plan WD #111 will submit to Kent and Auburn its Comprehensive Water System Plans and amendments thereto.
- 6. Auburn Comprehensive Water Planning. The terms of this Agreement will be included as an amendment to Auburn's Comprehensive Water Plan. Auburn will submit to Kent and WD #111 its Comprehensive Water System Plans and amendments thereto.
- 7. Reliance. Each Party hereto acknowledges that the terms hereof will be relied upon by the other in its comprehensive planning to meet the needs of the service area designated herein.

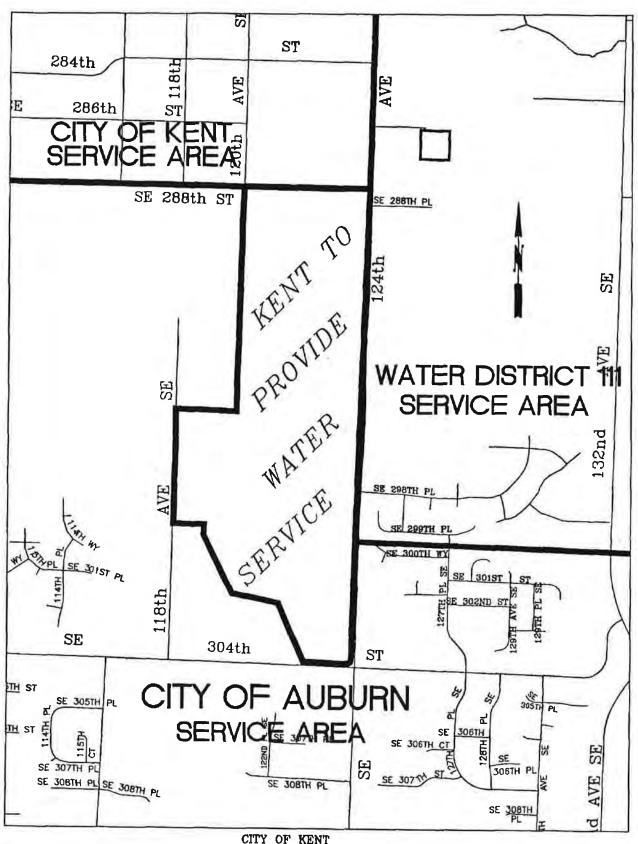
- 8. Liability. Except as set forth in Section 12 regarding default, failure to perform or negligent conduct, the Parties agree that this Agreement shall not be a source of liability between the Parties for any failure or interruption of service in the service area of any Party as designated in this Agreement.
- 9. Government Notifications. Auburn will give notice of the adoption of this Agreement to Metropolitan/King County, to the Washington State Department of Health, to the South King County Regional Water Association, to the Water Utility Coordinating Committee, and to any other agency with jurisdiction over, or interest in, the terms hereof, and the Parties shall cooperate and assist each other in all reasonable manner in procuring any necessary approvals hereof by those agencies.
- 10. Boundary Review Board. In the event that implementation of the terms herein result in permanent water service to areas that will be outside the respective service boundaries of Kent, WD #111 or Auburn, the Parties will, at the time of such service, jointly file a notice of intention with the King County Boundary Review Board in accordance with Chapter 36 93.090 RCW and Chapter 57 08 047 RCW
- **11. Alteration, Amendment or Modification.** Kent, WD #111 and Auburn hereby reserve the right to alter, amend or modify the terms and conditions of this Agreement only upon written agreement of the Parties to such alteration, amendment or modification.
- 12. Indemnification and Hold Harmless. Each Party hereto agrees to protect, defend, and indemnify the other Parties, their officers, officials, employees and agents from any and all cost, claims, judgments and/or awards of damages, arising out of or in any way resulting from the indemnifying Party's, its employees, subcontractors or agents default, failure of performance, or negligent conduct associated with this agreement. Each Party agrees that its obligations under this provision extend to any claim, demand, and/or cause of action brought by or on behalf of any of its employees, or agents. The foregoing indemnity is specifically and expressly intended to constitute a waiver of each Party's immunity under Washington's Industrial Insurance Act, RCW Title 51, as respects the other Parties only, and only to the extent necessary to provide each Party with a full and complete indemnity of claims made by the other Party's employees. The Parties acknowledge that these provisions were specifically negotiated and agreed upon by them.
- 13. Integration. This Agreement constitutes the entire agreement of the Parties regarding the subject matter hereof, and there are no other representations or oral agreements other than those listed herein, which vary the terms of this Agreement. Future agreements may occur between the Parties to transfer additional or future service areas by mutual agreement.

- 14. Obligation Intact. Nothing herein shall be construed to alter the rights, responsibilities, liabilities, or obligations of Kent, WD #111 or Auburn regarding provision of water service, except as specifically set forth herein.
- **15. Duration.** This Agreement shall take effect on the last day approved by all of the Parties and shall remain in effect until modified by written agreement of the Parties
- **16. Recording.** Pursuant to RCW 39.34 040, following the approval and execution of this Agreement by the Parties, this Agreement shall be filed with the King County Auditor.

CITY OF KENT
Approved by Motion No of the City of Kent, Kent, Washington, at it
regular meeting held on the/stday of Quesust
2006.
Suzette Cooke, Mayor City of Kent
Approved as to form:
Kristin M. Lamson Assf., City Attorney City of Kent
KING COUNTY WATER DISTRICT NO. 111
Approved by Resolution No of the King County Water District No. 111
Kent, Washington, at its regular meeting held on the 8th day of 1016.
Patrick Hanis, President
King County Water District No 111
Approved as to form:
King County Water District No. 444

Auburn Resolution No 3920 Kent, WD #111 and Auburn Interlocal Agreement Establishing Water Service Boundaries Page 5 of 9

CITY OF AUBURN Approved by Resolution No. 3920 of the City	of Auburn, Washington, at its
regular meeting held on the 5th day of kplen	<u>der</u> , 2006.
Peter B. Lewis, Mayor City of Auburn  Attest: Danielle Daskam, City Clerk  Approved as to form:	
Daniel B Heid, City Attorney	



CITY OF KENT
KING COUNTY WATER DISTRICT NO 111
AND CITY OF AUBURN
INTERLOCAL AGREEMENT ESTABLISHING
WATER SERVICE BOUNDARIES
ATTACHMENT 1

#### Attachment 2

#### **Legal Description**

THAT PORTION OF THE NORTHWEST QUARTER AND THE SOUTHWEST QUARTER OF SECTION 4, TOWNSHIP 21 NORTH, RANGE 5 EAST, W M IN KING COUNTY WASHINGTON, DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHEAST CORNER OF GOVERNMENT LOT 3 IN SAID SECTION 4;

THENCE WEST ALONG THE NORTH LINE OF SAID GOVERNMENT LOT 3 A DISTANCE OF 30 FEET TO THE WEST MARGIN OF 124<sup>TH</sup> AVENUE SOUTHEAST AND THE TRUE POINT OF BEGINNING,

THENCE SOUTH ALONG SAID WEST MARGIN TO THE NORTHERLY MARGIN OF SOUTHEAST 304<sup>TH</sup> STREET:

THENCE WESTERLY ALONG SAID NORTHERLY MARGIN OF SE 304<sup>TH</sup> STREET TO THE SOUTHEAST CORNER OF THE PLAT OF CRYSTAL MEADOWS AS RECORDED IN VOLUME 194 OF PLATS AT PAGES 66 AND 67, RECORDS OF KING COUNTY,

THENCE NORTHWESTERLY ALONG THE NORTHEASTERLY EDGE OF SAID PLAT TO THE MOST NORTHERLY CORNER OF LOT 10 OF SAID PLAT.

THENCE WESTERLY ALONG THE NORTH EDGE OF SAID PLAT TO THE NORTHWEST CORNER OF LOT 15 OF SAID PLAT,

THENCE SOUTHERLY ALONG THE WEST LINE OF SAID LOT 15 TO A POINT 50 FEET NORTH OF THE SOUTHEAST CORNER OF TRACT 11 OF THE PLAT OF THE SOUND TRUSTEE COMPANY'S THIRD ADDITION, ACCORDING TO THE PLAT THEREOF RECORDED IN VOLUME 13 OF PLATS AT PAGE 100, RECORDS OF KING COUNTY, WASHINGTON,

THENCE NORTHWESTERLY TO A POINT ON THE NORTH LINE OF THE SOUTH HALF OF SAID TRACT 11, SAID POINT LYING 135 FEET WEST OF THE EAST LINE OF SAID TRACT 11,

THENCE CONTINUING NORTHWESTERLY TO A POINT ON THE NORTH LINE OF SAID TRACT 11, SAID POINT LYING 313.36 FEET WEST OF THE NORTHEAST CORNER OF SAID TRACT 11,

THENCE WESTERLY ALONG THE LINE COMMON TO TRACTS 10 AND 11 OF SAID PLAT OF THE SOUND TRUSTEE COMPANY'S THIRD ADDITION TO THE SOUTHWEST CORNER OF THE EAST HALF OF THE SOUTH 120 FEET OF SAID TRACT 10,

THENCE NORTHERLY ALONG THE WEST LINE OF THE EAST HALF OF THE SOUTH 120 FEET OF SAID TRACT 10 TO THE NORTHWEST CORNER OF THE EAST HALF OF THE SOUTH 120 FEET OF SAID TRACT 10,

THENCE WEST ALONG THE NORTH LINE OF THE SOUTH 120 FEET OF SAID TRACT 10 TO THE WEST LINE OF SAID TRACT 10.

THENCE NORTH ALONG SAID WEST LINE OF SAID TRACT 10 AND THE WEST LINE OF TRACT 9 OF SAID PLAT OF THE SOUND TRUSTEE COMPANY'S THIRD ADDITION TO THE NORTHWEST CORNER OF SAID TRACT 9.

THENCE EAST ALONG THE NORTH LINE OF SAID TRACT 9 TO THE NORTHEAST CORNER OF SAID TRACT 9 AND THE WEST LINE OF THE SOUTHEAST QUARTER OF THE NORTHWEST QUARTER OF SAID SECTION 4;

THENCE NORTH ALONG LAST SAID WEST LINE AND THE WEST LINE OF GOVERNMENT LOT 3 OF SAID SECTION 4 TO THE NORTHWEST CORNER OF SAID GOVERNMENT LOT 3;

THENCE EAST ALONG THE NORTH LINE OF SAID GOVERNMENT LOT 3 TO THE TRUE POINT OF BEGINNING



September 18, 2006

Brenda Jacober, City Clerk City of Kent 220 4<sup>th</sup> Avenue South Kent WA 98032

RE: INTERLOCAL AGREEMENT ESTABLISHING WATER SERVICE BOUNDARIES

Dear Brenda<sup>1</sup>

Enclosed are two fully executed originals of the City of Kent, King County Water District No. 111 and City of Auburn Interlocal Agreement establishing Water Service Boundaries. The City of Auburn City Council approved the Interlocal Agreement on September 5, 2006 pursuant to Resolution No. 3920

If you have any questions regarding the agreement, please contact Water Utility Engineer Jeff Roscoe at (253) 931-4008

Sincerely,

Danielle Daskam

City Clerk

Enc

# **EMERGENCY WATER SYSTEM INTERTIE AGREEMENT**

Kent/Auburn Intertie Agreement No. 1

# EMERGENCY WATER SYSTEM INTERTIE AGREEMENT Kent/Auburn Intertie Agreement No. 1

THIS AGREEMENT made and entered into by and between the City of Auburn, hereinafter referred to as Auburn, and, the City of Kent, hereinafter referred to as Kent, for the purposes of planning, designing, constructing, maintaining, and operating an emergency system intertie between the respective parties,

#### WITNESSETH:

WHEREAS, both Cities have water facilities in the vicinity, and

WHEREAS, both Cities can increase fire protection and emergency water supply reliability for their customers, and

WHEREAS, the Cities are willing to provide the necessary services to increase fire fighting and emergency supply reliability upon the terms and conditions set forth herein,

# NOW, THEREFORE, IT IS MUTUALLY AGREED as follows:

- The emergency water system intertie is intended to be operated manually as a two way emergency supply between the Auburn and Kent Systems. The intertie facility shall be located near South 277<sup>th</sup> Street at the Water Service Area Boundaries between the two cities. An existing intertie located at B Street NE and South 277<sup>th</sup> Street will be replaced with a temporary metering station and eventually a permanent metering station Final location and configuration of the facilities shall be determined at the time of final design
- The emergency water system intertie shall be operated only in the event of an emergency. For purposes of this agreement, an emergency shall be defined as resulting from a water shortage, a major water line break, fire demand, contamination to the water supply system, mechanical equipment failure, electrical equipment failure or Puget Sound Energy facility failure, or any other agreed upon emergency within the water supply system.
- Auburn has acquired the right of way for the metering station and Kent will design and administer the contract for the construction of the temporary facilities within the right of way acquired by the City of Auburn. The permanent facilities will be constructed as part of the South 277<sup>th</sup> Street Improvement Project. All of the facilities will be designed and constructed in accordance with reasonably accepted water utility standards for similar municipal water utilities. Auburn will own and maintain the piping, interior

equipment, emergency meter and interior appurtenances, and all piping up to the Kent side of the vault for both the temporary and permanent metering stations

- Upon completion of construction, Auburn will transfer ownership of all exterior appurtenances, and all piping which is located on the Kent side of the vault, to Kent Kent will own and maintain the exterior appurtenances and all piping on Kent's side of the vault
- 5 Each City will each have unlimited access to the vault via a dual padlock or ownership of keys to the vault
- Each City will operate the respective normally locked valve inside of the vault. Auburn will solely unlock and operate the locked valve on Auburn's side of the meter and Kent will solely unlock and operate the locked valve on Kent's side of the meter.
- 7 The procedure for operating the intertie in the event of such emergency shall be as follows
  - A Each City shall determine that an emergency of sufficient magnitude has occurred which warrants the need to request that the intertie be activated
  - B The Public Works Director or appointed person or authorized personnel shall provide a verbal request to the other City's Public Works Director or appointed person. Upon agreement that an emergency exists which shall allow for the intertie to be opened, the intertie will be activated as soon as reasonably possible. Both Cities' personnel shall be present at the vault to open the valves to activate the facility.
  - C The City requesting the activation shall provide a written confirmation of the request not less than 24 hours after the verbal request, or on the first day of normal business after the verbal request.
  - D The intertie shall remain activated until the City requesting activation determines that the need for activation of the emergency intertie has ceased and shall request in writing to close the intertie
  - E. In case of emergency or whenever the public health, safety, or the equitable distribution of water so demands, the City supplying the water may change, reduce or limit the time for or temporarily discontinue the supply of water without notice, water service may be temporarily interrupted, limited for purposes of making repairs,

extensions or doing other necessary work; and the City supplying the water shall not be responsible for any damage resulting from interruption, change or failure of the water supply, and the City receiving the water (City requesting activation) shall save and hold harmless the City supplying the water from any loss, damages or suites to or by customers of the City receiving the water resulting from interruption, change or failure of water supply provided by this Agreement, except damages arising out of the City supplying the water's negligence Prior to a planned interruption or limiting of service, the City supplying the water will notify the City receiving the water of such not less than three days prior to the service disruption. The City supplying the water agrees to use best efforts and reasonable diligence to notify the City receiving the water as soon after it becomes aware of the need for service disruption and further will, to the extent practical, limit the service disruption to daylight hours

- Auburn shall read the meter upon activation and upon deactivation of the intertie. The city supplying the water shall verify the information and shall then calculate and invoice the other City for the water used during the request. The invoice shall be calculated by the total water used during the event. The rate shall be at the current Auburn or Kent Wholesale Rate depending on which city is supplying the water. This shall be complete payment for the water, labor, and administration of activating the intertie.
- The total project costs shall include costs for consulting design service, and construction. These costs shall be paid for by the City of Kent. The project costs shall be reviewed and agreed upon by Public Work Directors of both Cities at the beginning and end of each stage described above Each City is responsible for associated staff, administration and legal costs associated with the implementation of the agreement.
- To the extent allowed by law, the City of Kent shall defend, indemnify, and hold harmless the City of Auburn, its elected officials, employees and agents from and against any and all suits, claims, actions, losses, costs, expenses of litigation, attorney's fees, penalties and damages of whatsoever kind or nature arising out of or in connection with or incident to an act or omission of the City of Kent, its employees, agents, and contractors in the performance of the City of Kent's obligations under the Agreement and this Amendment. This indemnification provision shall include, but is not limited to, all claims against the City of Auburn by an employee or former employee of the City of Kent or its contractors and, as to such claims, the City of Kent expressly waives all immunity and limitation of liability under Title 51 RCW.

To the extent allowed by law, the City of Auburn shall defend, indemnify and hold harmless the City of Kent, its elected officials, employees and agents from and against any and all suits, claims, actions, losses, costs, expenses of litigation, attorney's fees, penalties, and damages or whatsoever kind or nature arising our of, in connection with or incident to an act or omission of the City of Auburn, its employees, agents, and contractors in the performance of the City of Auburn's obligations under this Agreement. This indemnification obligation shall include, but is not limited to, all claims against the City of Kent by an employee or former employee of the City of Auburn or its contractors and, as to such claims, the City of Auburn expressly waives all immunity and limitation of liability under Title 51 RCW.

11 This Agreement shall remain in force until terminated by either party hereto upon 60-days written notice to the other party. Any project costs, incurred up to the date of such notice, as described herein, shall be shared in accordance with the provisions of this Agreement.

By.

IN WITNESS WHEREOF, we have hereunto set our hands and seals

CITY OF AUBURN King County, Washington

Mayor

Date

CITY OF KENT

King County, Washington

Date

Approved as to form

City Attorney

Approved as to form:

ASS City Attorney

8-29-01

Date

Swun Strikes

H \WQWATER UTILITY\INTERTIES\KENT\KENT EIA - FINAL DOC

# INTERLOCAL AGREEMENT BETWEEN THE CITY OF KENT AND HIGHLINE WATER DISTRICT

(Emergency Intertie)

April 5, 1995

Mr. Don E. Wickstrom, P.E. Director of Public Works City of Kent 220 - 4th Avenue S. Kent, WA 98032-5895

Re:

Changes to Intertie Agreement and No Protest LID Covenant

Dear Don:

Enclosed are three originals of each of the above-referenced documents which have been signed by our General Manager. These originals include the changes you requested in your April 4, 1995 letters.

Thanks for bringing these omissions/changes to my attention. I look forward to working with you.

Sincerely,

Keith A. Harris

X142

Manager

Plannin and Construction

W

Enclosures (3) originals

#### INTERTIE AGREEMENT

This Fire Protection and Intertie Agreement (the "Agreement" or "this Agreement") is made this 15th day of March 1995 (being the "anniversary date") between Highline Water District, King County (hereinafter sometimes referred to as "Highline") and the City of Kent, King County (hereinafter sometimes referred to as "Kent").

WHEREAS Highline and Kent are each municipal corporations organized and operating consistent with the laws of the State of Washington; and

WHEREAS the State of Washington, Department of Health encourages Water Service Agreements between adjacent water utilities; and

WHEREAS the connection operates via a pumping system to flow water to Kent and via gravity to flow water to Highline; and

WHEREAS Highline and Kent presently have an eight-inch (8") manually-operated connection between the District's connection between the districts located at S. 240th Street and 35th Avenue South, as governed by an Agreement to Provide Water Services dated October 6, 1982; and

WHEREAS the rate structure of Highline specifies the costs of providing water for certain classes of users; and

WHEREAS at least one boundary of Highline is parallel with and abuts at least one boundary of Kent; and

WHEREAS Highline and Kent wish to supersede the October 6, 1982 Agreement to Provide Water Service (the "Water Service Agreement"), and enter into a new Fire Protection and Emergency Intertie Agreement to serve the customers of Kent.

NOW THEREFORE, it is agreed as follows:

- 1. <u>Location of Facilities</u>: Highline and Kent agree to cooperate on the replacement and maintenance of an emergency fire protection intertie at the intersection of South 240th Street and 35th Avenue South. This intertie will be for two-way flow between Highline and Kent. The intertie shall be operational on a year-round basis.
- 2. <u>Limitations on Use of Water From Intertie:</u> Kent and Highline shall limit the use of the water obtained through the intertie for fire-fighting purposes, emergency use and special maintenance purposes.

# Intertie Agreement

For purposes of this Agreement:

- a. Firefighting Purposes means in the event Kent storage tank and well pumping capacities are inadequate to combat a conflagration from mains with Kent, water from the intertie may be used to extinguish the fire.
- b. Emergency Use means in the event of a power outage, a pump system mechanical failure or a rupture in the distribution system which would impair the productivity of Kent wells to maintain the capacity of the storage tank for fire-fighting purposes and consumption by the public. This emergency use would terminate upon restoration of the electrical power and the repair to the pump(s) and damaged distribution system.
- c. Special maintenance purposes are limited to:
  - Temporary removal from service of either the City's 300,000 gal. reservoir at 264th St. & 34th Ave. and/or 1 million gal. site at Reith Rd. & 256th St. for the purpose of maintenance, painting or decontamination.
  - Scheduled preventive maintenance operation of the intertie pumping station whereupon the pumping station is operated once a month for no longer than a four hour duration.
- 4. <u>Maintenance. Repair. Inspections and Costs for Same</u> Kent shall be responsible for inspecting and maintaining the intertie. Kent shall advise Highline of the qualifications of the firm which is proposed to do the inspection and maintenance. Highline shall reasonably approve the choice.

Kent or its representative shall inspect the intertie annually or more often as required, and shall advise Highline of the results of the inspections. Kent shall pay all costs to repair the intertie as necessary to insure its proper functioning and shall advise Highline of its maintenance and repair activities.

The parties agree that emergency repairs to the South 240th Street and 35th Avenue South Intertie may be performed by either party without notice, followed by notice to the other party as soon as reasonably possible. The costs of any emergency repairs undertaken by Kent shall be borne solely by Kent. The costs of any emergency repairs undertaken by Highline shall be promptly reimbursed by Kent.

# Intertie Agreement

- 5. <u>Notice</u> Kent shall notify Highline within a ten(10) day period after use of the intertie for fire-fighting purposes or other emergency use stating the nature of the emergency use, the date and time of use and the quantity of water used in the intertie.
- 6. Costs of Water Supplied by Highline Kent shall pay Highline for use of water through the intertie system based on Highline's published wholesale rate in effect on the date the water is used by Kent. Any time Kent uses water, whether for one day or an entire month, Kent shall pay the monthly meter charge for the month or months in which it is drawing water, plus pay the commodity charge. Thus, using the rates in effect at the present time, for any use of water within a single month, Kent will pay \$2,305 plus \$1.41 (October through May) and \$1.87 (June through September) for each 100 cubic feet of water used. Kent understands that the wholesale rate may be revised by Highline from time to time. However, Kent will be allowed a scheduled maintenance period (up to four hours) each month to allow operation of the intertie pumping station for preventive maintenance purposes. This will not require payment of the monthly meter charge, only payment for water used.
- 7. <u>City of Seattle Demand Charges</u> The parties reserve the right to negotiate with the City of Seattle to obtain an agreement with the City of Seattle to waive any City of Seattle demand charges incurred by Highline as a consequence of the South 240th Street and 35th Avenue South Intertie. Any agreement shall be in writing and shall become a part of this intertie Agreement. Highline will provide a signed copy of same to Kent.

If Highline is unable to obtain an agreement with the City of Seattle to reduce or waive demand charges to Highline caused by use of water in accordance with this Agreement, and shall any of the ten peak days used to calculate the demand charge be coincidental with a day in which water was taken through the South 240th Street and 35th Avenue South Intertie, then Kent shall calculate their portion, if any, of the demand charge.

8. <u>Indemnification</u> - The parties agree to indemnify and hold each other harmless from any claim arising under this Agreement. It is understood and agreed that Highline makes no warranties or assurances as to water availability, pressure or volume at any given time relating to the Intertie.

It is understood that if Highline's water service to the South 240th Street and 35th Avenue South Intertie is temporarily interrupted for repair for an emergency, or for any other reasons, it is not obligated to provide an alternative source of water supply. Highline does, however, warrant that it will not, except for reasons relating to emergencies or other necessary repairs, interrupt the water supply to the intertie.

8-A <u>Costs of Water Supplied by Kent</u> - Highline shall pay Kent for use of water through the intertie system based on Kent's published water rate in effect on the date the water is used by Highline.

Intertie Agreement

- 9. <u>Term</u> This Intertie Agreement, except for the water rate, shall be reviewed annually, and shall continue indefinitely unless either party notifies the other of its intention not to continue or to renegotiate this Agreement by giving six months written notice prior to the end of each annual anniversary date.
- 10. <u>Dispute Resolution</u> If a dispute arises out of or relates to this Agreement, or the breach of it, and if the dispute cannot be settled through negotiation, the parties agree first to try in good faith to settle the dispute by mediation under the rules and regulations of the Washington State Water/Wastewater Association, or Washington Arbitration and Mediation Services, Inc. before resorting to arbitration, litigation or some other dispute resolution procedure.

Services, Inc. before resorting to arbitration, liti procedure.	gation or some other dispute resolution
11. <u>Termination</u> - The October 6, 1982 Agrey this Agreement, subject to any accrued monto Highline.	eement to Provide Water Service is superseded letary charges which may be owing from Kent
DATED this DAY OF	1995.
HIGHLINE WATER DISTRICT	CITY OF KENT
By Seaan S. Evolen	Ву
Pegg S. Bosley	Its
Its GENERAL MANAGER	
STATE OF WASHINGTON )	STATE OF WASHINGTON
COUNTY OF KING	COUNTY OF KING
I certify that I know or have satisfactory evidence that Peggy S. Bosley is the person who appeared before me and said person acknowledged that he/she signed this instrument on oath and stated that he/she was authorized to execute the instrument and acknowledged it as the Fire Protection & Emergency Internie Agreement of Highline Water District, and she signed the document as the free and voluntary act of such party for the uses and purposes mentioned in the instrument.  I, POLLY DAIGLE, am a Notary Public in King County, WA whose commission.	I certify that I know or have satisfactory evidence that  is the person who appeared before me and said person acknowledged that he/she signed this instrument on oath and stated that he/she was authorized to execute the instrument and acknowledged it as the Fire Protection & Emergency Interne Agreement of Highline Water District, and that he/she signed the document as the free and voluntary act of such party for the uses and purposes mentioned in the instrument.
in Kent WA POLLY DAIGLE POLLY DAIGLE	I am a Notary Public in King County, WA, whose commission expires and who resides in
DATED: A TILL 1995. (seal or stamp)	DATED: 1995. (seal or stamp)

# WATER SERVICE AREA BOUNDARY ADJUSTMENT AGREEMENT

This Water Service Area Boundary Adjustment Agreement ("Agreement") is made and entered into by and between the City of Kent, a Washington municipal corporation ("City"), and King County Water District 111, a Washington municipal corporation ("District") (each individually a "Party" and collectively the "Parties") for the purposes set forth below.

### **Recitals**

- A. The City is a non-charter code city formed and existing pursuant to Title 35A of the Revised Code of Washington (RCW). The City owns and operates water and sewer utility systems and provides retail water utility services to customers located within the City's corporate and approved utility service area boundaries.
- B. The District is a water special purpose district formed and existing pursuant to Title 57 RCW. The District owns and operates a water utility system and provides retail water services to customers located within the District's corporate and approved water service area boundary.
- C. Portions of the District's and the City's water service area boundaries are adjacent.
- D. The City's and the District's exclusive water service area boundaries have been established and approved pursuant to Chapter 70.116 RCW, the Public Water System Coordination Act of 1977 ("Act"). In accordance with the South King County Coordinated Water System Plan prepared pursuant to the Act, the City and the District have been designated the exclusive water service purveyors within their respective authorized water service areas. The City's and District's retail water service area boundaries have also been established and approved pursuant to water system plans approved by the Washington State Department of Health (DOH), King County, and other public agencies with jurisdiction.
- E. The City's and the District's exclusive water service area boundaries need to be revised to reflect existing infrastructure installed and maintained by either the City or the District, as the case may be, and to revise both boundaries to conform to the edges of existing lot lines, where possible, instead of bisecting existing lots. It is cumbersome for developers, City staff, and District staff, when a development proposal is submitted, and the water service area boundaries split the proposed development into separate water service areas.

Therefore, in consideration of the terms and conditions set forth herein, the Parties agree as follows:

### **Agreement**

- 1. The Recitals set forth above are incorporated herein in full by this reference.
- 2. <u>Water Service Area Boundary Adjustment</u>. The water service area boundary between the City and the District is hereby adjusted as agreed upon by the Parties and shown in **Exhibit A** attached hereto and incorporated herein by this reference, as of the Effective Date of this Agreement.
- 3. Planning Documents, Other Approvals, and Governmental Notifications. The Parties agree to amend their respective water system plans and any other required planning or permitting documents to document, show, formalize and confirm the adjusted exclusive water service area boundary between the Parties as provided for in this Agreement, with each regular update of those plans, permits or other documents. Both Parties shall provide any required government notifications, including without limitation, notifications to DOH and the King County Boundary Review Board. However, failure to make those amendments, failure to obtain any required plan approvals involving the service area adjustment, or failure to provide required notifications will not affect the contractual obligations between the Parties as provided for in this Agreement.

### 4. Miscellaneous.

- 4.1 <u>Duration</u>. This Agreement will remain in effect as a permanent water service area boundary change between the Parties.
- 4.2 <u>Indemnification</u>. The City will defend, indemnify and hold the District, its officers, officials, employees, agents and volunteers harmless from any and all claims, injuries, damages, losses or suits, including all legal costs and attorney fees, arising out of or in connection with the City's negligent performance of this Agreement.

The District will defend, indemnify and hold the City, its officers, officials, employees, agents and volunteers harmless from any and all claims, injuries, damages, losses or suits, including all legal costs and attorney fees, arising out of or in connection with the District's negligent performance of this Agreement.

- 4.3 <u>Non-Waiver of Breach</u>. Either Party's failure to insist upon strict performance of any of the covenants and agreements contained in this Agreement or to exercise any option conferred by this Agreement in one or more instances will not be construed to be a waiver or relinquishment of those covenants, agreements or options.
- 4.4 <u>Governing Law, Resolution of Disputes and Legal Costs</u>. Washington law will govern this Agreement. If the Parties are unable to settle any dispute, difference or claim arising from this Agreement, the exclusive means of resolving that dispute, difference or claim, will only be by filing suit under the venue, rules and jurisdiction of the King County Superior Court, King County, Washington,

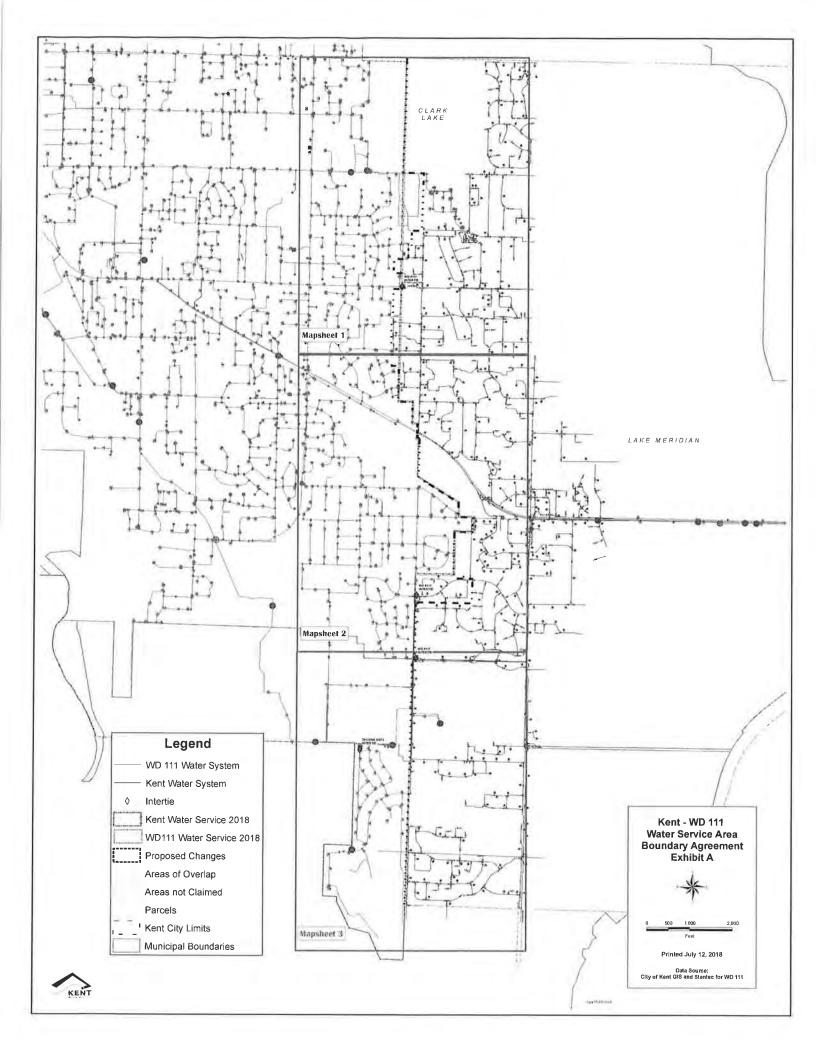
unless the Parties agree in writing to an alternative dispute resolution process. In any claim or lawsuit for damages arising from the Parties' performance of this Agreement, each Party will pay all its legal costs and attorney fees incurred in defending or bringing that claim or lawsuit, including all appeals, in addition to any other recovery or award provided by law; provided, however, nothing in this paragraph will be construed to limit either Party's right to indemnification under subsection 4.2.

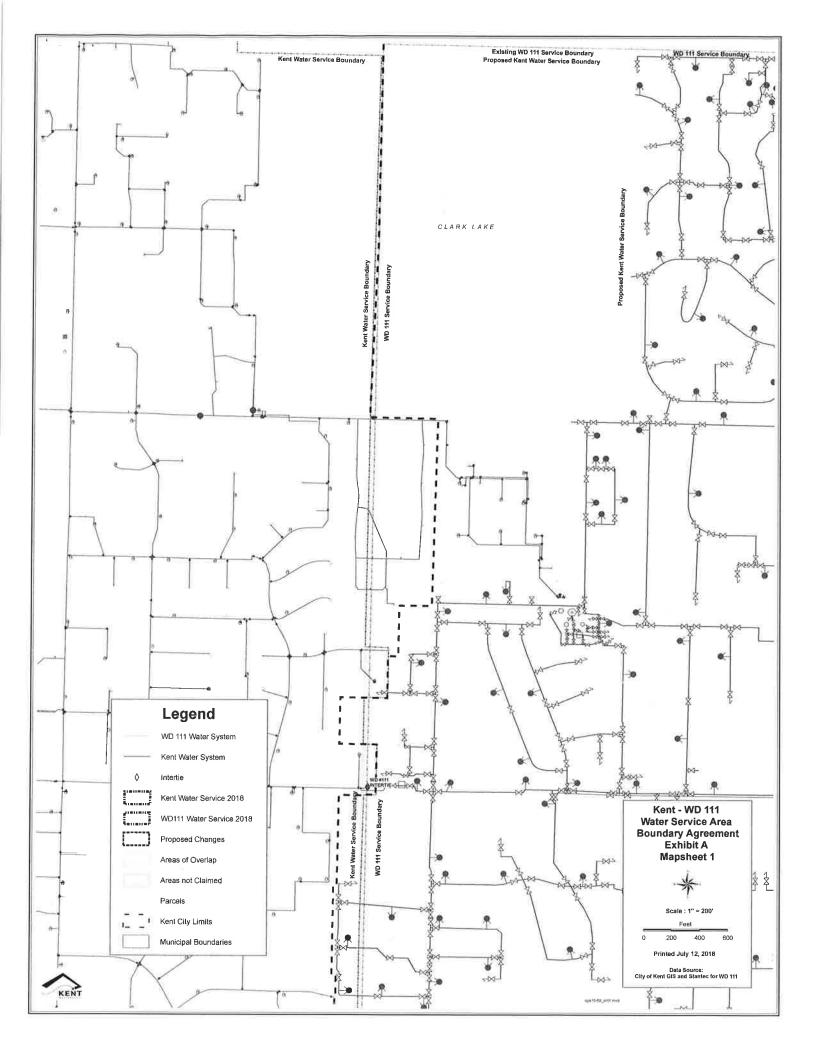
- 4.5 <u>Assignment or Modification</u>. Assignment, waiver, alteration, or modification of all or part of this Agreement will not be binding on the Parties unless in writing and signed by a duly authorized representative of each Party.
- 4.6 <u>Entire Agreement</u>. The written provisions and terms of this Agreement supersede all prior verbal statements of any officers or other representatives, and those statements will not be construed as part of this agreement.
- 4.7 <u>Counterparts</u>. This Agreement may be executed in one or more counterparts, each of which shall constitute an original, and all of which together will constitute one agreement.
- 4.8 <u>Authority</u>. The Parties represent and warrant this Agreement has been duly approved and authorized by their respective legislative authorities, that each Party has full power and authority to enter into this Agreement and to carry out the actions required of them in this Agreement, and all persons signing this Agreement in a representative capacity represent and warrant they have the full power and authority to bind their respective municipal entities.
- 5. <u>Effective Date</u>. This Agreement will take effect on the last date entered below ("Effective Date").

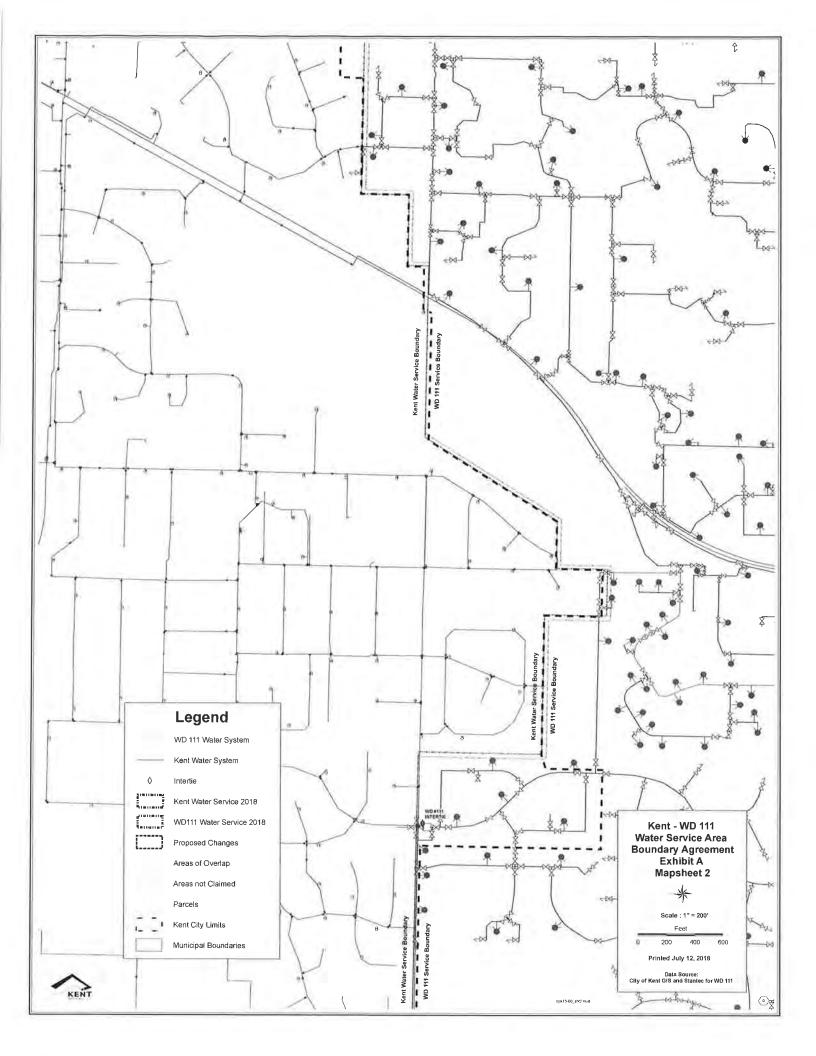
The City of Kent	King County Water District 111 William C Hall
Ву	BY WILLIAM C. HALL
Its	Its GENERAL MANAGER
Date:	Date: 8/31/2018
APPROVED AS TO FORM:	
Misrok	

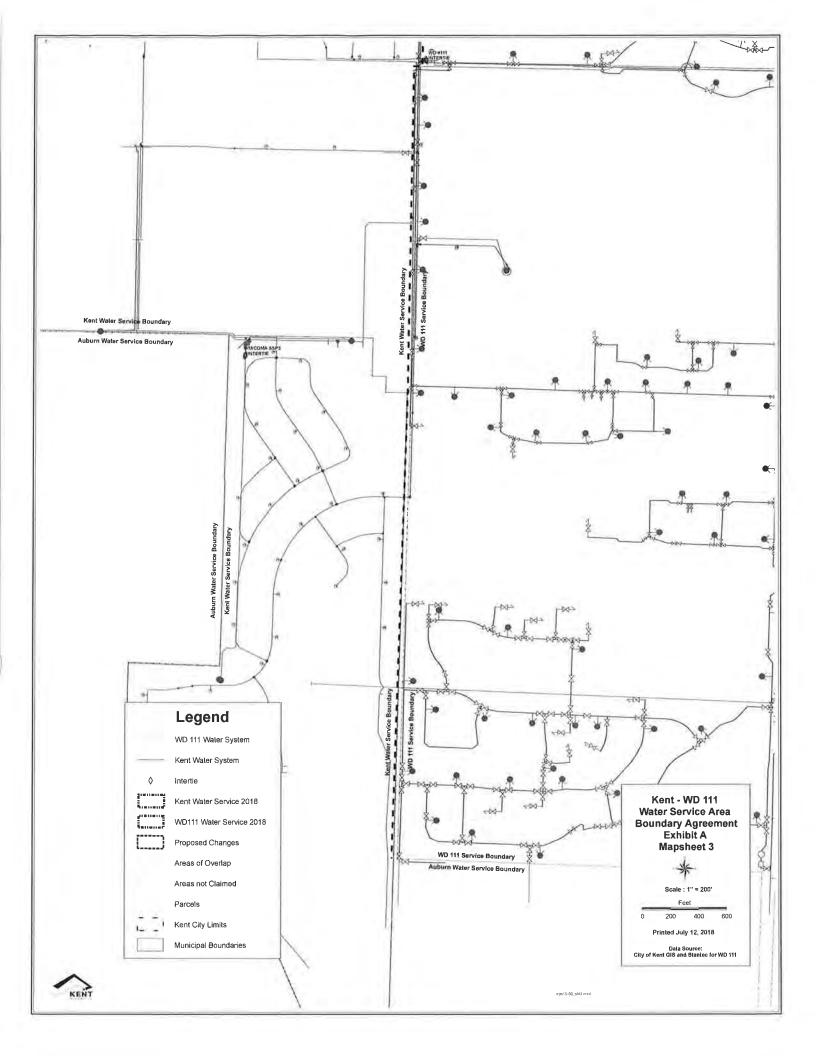
KENT LAW DEPARTMENT

# EXHIBIT A DEPICTION OF MODIFIED EXCLUSIVE RETAIL WATER SERVICE AREA BOUNDARIES









## AGREEMENT FOR THE EMERGENCY SALE OF WATER BETWEEN THE CITY OF RENTON AND THE CITY OF KENT

This AGREEMENT made and entered into this 17 day of May, 1995, by and between the CITY OF RENTON, a municipal corporation of the State of Washington, hereinafter called "RENTON" and the CITY OF KENT, a municipal corporation of the State of Washington, acting through its Water Department, hereinafter called "KENT".

WHEREAS, RENTON and KENT may experience periodic water supply shortfall; WHEREAS, RENTON and KENT recognize the public benefits of cooperation and collaborative problem solving;

WHEREAS, RENTON and KENT are willing to sell water in an emergency at the existing

system interties:

WHEREAS, the parties desire to enter into an AGREEMENT providing for the emergency sale of water.

### NOW THEREFORE, IT IS AGREED AS FOLLOWS:

- The effective date of this AGREEMENT shall be Term of AGREEMENT. 1) 1995. The AGREEMENT shall be for a minimum of one (1) year and shall continue in full force and effect in its present form or as amended until terminated by either party in accordance with Section 15 of this AGREEMENT. The rates and quantities of water sold are set forth in Sections (3), and (7).
- Sale. Subject to the conditions set out in this agreement either party may sell water to the 2) other in the event that the receiving City is experiencing an emergency. An emergency is defined, for the purposes of this agreement, as a situation of relative short duration during which the City can not meet water consumption needs of all or part of its distribution system.
- Rate. For 1995 KENT shall pay to RENTON for all water delivered at the rate of \$1.73 per 3) 100 cubic feet, which is Renton's retail rate for commercial customers for 1995. For 1995 RENTON shall pay to KENT for all water delivered at the rate of \$1.64 per 100 cubic feet during the period May 1st to September 30th, which is KENT's summer retail rate for commercial customers for 1995 and at the rate of \$1.24 per 100 cubic during the period October 1st to April 30th, which is KENT's winter retail rate for commercial customers for 1995. The rates charged by the SELLER shall be adjusted each year on January 1st and shall be the retail rates for the coming year for commercial customers of each respective City.
- Metering. RENTON and KENT shall each provide, and own and maintain, an appropriate metering device to measure the water flowing through the intertie. An interlocal agreement may be prepared to allow one party to operate and maintain the intertie and distribute the costs equally between the both parties. Before allowing any water to flow through the intertie, the party requesting the water shall provide a description and documentation of the emergency condition to the other party.
- Priority and Continuity of Service. The determination of whether water is available for 5) emergency sale shall be at the sole discretion of the party delivering (selling) the water. In the event of a condition requiring restrictions on the delivery of water, the party delivering the water shall have the right to restrict or interrupt service. The party providing water may voluntarily interrupt or reduce deliveries of water if it determines that such interruption or

Agreement for the Emergency Sale of Water by the City of Renton to the City of Kent Page 2

reduction is necessary or reasonable. Except in cases of emergency and in order that operations will not be unreasonably interfered with, the party providing water shall give the party buying water, reasonable notice of any such interruption or reduction, the reason therefor, and the probable duration thereof. The party buying water shall discontinue or reduce service from the intertie upon reasonable notice. Service shall be reactivated or increased again subject to the aforementioned conditions.

- Mater Quality. The quality of water delivered under this AGREEMENT shall be subject to applicable provisions of State and Federal law and rules and regulations of the appropriate State agency governing water quality, and subject also to applicable provisions of City ordinances relating thereto and not inconsistent herewith. Each party agrees to deliver water which shall be of no less quality than is delivered to its other retail customers throughout the service area.
- Ouantity of Water. Depending upon demand conditions, water availability (including conservation impacts), as well as aquifer behavior, in the RENTON system, RENTON may make available, for purchase by KENT, up to the approximate amount of three and a half million (3,500,000) gallons per day or more from the existing emergency intertie located at SW 43rd and Lind Avenue South. Depending upon demand conditions and water availability (including conservation impacts), KENT may make available, for purchase by RENTON, up to two million (2,000,000) gallons per day from the existing emergency intertic located at SW 43rd and Lind Avenue South.
- Coordination and Project Management,

### A) Operations:

For the purpose of operating the water system intertie between RENTON and KENT, coordination shall occur between representatives of the systems, who are:

Water Maintenance Manager, City of RENTON

and

Water Superintendent, City of KENT (or their designated representatives).

The coordination shall consist of exchanging operational information such as when the intertie is used, the respective flow rates, pumping capacities, back-pressure sustaining valve setpoints, system pressure effects, water quality characteristics, and other operational information as necessary to accomplish the purposes of this AGREEMENT while maintaining safe operation of both systems.

### B. Engineering:

For the purposes of coordinating engineering issues regarding the RENTON and KENT intertie, the following personnel shall be the designated representatives:

Water Utility Supervisor, City of RENTON and City Engineer, City of KENT (or their designated representatives)

The engineering issues addressed shall include operational criteria as well as hydraulic

Agreement for the Emergency Sale of Water by the City of Renton to the City of Kent Page 3

behavior, water quality considerations, and other appropriate engineering issues.

### C. Administration:

For the purposes of AGREEMENT administration and AGREEMENT modifications or interpretations, the following personnel shall be the designated representatives:

Planning/Building/Public Works Administrator, City of RENTON and
Public Works Director, City of KENT
(or their designated representatives)

9) Payment. The City providing the water shall read the meter once each month at approximately thirty (30) day intervals (when the intertie is being used). Payment shall be made by the City receiving water as soon as possible after receipt of statement and in any event, not later than the tenth (10) of the second month following the presentation of the bill.

In the event a meter shall fail to register or obviously register incorrectly, the amount of water considered delivered through said meter shall be the amount delivered the previous day or the last day that the meter was previously known to be properly functioning and the total amount registered shall be pro-rated based on the number of days multiplied times the reading used.

- Penalties For Late Payment. The City selling water may assess a late charge on the City buying water for failure to comply with the provisions in Section (9). This charge shall be at the rate of twelve percent (12%) per year. In the event that the City buying water should fail to make any payment for a period of sixty (60) days after the same becomes due, the City selling water shall have the right to terminate further water service without further notice, until such delinquency is cured.
- Breach of Contract. Either party may cancel this Agreement for material breach of its terms by written notice served upon the other party at least twenty (20) days prior to the proposed termination date. If the breaching party removes the breach and performs under terms of this agreement before the termination date, the Agreement shall remain in full force and effect. However, if the breach is not removed and continues, then the Agreement shall be null and void in all respects except for obligation to make payments as defined for water use prior to the termination date.
- Procedure for Amending the Contract. Either party can request the other to consider an amendment of the AGREEMENT. Any proposed amendments shall be made in writing. Amendments may be made if they are mutually acceptable to RENTON and KENT and signed by both parties. Minor or operational amendments may be made by the Administrators.
- Access to Facilities and Records. Each party shall be entitled to inspect the intertie facilities of the other at any reasonable time. Both parties agree to make mutually available such information or records regarding the intertie as are at their disposal and as may be reasonably necessary to properly implement any section of this AGREEMENT.
- 14) Non-Assignability. Neither this AGREEMENT nor any interest therein shall be transferred

Agreement for the Emergency Sale of Water by the City of Renton to the City of Kent Page 4

or assigned by either City without prior written consent of both Cities.

15) <u>Termination</u>. This AGREEMENT may be terminated in whole or in part by either party any time after one year from date of this AGREEMENT, upon ten (10) days written notice sent by certified mail to the other party. Send notices to the Water Utility Supervisor at the City of Renton and the City Engineer at the City of Kent.

IN WITNESS WHEREOF, the parties have hereunto set their hands this day and year above written.

CITY OF RENTON

Earl Clymer, Mayor

ATTEST/AUTHENTICATED:

Marilyn J. Petersen, City Clerk

APPROVED AS TO LEGAL FORM:

Larry Warren, City Attorney

CITY OF KENT

By: Danson

ATTEST/AUTHENTICATED:

Brenda Jacober, City Clerk

APPROVED AS TO LEGAL FORM:

Roger Lubovich, City Autorney

H:DOCS:95-136:JDW:ps

## CITY OF KENT and SOOS CREEK WATER AND SEWER DISTRICT EMERGENCY USE INTER-TIE AGREEMENT

THIS AGREEMENT, made and entered into this <a href="7">7th</a> and <a href="7">August</a> 2001, by and between the CITY OF KENT, a Washington municipal corporation (hereinafter referred to as "the City"), SOOS CREEK WATER AND SEWER DISTRICT, a Washington municipal corporation (hereinafter referred to as "the District"), and the CITY OF SEATTLE (hereinafter referred to as SPU), all entities being duly organized and existing under and by virtue of the laws of the State of Washington, is entered into for the purposes of planning, designing, constructing, maintaining and operating an emergency system inter-tie between the respective parties.

#### WITNESSETH:

WHEREAS, both the City and the District are public agencies authorized by law and qualified to provide domestic public water in accordance with federal, state and local laws and regulations; and

WHEREAS, emergency use inter-ties between public water agencies can assist them in performing their water supply duties during times of emergency and water shortage; and

WHEREAS, implementation of emergency intertie agreements between SPU purveyor and non-purveyor customers that involve SPU water supply are allowed subject to SPU approval; and

WHEREAS, it is in the public interest for the parties herein to establish an emergency use inter-tie to provide backup water supply in the event of an emergency, as defined herein.

#### NOW, THEREFORE:

IT IS HEREBY AGREED by and between the parties hereto as follows:

- 1. The inter-tie is intended to operate as a one way gravity flow from the District's system into the City's system, by an inter-tie facility to be located within a vault suitable for the purpose. The facilities for this purpose are schematically shown on Attachment 1 to this document. Final location and configuration of the facilities will be determined at the time of final design.
- The District will act as the lead agency, and will be the design and contracting entity for the construction of the facilities contemplated hereby.
- 3. Upon completion of construction, the District and the City will own and operate the facilities respectively indicated on Attachment 1 to this agreement. The District will convey those facilities to be owned and operated by Kent by Bill of Sale.
- 4. The City shall reimburse the District for all actual costs associated with the planning, design, construction and permitting for this project. All reasonable

- efforts have been made to develop cost projections for this project. The estimated total project cost is \$85,000.
- 5. The City and the District will each have access to the vault via dual padlocks or ownership of keys to the vault.
- 6. The City will be provided a key to the vault's lock. Only the District will unlock and operate the vault, except as otherwise provided herein.
- The inter-tie will be operated only in the event of an emergency. For purposes of this agreement, an emergency is defined to be as a infrastructure failure, contamination of water supply fire flow demand failure, electrical supply failure, or drought condition as defined by the State Department of Ecology such that -the City's water supply is unable to provide sufficient water supply to its inhabitants.
- 8. It is anticipated that the inter-tie will be capable of transporting approximately 500-750 gpm. Both parties recognize that the District's water system's ability to sustain this flow rate is limited by District physical system characteristics. The District may reduce the rate of flow for any period necessary to ensure that the inter-tie does not adversely impact its system operation.
- 9. The procedures for operating the inter-tie in the event of an emergency shall be as follows:
  - a. The City will make the determination that an emergency exists which warrants a request that the inter-tie be activated.
  - b. The City's Water Superintendent or designee shall provide a verbal request to the District Manager or designee and Seattle Public Utilities (SPU). Upon the District's and SPU's concurrence that such an emergency exists, the inter-tie will be activated in one of the two following manners:
    - i. If the emergency is one that does not require immediate water by the City, the District will open the inter-tie at 9:00 a.m. on the first business day following the determination of the emergency. The City's personnel shall also be on site for operation of the City's facilities. At the time of activation, District and City personnel shall concurrently confirm and note the standing reading on the flow meter totalizer of the inter-tie.
    - ii. In the even of an emergency which requires immediate use of the inter-tie, the City shall verbally notify the District that the inter-tie's activation is required as soon as reasonably possible. If the District is unable to respond within thirty minutes of such verbal notification, the City's personnel will be permitted to unlock and activate the inter-tie valve, and to verify and to note the standing reading on the flow meter totalizer of the inter-tie.

- c. The City will provide the District with a written request confirmation not less than 24 hours after any verbal request, or during the first day of normal business after the verbal request, whichever is later. If the City requests that the inter-tie be activated prior to 9:00 a.m. on the first business day following the determination of an emergency, the City will provide backup data as necessary to allow the District to request a waiver of demand metering charges from SPU for the particular event, in accordance with the wholesale water contract between the District and SPU. If demand metering charges are not waived by SPU, the City shall pay such charges incurred by the District relative to the event.
- d. The District shall notify SPU in writing within 10 days after the use of the emergency inter-tie. This notification will include a description of the nature of the emergency, and the date, time and quantity of water used during the activation of the inter-tie.
- e. The inter-tie shall remain activated until the City has determined that the emergency causing need for the activation has ceased, but in no event for longer than two weeks unless mutually agreed to in writing by the District and SPU. The District shall close the inter-tie at the time of such determination, or at 9:00 a.m. on the following day. The City shall provide a written confirmation of its request that the inter-tie be closed.
- f. The District shall read the meter, and calculate and invoice the City for the water used during each activation of the inter-tie as follows:
  - The District shall prepare an invoice by multiplying the number of ccf's (hundred cubic feet) of water used by either the new water wholesale rate or the demand metering charge the District is required to pay to SPU for the event, whichever is greater, plus the amount per ccf established the District's Board of Commissioners as the District's wheeling charge. For calendar year 2001, the wheeling charge shall be \$.20 per ccf. Payment of invoices calculated in accordance herewith shall constitute complete payment for the water, labor, and activation of the intertie, and its administration while activated or while pending activation.
  - ti. The City shall pay each invoice in full within thirty days of its issue. After 60 days, a late charge of 10% of the amount due shall be added, and thereafter the entire balance due shall bear interest at 12% per annum, until paid in full.
- The implementation of this agreement is contingent upon receipt of the written approval of SPU; and it shall be subject to any amendments made to the District's wholesale water contract with SPU during the term hereof.
- The inter-tie project is subject to approval by the Washington State Department of Health. The District will submit plans and specifications to the Department for review and approval concurrently with the project's construction. The City will pay the review fees directly to the Department. Any changes to the project

required by the Department will be made by the District. Both parties recognize that these changes may result in additional costs to the City.

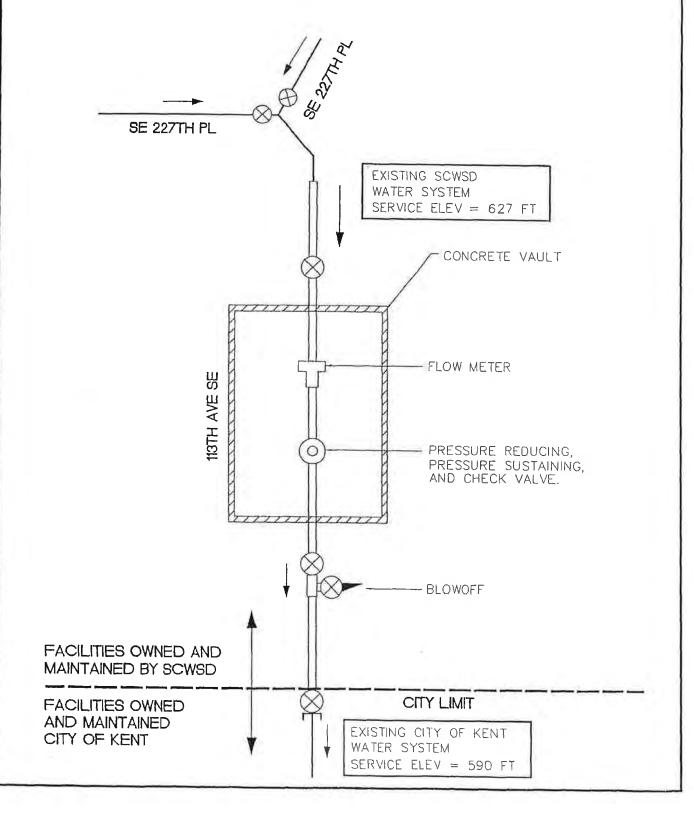
- Each party hereto agrees to protect, defend and indemnify the other party, its officers, officials, employees and agents from any and all costs, claims, judgments and/or awards of damages, arising out of or in any way resulting from the party's default, failure of performance, or negligent conduct associated with this agreement, by the party, its employees, subcontractors or agents. Each party agrees that its obligations under this provision extend to any claim, demand, and/or cause of action brought by or on behalf of any of its employees, or agents. The foregoing indemnity is specifically and expressly intended to constitute a waiver of each party's immunity under Washington's industrial insurance act, RCW Title 51, as respects the other party only, and only to the extent necessary to provide each party with a full and complete indemnity of claims made by the other party's employees. The parties acknowledge that these provisions were specifically negotiated and agreed upon by them.
- The City agrees to protect, defend and indemnify the District, its officers, officials, employees and agents from any and all costs, claims, judgments and/or awards of damages, arising out of or in any way related to pressure changes within the City's service area attributable to the activation and use of the inter-tie.
- 15. This agreement shall continue in effect until mutually cancelled by the parties.
- Unless otherwise agreed to by the parties, this agreement is not intended to preclude, conflict with, or otherwise affect the terms of existing or future agreements executed between SPU and the City that may involve use of the inter-tie described herein.

THE CITY OF KENT	AND SEWER DISTRICT
Jam Mate	An Joen
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Date: 7-26-01	Date:
CITY OF SEATTLE H. Gula	
Sai Managere Butter	
Date:	

SOOS CREEK WATER

### ATTACHMENT NO. 1

CITY OF KENT - SOOS CREEK WATER AND SEWER DISTRICT EMERGENCY USE INTERTIE AGREEMENT SCHEMATIC DIAGRAM OF FACILITIES AND OPERATION



604 × CXA

### AGREEMENT

THIS AGREEMENT entered into this 28 day of 1979, by and between the CITY OF KENT, hereinafter referred to as "Kent" and the CITY OF TUKWILA, hereinafter referred to as "Tukwila".

WHEREAS Municipal Corporations are given the power to contract under RCW 39.34 for cooperative services, and

WHEREAS it is necessary for Tukwila and Kent to enter into this Agreement to provide a water intertie system, and

WHEREAS it is mutually beneficial to both parties to enter into this Agreement to provide emergency water flow and water supply to meet Kent's needs during periods of peak demand and for emergency flow and fire protection in both cities,

NOW, THEREFORE, IN CONSIDERATION of the mutual benefits conveyed hereby do agree as follows:

- 1. Both parties agree to cooperate in the construction of a water flow intertie system uniting the water supplies of the City of Kent and the City of Tukwila at a point on the West Valley Highway.
- 2. The intertie system will be constructed by the City of Kent at the City of Kent's expense and ownership of said facility shall remain with the City of Kent. The City of Kent hereby agrees to operate and maintain said facility.
- 3. Both parties agree that the intertie system will not be operated except during periods when either party desires to obtain

water from the other party. Whenever either party wishes to operate the intertie, ten days notice shall be given to the other party, except that in the case of an emergency, such notice shall not be required. Whenever operated, the operating party agrees to notify the other party's Fire Department and Water Department immediately.

- 4. Both parties agree that the rate to be charged for water used under this Agreement will be at the rate of \$0.33 per 100 cubic feet of water used. Billing for said charge shall be made in the normal course of business and paid by the other party promptly upon receipt of the invoice. Failure to pay for water utilized under this Agreement or for use for other than emergency purposes, unless otherwise agreed upon, shall be grounds for termination of this Agreement.
- 5. Either party may cancel this Agreement for material breach of its terms by written notice served upon the other party at least twenty (20) days prior to the proposed termination date. If the breaching party removes the breach and performs under terms of this Agreement before the termination date, the Agreement shall remain in full force and effect. However, if the breach is not removed and continues, then the Agreement shall be null and void in all respects except for the obligation to make payments as defined for water used prior to the termination date.

CITY OF TUKWILA

Edgar N. Bauch

CITY OF KENT

Mavor

Attest:

By Mafine Anderson
City Clerk

Apprôved as to Form:

City Attorney for City of Tukwila

Attest:

By mane Inen Orty Clerk

Approved as to Form:

City Attorney for City of Kent

### **ORDINANCE NO. 4299**

AN ORDINANCE of the City Council of the City of Kent, Washington, granting Highline Water District a non-exclusive 15-year franchise to construct, maintain, operate, replace and repair a water system within public rights-of-way of the City of Kent, imposing a franchise fee in the amount of six percent on the District's revenues and setting forth other provisions concerning the relocation of District facilities to accommodate projects caused by the City and other projects not caused by the City.

### RECITALS

- A. Highline Water District, a Washington special purpose municipal corporation ("District"), owns and operates water facilities ("Facilities") and provides retail utility water service to customers located within the District's corporate and approved retail water utility service area boundary; a portion of the District's Facilities are located in the City of Kent, a Washington non-charter municipal code city ("City"), within the City's right-of-way as hereinafter defined; and
- B. The City also owns and operates a water utility system and provides retail water utility services to customers located with the City's corporate and approved retail water utility service area boundary.
- C. Portions of the District's and the City's corporate and retail water utility service area boundaries are adjacent.
- D. RCW 57.08.005 (3) authorizes the District to conduct water throughout the District and any city and town therein, and construct and

lay facilities along and upon public highways, roads and streets within and without the District; and

- E. RCW 35A.47.040 authorizes the City to grant non-exclusive franchises for the use of the public streets above or below the surface of the ground by publicly owned and operated water facilities; and
- F. The City and the District have prepared a Franchise Agreement ("Franchise" or "Agreement") to provide for the operation of District Facilities within the City right-of-way, to impose a franchise fee of six percent on District revenues and to govern the relocation of District facilities;

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF KENT, WASHINGTON, DOES HEREBY ORDAIN AS FOLLOWS:

### **ORDINANCE**

**SECTION 1.** - <u>Definitions</u>. Where used in this Franchise these terms have the following meanings:

- A. "City" means the City of Kent, a Washington municipal corporation, and its respective successors and assigns.
- B. "District" means Highline Water District, a Washington municipal corporation, and its respective successors and assigns.
- C. "Facility" or "Facilities" means tanks, reservoirs, water treatment facilities, meters, pipes, mains, services, valves, blow offs, vaults, fire suppression water facilities, risers, generators, electrical control panels, power meters, telephone connections, pressure reducing valves ("PRVs"), pump stations, meter stations, interties, lines, and all other necessary or convenient facilities and appurtenances thereto for the purpose of operating a water utility system, whether the same be located over or under ground.

- D. "Franchise Area" means every and all of the public roads, streets, avenues, alleys, highways and rights-of-way of the City as now or hereafter laid out, platted, dedicated or improved in District's service area within the present corporate boundaries of the City, and as such corporate boundaries may be extended within District's service area by annexation or otherwise.
- E. "Ordinance" means this Ordinance No. 4299, which sets forth the terms and conditions of this Franchise.
- F. "Party" or "Parties" means the City or the District individually, or collectively as addressed in this Franchise.
- "Revenue" means income received by the District from the sale of G. metered water to direct retail customers whose connections to the District's water system are located within the City. Revenue shall not include: late fees; shut-off and reconnect fees; delinquent service charge collection costs and expenses; surcharges; impact or mitigation fees; permit fees and costs; any type of connection charges, general facilities charges, or local facilities charges; local improvement district and utility local improvement district assessments and payments; grants; contributed assets (contributions in aid of construction); loans; income from legal settlements not related to water sales to District customers; income from telecommunication leases or licenses; income from real property or from real property sales; income from the sale of surplus equipment, tools or vehicles; interest income; penalties; hydraulic modeling fees; water availability document fees and charges; water system extension agreement fees and charges; income from street lights; labor, equipment and materials charges and the Franchise Fee.

### SECTION 2. - Franchise.

A. The City does hereby grant to District the right, privilege, authority and franchise to construct, install, lay, support, attach, maintain, repair,

renew, replace, remove, enlarge, operate and use Facilities in, upon, over, under, along, through and across open city right-of-ways within the Franchise Area for purposes of its water utility functions as defined in Title 57 RCW beginning on the Effective Date of this Franchise; provided the City's grant of the right to use the Franchise Area to the District as provided herein for its Facilities shall not be construed to require the District to provide such Facilities to the City.

- B. Nothing contained in this Ordinance is to be construed as granting permission to District to go upon any other public place other than those types of public places specifically designated as the Franchise Area in this Ordinance. Permission to go upon any other property owned or controlled by the City must be sought on a case-by-case basis from the City.
- C. In addition to the rights granted to the District to undertake and perform activities within the Franchise Area as provided herein, District shall have the right to discharge District water supply to and into the City's storm water system while performing water system flushing and other District activities, provided any District water to be discharged to the City's storm water system must comply with all applicable federal and state water quality standards and the City's NPDES permit relating to the City's storm water system.
- D. At all times during the term of this Franchise, District shall fully comply with all applicable federal, state, and local laws and regulations.

### SECTION 3. - Non-interference of Facilities.

A. Survey monuments shall not be removed or destroyed without the District first obtaining the required Department of Natural Resources (DNR) permit in accordance with RCW 58.09.130 and WAC 332-120-030, and as such statute and regulation may be modified and amended. All survey monuments which have been distributed or displaced by such work shall

be restored pursuant to all federal, state and local standards and specifications. District agrees to promptly complete all restoration work and to promptly repair any damage caused by such work at its sole expense.

B. If it is determined that the District has failed to restore the right-of-way in accordance with this Section, the City shall provide the District with written notice, which shall include a description of actions the City believes necessary to restore the right-of-way. If the right-of-way is not restored in accordance with the City's notice within fifteen (15) days of that notice, or such longer period as may be specified in the notice, the City, or its authorized agent, may restore the right-of-way and District shall be responsible for all reasonable costs and expenses incurred by the City in restoring the right-of-way in accordance with this Section. The rights granted to the City under this Section shall be in addition to those otherwise provided by this Franchise.

### SECTION 4. - Relocation of Facilities.

- A. Subject to each Party's prior and consistent compliance with the Section 6 Planning Coordination requirements below, whenever the City causes the grading or widening of the Franchise Area or undertakes construction of storm drainage lines, lighting, signalization, sidewalk improvement, pedestrian amenities, or other public street improvements (for purposes other than those described in Section 4(D) below) and such project requires the relocation of the District's then existing Facilities within the Franchise Area, the City shall:
- Pursuant to RCW 35.21.905, or as amended, consult with the
   District in the predesign phase of any such project; and
- After receipt of written notice from the City, the District shall design and relocate such Facilities within the Franchise Area within ninety (90) days for a smaller project and two hundred forty (240) days for a

larger project to accommodate the City project, unless the Parties agree on a different time; in any event, the City and the District will, in good faith, use their best efforts to coordinate their project schedules to avoid delay to the City's project. A smaller project includes but is not limited to adjusting at minimal time and cost, a water service line or a meter to a new grade or location, adjustment of a valve box, relocation or extension of a fire hydrant, or relocation of an air vac assembly or blow off. Notwithstanding the above, the District may, at any time within thirty (30) calendar days after receipt of written notice requesting the relocation of its Facilities, submit to the City written alternatives to such relocations. The City shall within a reasonable time evaluate such alternatives and advise the District in writing whether one or more of the alternatives is suitable to accommodate work that would otherwise necessitate relocation of the Facilities. If so requested by the City, District shall submit such additional information as is necessary to assist the City in making such evaluation. The City shall give each alternative full and fair consideration. In the event the City reasonably determines there is no other reasonable or feasible alternative, the City shall provide the District with further written notice to that effect. In that event, the City shall provide the District with conceptual plans and specifications for the City project and the District shall then relocate its Facilities by the date so established.

- 3. Coordinate and work with the District to minimize conflicts between existing Facilities and the public improvements where possible, and to avoid having the District relocate its Facilities whenever possible. The City and the District agree that coordination under this Section 4 shall include evaluating the costs of alternative plans that achieve the essential function of the public improvement most efficiently for both the District and the City, and to the greatest extent possible, avoid the relocation of District Facilities.
- B. If relocation of District Facilities cannot be avoided through the coordination requirements in this Section 4 and a city project causes the

relocation of District Facilities, the cost of relocating such Facilities existing within the Franchise Area shall be paid as follows:

- 1. If the relocation occurs within fifteen (15) years after the District or a third party on the District's behalf initially constructed such Facility, then the City shall pay fifty percent (50%) of the cost of such relocation and the District shall pay the remaining fifty percent (50%);
- 2. If the relocation occurs more than fifteen (15) years after the District or a third party on the District's behalf initially constructed such Facility, then the relocation shall be at the District's sole cost.
- For the purposes of this Section 4, the date of the Facility's acceptance by the District Board of Commissioners shall determine the age of the Facility.
- C. Whenever any person or entity, other than the City, requires the relocation of District Facilities to accommodate the work of such person or entity within the Franchise Area, the City agrees not to require the District to relocate its Facilities. District shall have the right as a pre-condition of such relocation to require such person or entity to:
- Make payment to District at a time and upon terms acceptable to the District for any and all costs and expense incurred by the District in the relocation of District Facilities; and
- 2. Protect, defend, indemnify and save the District harmless from any and all claims and demands made against it on account of injury or damage to the person or property of another arising out of or in conjunction with the relocation of District Facilities, to the extent such injury or damage is caused by the negligence or willful misconduct of the person or entity requesting the relocation of District Facilities or other negligence or willful misconduct of the agents, servants or employees of the person or entity requesting the relocation of District Facilities.

- D. This Section 4 shall govern all relocations of District's Facilities required in accordance with this Franchise. Any cost or expense in connection with the location or relocation of any Facilities existing under benefit of easement or other right not in the Franchise Area shall be borne by the City, provided the City obtains the District's prior consent to such location or relocation.
- E. For the purpose of this Section 4, a project or improvement is considered to be caused by the City (as described in Section 4(A) above) if it is permitted by the City and both of the following conditions exist:
  - 1. The City is the lead agency for the project or improvement; and
- Developer assessments, impact fees, contributions in aid of construction, and contributions in lieu of construction make up a minority of the overall costs of the improvement or project.
- F. If a City project requires the relocation of then existing Facilities within the Franchise Area as provided in this Section 4, the District and the City may agree to include the relocation of any Facilities as part of the City's public works project under terms and conditions agreed between the City and the District.

### SECTION 5. - Right-of-Way Management.

A. Excavation. Whenever the District excavates in any right-of-way for the purpose of installation, construction, operation, maintenance, repair or relocation of its Facilities, it shall apply to the City for a permit to do so in accordance with the ordinances and regulations of the City requiring permits to operate in City right-of-way. No District work shall commence within any City right-of-way without a permit, except as otherwise provided in this Franchise and applicable City Ordinance.

- B. Restoration after Construction. The District shall, after any installation, construction, relocation, operation, maintenance or repair of Facilities within the Franchise Area, restore the right-of-way as nearly as reasonably possible to its condition prior to any such work. The District agrees to promptly complete all restoration work and to promptly repair any damage to the right-of-way caused by such work at its sole cost and expense. If it is determined the District has failed to restore the right-of-way in accordance with this Franchise and other applicable City regulations, the City shall provide the District with written notice including a description of the actions the City believes necessary to restore the right-of-way.
- C. Bonding Requirement. The District, as a public agency, shall not be required to comply with the City's standard bonding requirement for working in the City's right-of-way.
- D. Emergency Work, Permit Waiver. In the event of an emergency where any District Facilities located in the right-of-way are broken or damaged, or if the District's construction area for the District's Facilities is in a condition as to place health or safety of any person or property in imminent danger, the District shall immediately take any necessary emergency measures to repair, replace or remove its Facilities without first applying for and obtaining a permit as required by this Franchise; provided the District shall notify the City as soon as reasonably possible relative to such emergency activity and shall immediately obtain a permit for such activity if required by this Franchise or City Ordinance.
- E. City Work Zones. The District shall not be required to obtain a City right-of-way permit to undertake utility work to accommodate a City-initiated project when the City and the District are jointly undertaking a project in the Franchise Area and the District work is located within the

City "work zone" for which the City has already approved a traffic control, pedestrian safety or other applicable plans.

- F. Complete Right-of-Way Permit Applications. If the District is required to obtain any permit from the City to undertake utility work in the Right-of-Way in the Franchise Area, the City shall provide written review comments within twenty-one (21) calendar days of receiving a complete application for such permit. If the permit application requires resubmittal by the District, the City shall complete all subsequent reviews within fourteen (14) days of the receipt of such submittal. To be considered complete for purposes of this section, the application must show existing utilities, hard surfaces and proposed restoration.
- G. City Invoices. The City shall invoice the District for all City fees and charges relating to the issuance of any City permits to the District, such as a City right-of-way permit or franchise street use permit, to undertake utility work in the Franchise Area, including inspection fees and charges, on a monthly basis, and the City's final fees and charges within sixty (60) calendar days of the completion of any District work in City right-of-way subject to a City permit, and the City's final acceptance of any such District work. The District shall pay all such City fees and charges within thirty (30) calendar days of receipt of the City's invoice for such fees and charges, except for any disputed fees and charges.
- H. Regular Maintenance. The City will not require the District to obtain a right-of-way permit, or any other City-issued permit, to conduct regular maintenance of the District's Facilities, including, but not limited to, flushing mains, video inspecting mains, valve, blow-off or hydrant adjustments, or repairing surface areas around existing Facilities, unless such maintenance impacts a traffic lane or a high pedestrian area on SR 99; SR 516; Military Road; South 272nd Street; 30th Avenue South; or South 259th Place/ South 260th Street.

### SECTION 6. - Planning Coordination.

- A. The Parties agree to participate in the development of, and reasonable updates to, the other Party's planning documents to the extent they apply to the District's service area within the City limits as follows:
- 1. Each Party will participate in a cooperative effort to develop their respective Comprehensive Plan Utilities Elements that meet the requirements described in RCW 36.70A.070 (4).
- Each Party will participate in a cooperative effort with the other Party to ensure that the Utilities Elements of their Comprehensive Plans are accurate as they relate to their operations and are updated to ensure continued relevance at reasonable intervals.
- 3. Each Party shall submit information related to the general location, proposed location, and capacity of all existing and proposed Facilities as requested by the other Party within a reasonable time, not exceeding sixty (60) days from receipt of a written request for such information, provided that such information is in the non-requesting Party's possession, or can be reasonably developed from the information in the non-requesting Party's possession.
- 4. Each Party will provide information relevant to their operations within a reasonable period of written request to assist the other Party in the development or update of their respective Comprehensive Plan(s), provided that such information is in the non-requesting Party's possession, or can be reasonably developed from the information in the non-requesting Party's possession.
- B. District and City shall each assign a representative whose responsibility shall be to coordinate planning for capital improvement plan projects including those that involve undergrounding. At a minimum, such coordination shall include:

- 1. For the purpose of planning, the District and the City shall provide each other with a copy of their respective current adopted Capital Improvement Plan annually and upon request by the other Party.
- 2. By February 1st of each year, District shall provide the City with a schedule of the District's planned capital improvements which may affect the rights-of-way for that year.
- 3. By February 1st of each year, City shall provide the District with a schedule of City's planned capital improvements which may affect the rights-of-way for that year including but not limited to street overlays and repairs, storm drainage improvements and construction, and all other rights-of-way activities that could affect District capital improvements and infrastructure.
- 4. The District shall meet with the City, and other franchisees and users of the right-of-way, as necessary, to schedule and coordinate construction activities.
- 5. All construction locations, activities, and schedules should be coordinated to minimize public inconvenience, disruption or damages.
- 6. The City and the District agree to cooperate in the planning and implementation of emergency operations response procedures.
- 7. Without charge to either Party, both Parties agree to provide each other with as-built plans, maps and records in electronic format as available that show the location of its facilities within rights-of-way.

### SECTION 7. - Indemnification.

A. District shall indemnify, defend and hold the City, its agents, officers, employees, volunteers and assigns harmless from and against any and all claims, demands, liability, loss, cost, damage or expense of any nature whatsoever, including all costs and attorney's fees, made against them on account of injury, sickness, death or damage to persons or property which is caused by or arises out of, in whole or in part, the willful, tortious or negligent acts, failures and/or omissions of District or its

agents, servants, employees, contractors, subcontractors or assigns in exercising the rights granted District in this Franchise; provided, however, such indemnification shall not extend to injury or damage to the extent caused by the negligence or willful misconduct of the City, its agents, officers, employees, volunteers or assigns.

- B. City shall indemnify, defend and hold the District, its agents, officers, employees, volunteers and assigns harmless from and against any and all claims, demands, liability, loss, cost, damage or expense of any nature whatsoever, including all costs and attorney's fees, made against them on account of injury, sickness, death or damage to persons or property which is caused by or arises out of, in whole or in part, the willful, tortious or negligent acts, failures and/or omissions of City or its agents, servants, employees, contractors, subcontractors or assigns in exercising the rights granted City in this Franchise; provided, however, such indemnification shall not extend to injury or damage to the extent caused by the negligence or willful misconduct of the District, its agents, officers, employees, volunteers or assigns.
- C. In the event any such claim or demand be presented to or filed with the District or the City arising out of or relating to the acts or omissions in whole or in part of the other Party, the Party shall promptly notify the other Party thereof, and the notified Party shall have the right, at its election and at its sole cost and expense, to settle and compromise such claim or demand.
- D. Should a court of competent jurisdiction determine that this Franchise is subject to RCW 4.24.115, then, in the event of liability for damages arising out of bodily injury to persons or damages to property caused by or resulting from the concurrent negligence of City and District, their officers, employees and agents, District's liability hereunder shall be only to the extent of District's negligence. It is further specifically and

expressly understood that the indemnification provided herein constitutes the parties' waiver of immunity under Industrial Insurance, Title 51 RCW, solely for the purposes of this indemnification.

**SECTION 8.** - Default. If the District fails to comply with any of the provisions of this Franchise, unless otherwise provided for herein, the City may serve upon the District a written order to so comply within thirty (30) days from the date such order is received by the District. If the District is not in compliance with this Franchise after expiration of said thirty (30) day period, the City may act to remedy the violation and may charge the costs and expenses of such action to District. The City may act without the thirty (30) day notice in case of an emergency.

**SECTION 9.** - Non-exclusive Franchise. This Franchise is not and shall not be deemed to be an exclusive Franchise. This Franchise shall not in any manner prohibit the City from granting other and further franchises over, upon, and along the Franchise Area, which do not interfere with District's rights under this Franchise. This Franchise shall not prohibit or prevent the City from using the Franchise Area or affect the jurisdiction of the City over the same or any part thereof.

SECTION 10. - Franchise Term. This Franchise shall have a term of fifteen (15) years from its Effective Date as defined in Section 29 herein; provided, this Franchise shall be automatically extended for one additional five (5) year period unless either Party at least one hundred eighty (180) days prior to the termination date of the Franchise provides written notice to the other Party of its intent to terminate the Franchise at the end of the Franchise term; provided, at the end of the five (5) year term, this Franchise shall be automatically extended for successive one (1) year periods unless either Party at least one hundred twenty (120) prior to the termination date of any one (1) year extension provides written notice to

the other Party of its intent to terminate the Franchise at the end of the then current Franchise term.

SECTION 11. - Non-assumption. In consideration of the District's payment of the Franchise Fee to the City as provided in Section 12 herein, and the District's acceptance of the other terms and conditions of this Franchise, the City agrees not to exercise and to forbear its statutory authority pursuant to chapter 35.13A RCW or other statutes to attempt to assume jurisdiction over all or part of the District or any District responsibilities, property, facilities, equipment or utility customers located within or without the City's corporate limits during the term of this Franchise. The City's agreement and forbearance includes not facilitating or cooperating with any other city or town to attempt pursuant to RCW 35.13A.060 or as such statute may be amended or superseded to assume jurisdiction over the District or any District responsibilities, property, facilities, equipment or utility customers located within or without the City's corporate limits during the term of this Franchise.

#### SECTION 12. - Franchise Fee.

- A. In consideration of the rights granted the District under this Franchise, the District shall pay to the City a franchise fee ("Franchise Fee") in the amount of six percent (6.0%) of the District's Revenue beginning the first day of the first calendar quarter occurring at least sixty (60) days after the Effective Date of this Franchise, subject to the provisions of Section 12(B) herein.
- B. Franchise Fees shall be paid to the City in bi-monthly installments due and payable within thirty (30) days following the end of the bi-monthly period.
- C. Should the District be prevented by judicial or legislative action from paying any or all of the Franchise Fees, the District shall be excused from

paying that portion of the Franchise Fee and this Franchise agreement will immediately terminate, unless the Parties otherwise agree.

- D. In consideration of the District's payment of a Franchise Fee to the City as provided in Section 12 herein, and the District's acceptance of the other terms and conditions of this Franchise, the City agrees not to exercise and to forbear any legal authority it may have to impose a utility, business and occupation tax, public utility tax, privilege tax, excise tax or any other tax (collectively, "Excise Tax") upon the District based on the District's revenues, gross receipts, or gross income during the term of this Franchise. However, if a court of competent jurisdiction determines the City may not agree to forbear its statutory authority to impose an Excise Tax upon the District based on the District's revenues, gross receipts, or gross income during the term of this Franchise, or to limit any such Excise Tax on the District's revenues, gross receipts, or gross income, the District shall have the right and option, at its sole election, to (1) terminate this Franchise and the payment of Franchise Fees to the City, and if the City determines to impose an Excise Tax on the District, the District shall have the right to bring an action to challenge the legal validity of any such Excise Tax, or (2) if the Parties mutually agree, elect not to terminate this Franchise and the District may agree to pay any such Excise Tax, provided the District's Franchise Fees herein to the City shall be credited against any such Excise Tax the City may impose.
- E. In consideration of the District's payment of a Franchise Fee to the City as provided herein, and the District's acceptance of the other terms and conditions of this Franchise, the City agrees not to exercise and to forbear any legal authority it may have to impose compensation or a rental fee (collectively, "Rental Fee") upon the District for the District's use of the Franchise Area as provided for herein.

F. The District shall have the right to recover the Franchise Fee from the District's ratepayers residing within the City and may identify the Franchise Fee as a separate billing item on utility customer billings by using the following line item:

"Effect of City of Kent Franchise Fee: \$X.xx"

# **SECTION 13.** - Compliance with Codes and Regulations; Annexations; Service Area Boundary.

- A. The rights, privileges and authority herein granted are subject to and governed by this ordinance and all other applicable City ordinances and codes, as they now exist or may hereafter be amended, provided the City shall not unreasonably affect or modify any portion of this Franchise without District's written approval. Nothing in this ordinance limits the City's lawful power to exercise its police power to protect the safety and welfare of the general public. Any location, relocation, erection or excavation by District shall be performed by District in accordance with applicable federal, state and City rules and regulations, including the City public works policies and pre-approved plans, and any required permits, licenses or regulatory fees, and applicable safety standards then in effect.
- B. If any territory served by District is annexed to the City after the Effective Date of this Franchise, this Franchise shall be deemed to be the new agreement required to be granted to a franchisee in annexed territory by RCW 35A.14.900 for whatever period of time is then remaining under this Franchise for the Franchise Area, unless a longer time period is required by that statute. Such territory shall then be governed by the terms and conditions contained herein upon the effective date of such annexation. The first Franchise Fee for any annexed area shall be calculated pro rata from the effective date of the annexation to the end of the next bi-monthly period and paid to the City at the same time as the fee for the Franchise Area is paid for that quarter.

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The District's and the City's exclusive retail water service area boundaries have been established and approved pursuant to chapter 70.116 RCW, the Public Water System Coordination Act of 1977. In accordance with the South King County Coordinated Water System Plan prepared pursuant to the Act, the District and the City have been designated the exclusive water service purveyors within their respective authorized water service areas. The District's and the City's retail water service area boundaries have also been established and approved pursuant to water system plans approved by the Washington State Department of Health, King County and other public agencies with jurisdiction. The water system plans designate the District and the City as the exclusive water service purveyors within their respective authorized water service areas. The District and the City have reviewed certain service areas where their water service areas are adjacent to determine which Party is the most logical provider of water service to the property located within such areas based on the sizing and proximity of the Parties' respective water systems to such property. Based on such review, the Parties have determined to adjust and confirm the exclusive retail water service area boundary between the Parties. Therefore, the Parties agree that their respective exclusive retail water service area boundaries shall be modified, adjusted and confirmed as described and depicted on Exhibit A attached hereto and incorporated herein by this reference ("City of Kent-Highline Water District Retail Water Service Area Boundary" or "Retail Water Service Area Boundary"). The Parties agree to cooperatively participate in obtaining any required approvals by public agencies with jurisdiction to reflect and confirm the exclusive retail water service area boundary as depicted on Exhibit A. The respective exclusive retail water service area boundaries as provided herein shall survive any termination or expiration of this Franchise. Any modification of the exclusive retail water service area boundary provided herein shall be by written agreement between the Parties. This provision and the agreed exclusive

retail water service area boundary between the Parties shall supersede, rescind, and cancel all prior agreements between the Parties relative to the Parties' respective retail water service area boundaries.

**SECTION 14.** - Location of Facilities and Equipment. With the exception of components that are traditionally installed above ground such as fire hydrants, blow offs, vault lids, risers, pump stations, generators, electrical control panels, power meters, telephone connections, automated reading equipment and appurtenances, and utility markers, all Facilities and equipment to be installed within the Franchise Area shall be installed underground; provided, however, that such Facilities may be installed above ground if so authorized by the City, which authorization shall not be unreasonably withheld, conditioned or delayed, consistent with the provisions of the City's land use and zoning code and applicable development pre-approved plans.

**SECTION 15.** - Record of Installations and Service. With respect to excavations by District and the City within the Franchise Area, District and the City shall each comply with its respective obligations pursuant to chapter 19.122 RCW, and as such statute may be modified and amended, and any other applicable state law.

Upon written request of the City, District shall provide the City with the most recent update available of any plan of potential improvements to its Facilities within the Franchise Area; provided, however, any such plan so submitted shall only be for informational purposes within the Franchise Area, nor shall such plan be construed as a proposal to undertake any specific improvements within the Franchise Area.

Upon written request of District, the City shall provide District with the most recent update available of any plan of potential improvements to its improvements located within the Franchise Area; provided, however, any such plan so submitted shall only be for informational purposes within the

Franchise Area, nor shall such plan be construed as a proposal to undertake any specific improvements within the Franchise Area.

Available as-built drawings of the location of any Facilities located within the Franchise Area shall be made available to the requesting Party within a reasonable time, which should typically not exceed fourteen (14) calendar days of request.

#### SECTION 16. - Shared Use of Excavations.

- A. District and the City shall exercise best efforts to coordinate construction work that either Party may undertake within the Franchise Area so as to promote the orderly and expeditious performance and completion of such work as a whole. Such efforts shall include, at a minimum, reasonable and diligent efforts to keep the other Party and other utilities within the Franchise Areas informed of its intent to undertake such construction work. District and the City shall further exercise best efforts to minimize any delay or hindrance to any construction work undertaken by themselves or other utilities within the Franchise Area.
- B. If at any time, or from time to time, either District, the City, or another franchisee, shall cause excavations to be made within the Franchise Area, the Party causing such excavation to be made shall afford the others, upon receipt of a written request to do so, an opportunity to use such excavation, provided that:
- No statutes, laws, regulations, ordinances or District policies prohibit or restrict the proximity of other utilities or facilities to District's Facilities installed or to be installed within the area to be excavated;
- Such joint use shall not unreasonably delay the work of the
   Party causing the excavation to be made;
- 3. Such joint use shall be arranged and accomplished on terms and conditions satisfactory to both Parties. The Parties shall each

cooperate with other utilities in the Franchise Area to minimize hindrance or delay in construction.

SECTION 17. - Insurance. District shall maintain in full force and effect throughout the term of this Franchise, a minimum of Two Million Dollars (\$2,000,000.00) liability insurance for property damage and bodily injury. In satisfying the insurance requirement set forth in this Section, District may self-insure against such risks in such amounts as are consistent with good utility practice. Upon request, the District shall provide the City with sufficient written evidence, as determined by the City in its reasonable discretion, that such insurance (or self-insurance) is being so maintained by District. Such written evidence shall include, to the extent available from District's insurance carrier, a written certificate of insurance with respect to any insurance maintained by District in compliance with this Section.

SECTION 18. - Abandonment and/or Removal of District Facilities.

The Parties agree that the standard practice will be to abandon underground District Facilities in-place whenever practical, subject to the following conditions:

- The District shall continue to own and be responsible for any such facilities abandoned within the Franchise Area.
- 2. The City shall have the right to require the District to remove any Facilities abandoned within the Franchise Area if the City reasonably determines the removal of the abandoned Facility is required to facilitate the construction or installation of a City project within the Franchise Area and the City determines there is no other reasonable or feasible alternative to the removal of the Facility. The City will make reasonable efforts to avoid conflicts with abandoned Facilities whenever possible, however, whenever a conflict cannot be resolved except by removal from the right-of-way of previously abandoned District Facilities, then the District shall, at

the District's expense, remove such abandoned Facilities by their own forces or by participating in the City's public works project. When necessary, removal of abandoned Facilities shall be limited to the area of direct conflict. In removing such material, the District shall conform to all local, state, and federal regulations applicable to asbestos abatement, when applicable.

- 3. Within forty-five (45) calendar days of the District's permanent cessation of use of any of its Facilities as determined by the District, or any portion thereof, the District will, in good faith, use its best efforts to provide as-built drawings locating the abandoned Facilities or if unable to provide as-built drawings, will provide the most complete and accurate drawings the District can make available to provide adequate notice of the location of all abandoned Facilities.
- District Facilities that are abandoned in-place shall be abandoned pursuant to City Standards, to the satisfaction of the Public Works Director.
- The Parties expressly agree that this section shall survive the expiration, revocation or termination of this Franchise, unless modified by separate agreement.

**SECTION 19.** - Vacation of Franchise Area. If the City determines to vacate any right-of-way which is part of the Franchise Area where District Facilities are located or maintained, any ordinance vacating such right-of-way shall provide and condition such vacation on the District obtaining, at no cost to the District, a permanent easement at least fifteen (15) feet wide in such vacated right-of-way for the construction, operation, maintenance, repair and replacement of its Facilities located and to be located in such vacated right-of-way.

<u>SECTION 20.</u> - <u>Assignment</u>. All of the provisions, conditions, and requirements herein contained shall be binding upon the District, and no right, privilege, license or authorization granted to the District hereunder

may be assigned or otherwise transferred without the prior written authorization and approval of the City, which the City may not unreasonably withhold, condition or delay, provided that a merger or consolidation of District with or into another Title 57 water-sewer district shall not be considered an assignment for the purposes of this provision and shall not be subject to the City's approval.

**SECTION 21.** - Notice. Unless applicable law requires a different method of giving notice, any and all notices, demands or other communications required or desired to be given hereunder by any Party (collectively, "notices") shall be in writing and shall be validly given or made to another Party if delivered either personally or by Federal Express or other overnight delivery service of recognized standing, or if deposited in the United States Mail, certified, registered, or express mail with postage prepaid, or if sent by e-mail with electronic confirmation. If such notice is personally delivered, it shall be conclusively deemed given at the time of such delivery. If such notice is delivered by Federal Express or other overnight delivery service of recognized standing, it shall be deemed given one (1) business day after the deposit thereof with such delivery service. If such notice is mailed as provided herein, such shall be deemed given three (3) business days after the deposit thereof in the United States Mail. If such notice is sent by email, it shall be deemed given at the time of the sender's receipt of electronic confirmation. Each such notice shall be deemed given only if properly addressed to the Party to whom such notice is to be given as follows:

To City:

City Clerk City of Kent 220 Fourth Avenue South Kent, WA 98032 Phone: (253) 856-5725

Fax: (253) 856-6725

#### To District:

General Manager Highline Water District 23828 – 30<sup>th</sup> Ave. S. Kent, WA 98032 Phone: (206) 824-0375

Fax: (206) 824-0806

Any Party may change its address for the purpose of receiving notices as herein provided by a written notice given in the manner required by this Section to the other Party.

**SECTION 22.** - Non-Waiver. The failure of either Party to enforce any breach or violation by the other Party or any provision of this Franchise shall not be deemed to be a waiver or a continuing waiver by the non-breaching Party of any subsequent breach or violation of the same or any other provision of this Franchise.

**SECTION 23.** - <u>Alternate Dispute Resolution</u>. If the Parties are unable to resolve disputes arising from the terms of this Franchise, prior to resorting to a court of competent jurisdiction, the Parties shall submit the dispute to mediation or other non-binding alternate dispute resolution process agreed to by the Parties. Unless otherwise agreed upon between the Parties or determined herein, the cost of that process shall be shared equally by the Parties.

<u>SECTION 24.</u> - <u>Governing Law/Venue</u>. This Franchise shall be governed by the laws of the State of Washington. Any suit to enforce or relating to this Agreement shall only be filed in King County Superior Court, King County, Washington.

**SECTION 25.** - Entire Agreement. The Recitals set forth above are hereby incorporated herein in full by this reference. This Franchise constitutes the entire understanding and agreement between the Parties as to the subject matter herein and no other agreements or

understandings, written or otherwise, shall be binding upon the Parties upon execution and acceptance hereof. This Franchise shall supersede, rescind and cancel any prior franchise or agreement granted by the City to the District to locate and operate a public water system within the Franchise Area.

SECTION 26. - Amendment. This Franchise may be amended only by written instrument, signed by both Parties, which specifically states that it is an amendment to this Franchise, and is approved and executed in accordance with the laws of the State of Washington. Without limiting the generality of the foregoing, this Franchise (including, without limitation, Section 7 "Indemnification" above) shall govern and supersede and shall not be changed, modified, deleted, added to, supplemented or otherwise amended by any permit, approval, license, agreement or other document required by or obtained from the City in conjunction with the exercise (or failure to exercise) by District of any and all rights, benefits, privileges, obligations, or duties in and under this Franchise, unless such permit, approval, license, agreement or document specifically:

- 1. References this Franchise; and
- States that it supersedes this Franchise to the extent it contains terms and conditions which change, modify, delete, add to, supplement or otherwise amend the terms and conditions of this Franchise.

In the event of any conflict or inconsistency between the provisions of this Franchise and the provisions of any such permit, approval, license, agreement or other document that does not comply with Subsections (1) and (2) referenced immediately above, the provisions of this Franchise shall control.

**SECTION 27.** - Directions to City Clerk. The City Clerk is hereby authorized and directed to forward certified copies of this ordinance to the

District as set forth in this ordinance. The District shall have thirty (30) days from the date of receipt of the certified copy of this ordinance to accept in writing the terms of the Franchise granted to the District by this ordinance and file with the City Clerk the executed statement of Acceptance of Franchise, attached hereto as **Exhibit B** and incorporated herein by this reference.

<u>SECTION 28.</u> - <u>District Acceptance of Franchise</u>. District shall have no rights under this Franchise nor shall District be bound by the terms and conditions of this Franchise unless District shall, within thirty (30) days after the receipt of the certified copy of this ordinance as addressed in Section 27 herein, file with the City its written acceptance of this Franchise.

**SECTION 29.** - <u>Effective Date of Franchise</u>. The terms and conditions of this ordinance shall not be binding on the City and the District unless the District Board of Commissioners within thirty (30) days of the receipt of the certified copy of this ordinance as addressed in Section 27 herein adopts a resolution accepting this Franchise, and the date of the adoption of such resolution by the District Board of Commissioners shall be the effective date ("Effective Date") of the Franchise.

**SECTION 30.** – <u>Severability</u>. If any one or more section, subsection, or sentence of this franchise is held to be unconstitutional or invalid, such decision shall not affect the validity of the remaining portion of this franchise and the same shall remain in full force and effect.

**SECTION 31.** – Corrections by City Clerk or Code Reviser. Upon approval of the city attorney, the city clerk and the code reviser are authorized to make necessary corrections to this ordinance, including the correction of clerical errors; ordinance, section, or subsection numbering; or references to other local, state, or federal laws, codes, rules, or regulations.

**SECTION 32.** - Effective Date of Ordinance. This ordinance, being an exercise of a power specifically delegated to the City legislative body, is not subject to referendum, and shall take effect 30 days after its passage and publication ("Effective Date").

DANA RALPH, MAYOR

<u>December 11, 2018</u> Date Approved

ATTEST:

KIMBERLEY A. KOMOTO, CITY CLERK

December 11, 2018
Date Adopted

December 14, 2018
Date Published

APPROVED AS TO FORM:

ARTHUR "PAT" FITZPATRICK, CITY ATTORNEY

State of Washington County of King City of Kent

CERTIFICATION

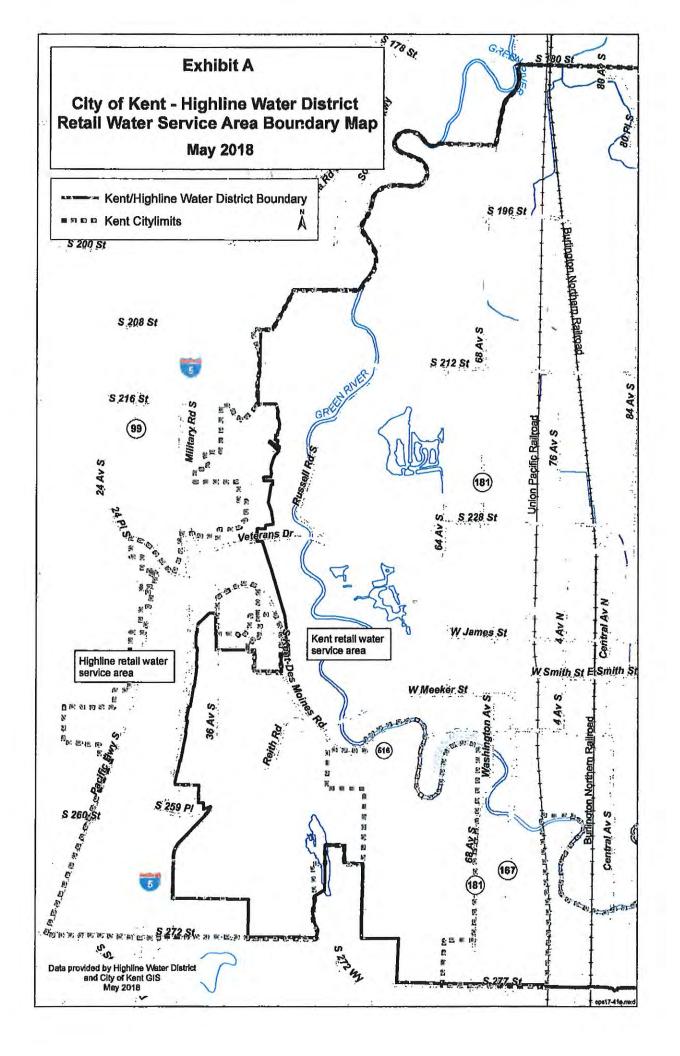
I KIMBERLEY A. KOMOTO, Clerk of the City of Kont, Washington, do hereby certify that the document on which this stamp is imprinted is a true and correct copy of sald original as it appears on file and of record in my office and of the whole thereof IN TESTIMONY WHEREOF I have affixed this seal of the City of Kent at my office in Kent, Washington on this date.

CORPORATE

KIMBERLEY A. KOMOTO, CITY CLERK

City Clerk

Franchise -Highline Water District



## EXHIBIT B ACCEPTANCE OF FRANCHISE

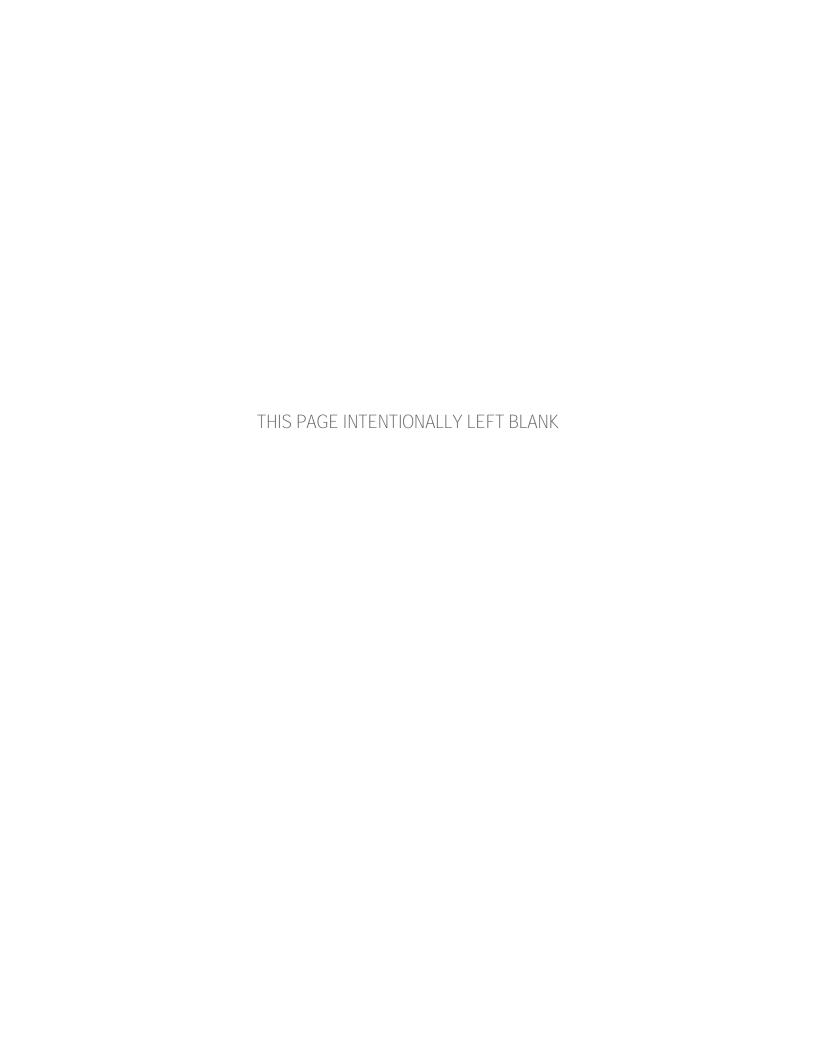
The undersigned authorized representative of Highline Water District (District) hereby declares on the District's behalf the District's acceptance of the nonexclusive franchise to Highline Water District approved by the City of Kent City Council on December 11, 2018, by the adoption of City of Kent Ordinance No. 4299.

DATED this 19th day of December, 2018.

**Highline Water District** 

By: <u>Matt Everett</u>

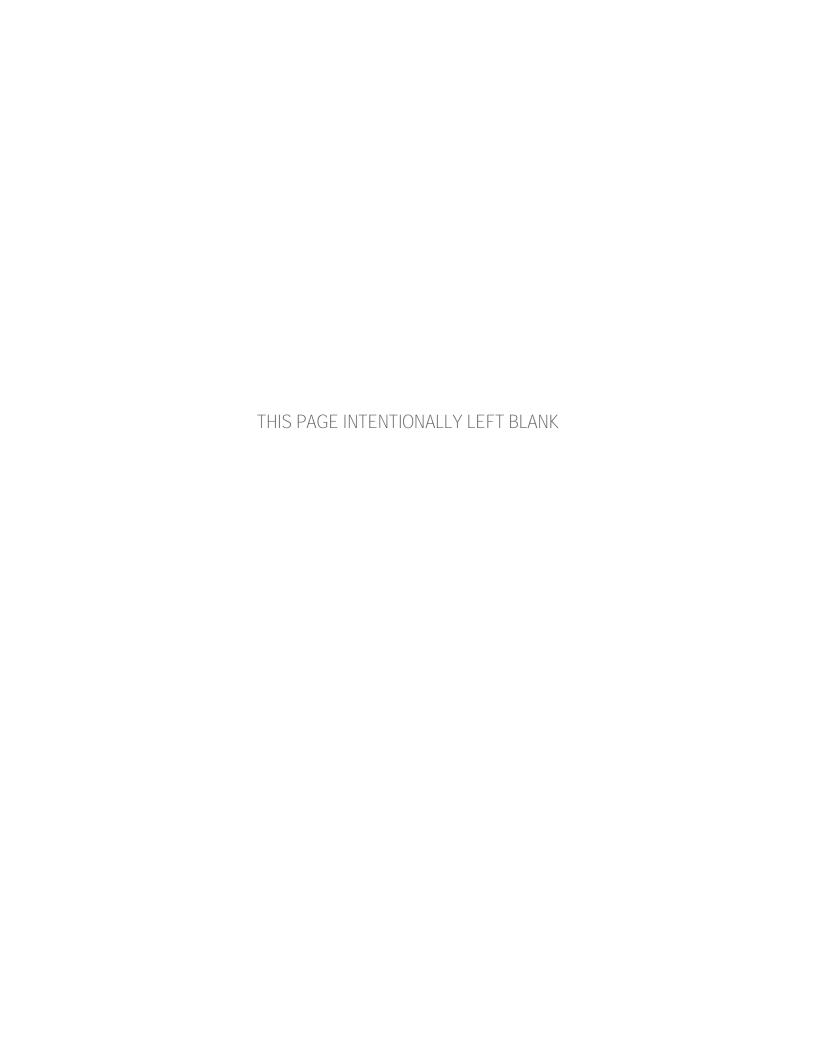
Its: General Manager



## APPENDIX C

# Consistency Statement Checklists

**FORTHCOMING** 





## **Local Government Consistency Determination Form**

Water System Name: <u>City of Kent</u>	_PWS ID: _381501
Planning/Engineering Document Title: Water System Plan	_Plan Date: <u>April 2019</u>
Local Government with Jurisdiction Conducting Review: City of Kent	

Before the Department of Health (DOH) approves a planning or engineering submittal under Section 100 or Section 110, the local government must review the documentation the municipal water supplier provides to prove the submittal is consistent with **local comprehensive plans, land use plans and development regulations** (WAC 246-290-108). Submittals under Section 105 require a local consistency determination if the municipal water supplier requests a water right place-of-use expansion. The review must address the elements identified below as they relate to water service.

By signing this form, the local government reviewer confirms the document under review is consistent with applicable local plans and regulations. If the local government reviewer identifies an inconsistency, he or she should include the citation from the applicable comprehensive plan or development regulation and explain how to resolve the inconsistency, or confirm that the inconsistency is not applicable by marking N/A. See more instructions on reverse.

		For use by water system	For use by local government
	Local Government Consistency Statement	Identify the page(s) in submittal	Yes or Not Applicable
a)	The water system service area is consistent with the adopted <u>land use</u> <u>and zoning</u> within the service area.	Figs 2-3 & 3-1	yes
b)	The growth projection used to forecast water demand is consistent with the adopted city or county's population growth projections. If a different growth projection is used, provide an explanation of the alternative growth projection and methodology.	Pages 3-6 to 3-10	yes
c)	For <u>cities and towns that provide water service</u> : All water service area policies of the city or town described in the plan conform to all relevant <u>utility service extension ordinances</u> .	Pages 5-3 to 5-5, App. M	yes
d)	Service area policies for new service connections conform to the adopted local plans and adopted development regulations of all cities and counties with jurisdiction over the service area.	Pages 5-1 to 5-5, App. M	yes
e)	Other relevant elements related to water supply are addressed in the water system plan, if applicable. This may include Coordinated Water System Plans, Regional Wastewater Plans, Reclaimed Water Plans, Groundwater Management Area Plans, and the Capital Facilities Element of local comprehensive plans.	Pages 3-1 to 3-5	yes

I certify that the above statements are true to the best of my knowledge and that these specific elements are consistent with adopted local plans and development regulations.

519/19

Signature

HAYLEY BONSTEEL, LONG RANGE PLANNING MANAGER, CITY OF KENT

#### **Consistency Review Guidance**

#### For Use by Local Governments and Municipal Water Suppliers

This checklist may be used to meet the requirements of WAC 246-290-108. When using an alternative format, it must describe all of the elements; 1a), b), c), d), and e), when they apply.

For water system plans (WSP), a consistency review is required for the service area and any additional areas where a <u>municipal water supplier</u> wants to expand its water right's place of use.

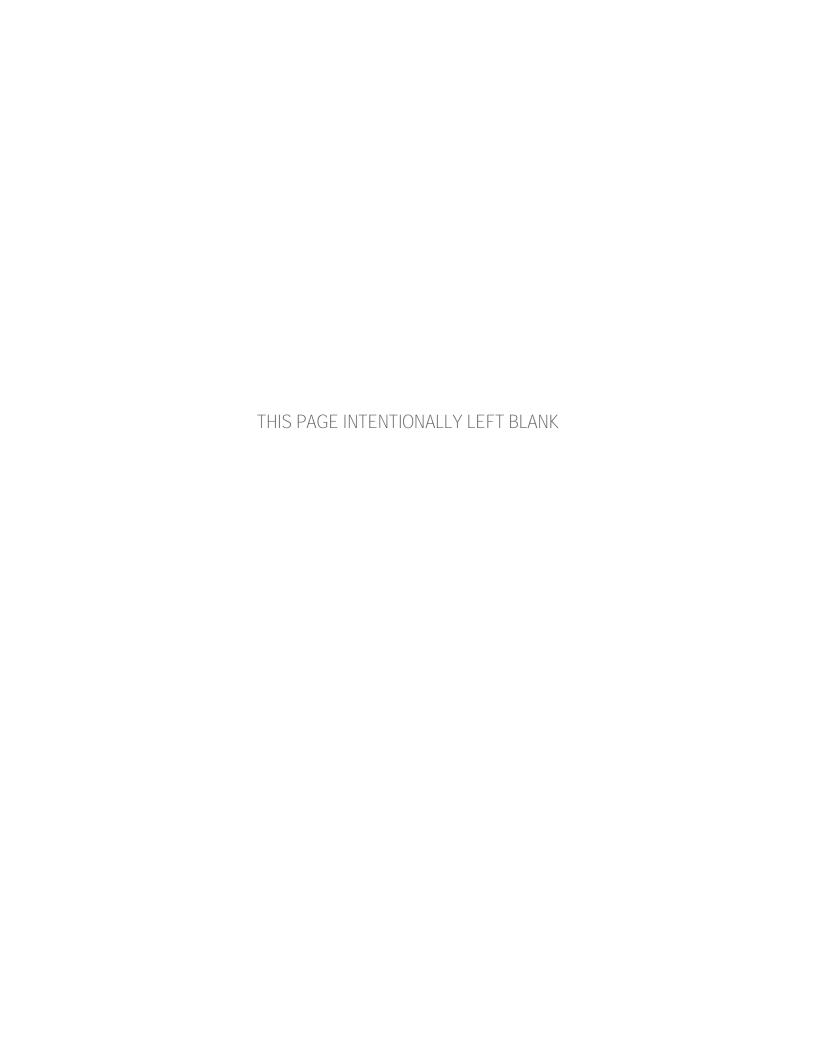
For **small water system management programs**, a consistency review is only required for areas where a <u>municipal water supplier</u> wants to expand its water right's place-of-use. If no water right place-of-use expansion is requested, a consistency review is not required.

For **engineering documents**, a consistency review is required for areas where a <u>municipal water</u> <u>supplier</u> wants to expand its water right's place-of-use (water system plan amendment is required). For noncommunity water systems, a consistency review is required when requesting a place-of-use expansion. All engineering documents must be submitted with a service area map (WAC 246-290-110(4)(b)(ii)).

- **A) Documenting Consistency:** The planning or engineering document must include the following when applicable.
  - a) A copy of the adopted **land use/zoning** map corresponding to the service area. The uses provided in the WSP should be consistent with the adopted land use/zoning map. Include any other portions of comprehensive plans or development regulations that relate to water supply planning.
  - b) A copy of the **growth projections** that correspond to the service area. If the local population growth projections are not used, explain in detail why the chosen projections more accurately describe the expected growth rate. Explain how it is consistent with the adopted land use.
  - c) Include water service area policies and show that they are consistent with the **utility service extension ordinances** within the city or town boundaries. *This applies to cities and towns only.*
  - d) All **service area policies** for how new water service will be provided to new customers.
  - e) **Other relevant elements** the Department of Health determines are related to water supply planning. See Local Government Consistency Other Relevant Elements, Policy B.07, September 2009.
- **B) Documenting an Inconsistency:** Please document the inconsistency, include the citation from the comprehensive plan or development regulation, and explain how to resolve the inconsistency.
- **C) Documenting a Lack of Local Review for Consistency:** Where the local government with jurisdiction did <u>not</u> provide a consistency review, document efforts made and the amount of time provided to the local government for review. Please include: name of contact, date, and efforts made (letters, phone calls, and emails). To self-certify, please contact the DOH Planner.

The Department of Health is an equal opportunity agency. For persons with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TTY 1-800-833-6388).

# APPENDIX D SEPA Checklist



#### **ECONOMIC & COMMUNITY DEVELOPMENT**



Kurt Hanson Director 220 4th Avenue South Kent, WA 98032 Fax: 253-856-6454

PHONE: 253-856-5454

August 16, 2019

RE: Environmental Checklist

State Environmental Policy Act (SEPA) ENV-2019-23 / KIVA #RPSA-2192101

K-PWE 2019 WATER COMPREHENSIVE PLAN

Dear Evan Swanson,

Enclosed, please find:

- 1. A copy of the signed environmental checklist for your project.
- 2. The Determination of Nonsignificance (DNS) without conditions.
- 3. The Decision Document

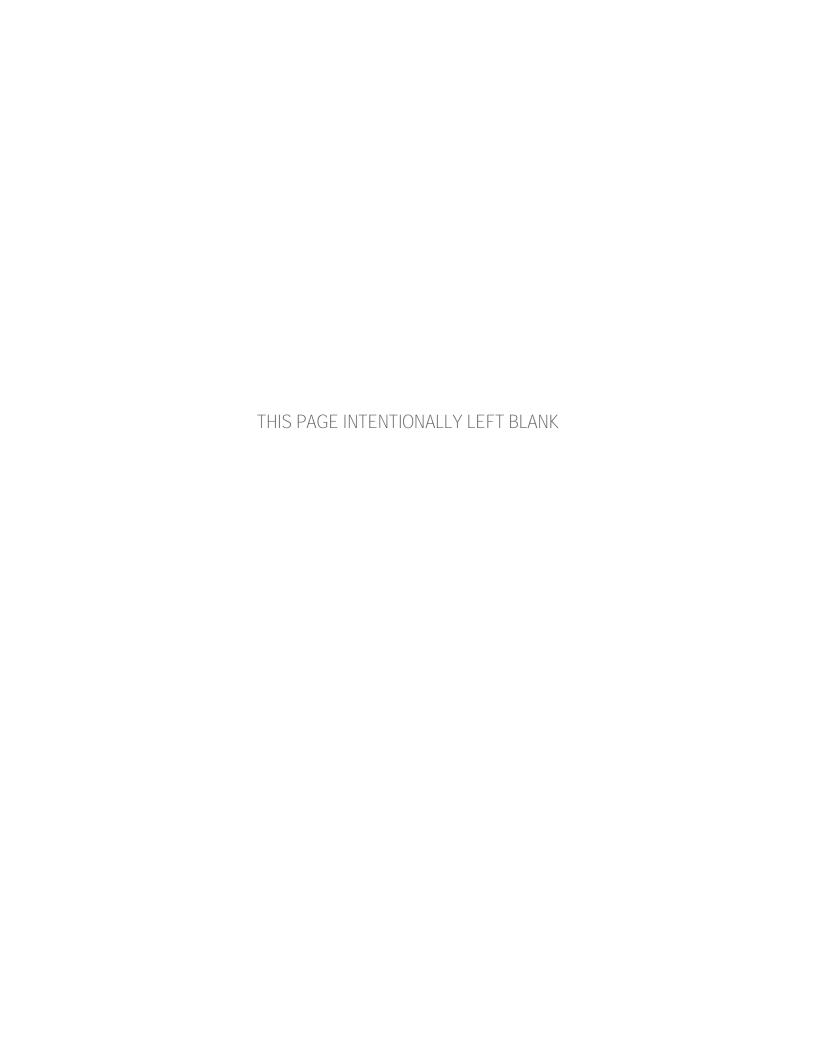
There is a 14-day appeal period for appeals to the DNS. All appeals are reviewed by the Kent Hearing Examiner.

If you have any questions concerning the SEPA review or the next step in the development plan review process, please call Kent Planning Services at 253-856-5454.

Sincerely,

Erin George, AICP

Responsible Official





Planning Services
Location: 400 W. Gowe • Mail to: 220 4th Avenue South • Kent WA 98032-5895
Permit Center (253-856-5302 FAX: (252) 255 www.ci.kent.wa.us/permitcenter

## **Environmental Checklist Application Form**

**Public Notice Board and** Application Fee...See Fee Schedule

APPLICATION #:	FINY-2014-20	KIVA#:_ RPSA 2192101
RECEIVED BY:	DATE:	PROCESSING FEE:
A. STAFF RE	VIEW DETERMINED THAT PRO	DJECT:
	Meets the categorically exe	mpt criteria.
	Has no probable signific application should be prenvironmental effects.	ant adverse environmental impact(s) and ocessed without further consideration of
-	Has probable, significant conditions. EIS not necess	impact(s) that can be mitigated through ary.
-	Has probable, significar Environmental Impact State	t adverse environmental impact(s). An ement will be prepared.
_	An Environmental Impact sprepared.	Statement for this project has already been
Signature of Resp	onsible Official	<u>8/16/19</u>
B. COMMENT	S:	
C TYPE OF P	ERMIT OR ACTION REQUESTE	D: Water System Plan
_upda	te (non-projec	t action)
	1/4-1	(city-wide)

#### TO BE COMPLETED BY APPLICANT:

Α.	BACKGROUND INFORMATION:
1.	Name of Project: City of Kent 2019 Water Comprehensive Plan
2.	Name of Applicant: Evan Swanson
	Mailing Address: 220 4th Avenue S./Envir. Eng. PW, Kent, WA, 98032
3.	Contact Person: Evan Swanson Telephone: 253.856.5527  (Note that all correspondence will be mailed to the applicant listed above.)  Applicant is (owner, agent, other): Employee of City of Kent
4.	Name of Legal Owner: City of Kent Telephone: N/A
	Mailing Address: 220 4th Avenue S./Envir. Eng. PW, Kent, WA, 98032
5.	Location. Give general location of proposed project (street address, nearest intersection of streets and section, township and range).  Does not apply
6.	Legal description and tax identification number  a. Legal description (if lengthy, attach as separate sheet):
	Does not apply
	b. <u>Tax identification number</u> :
	Does not apply
7.	Existing conditions: Give a general description of the property and existing improvements, size, topography, vegetation, soil, drainage, natural features, etc. (if necessary, attach a separate sheet).  Does not apply
8.	Site Area: Does not apply Site Dimensions: Does not apply

9. <u>Project description</u>: Give a brief, complete description of the intended use of the property or project including all proposed uses, days and hours of operation and the size of the project and site. (Attach site plans as described in the instructions):

The Water System Plan (WSP) is required to be developed by all municipal water purveyors pursuant to guidelines and standards promulgated by the Washington State Department of Health (DOH). The WSP provides a detailed overview of the Kent Water System including current storage capacity, demand, and delivery capability. It describes future water system demand based on growth predictions and identifies deficiencies and capital projects that can remedy the deficiencies.

This WSP is a non-project action. A separate Washington State Environmental Policy Act (SEPA) review will be completed prior to actual implementation and construction of each individual project as identified in the Capital Improvement Plan (CIP) list. Certain categorical exemptions from the SEPA review process may apply to specific projects, in accordance with WAC 97-11-800.

10. <u>Schedule</u>: Describe the timing or schedule (include phasing and construction dates, if possible).

The CIP presented in the WSP consists mainly of physical improvements to the system that are intended to improve the City's ability to provide sufficient quantity and quality of water. The projects described in the CIP are grouped according to water main improvements, pressure zone improvements, facility improvement, and miscellaneous improvements. The projects are defined for each year with the projected estimated costs associated with each project. However, the CIP projects listed in the WSP should not be viewed as a commitment by the City to implement each project as planned and shown in the WSP. Actual project implementation will be based upon environmental review, permits and approvals, available funding and scheduling needs.

11. <u>Future Plans</u>: Do you have any plans for future additions, expansion or further activity related to or connected with this proposal? If yes, explain.

An update to the WSP is currently required by the DOH every 10 years. Any projects in the current WSP that fall beyond the 10-year planning horizon will be updated at the time of the next update. As noted above, a SEPA review will be conducted, as needed, for each project in the CIP scheduled to occur in the next 10 years.

12. <u>Permits/Approvals</u>: List all permits or approvals for this project from local, state, federal, or other agencies for which you have applied or will apply as required for your proposal.

The WSP, and all of its updates, must be approved by the Washington State Department of Health. No project specific approvals or permits are required as part of the WSP update.

13. <u>Environmental Information</u>: List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

Specific environmental information has not been prepared for the update of the WSP.

14. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

Development within the City's Water Retail Service Area will continue throughout the life of the WSP. This is consistent with the King County and City's planning policies, the Urban Growth Boundary and other environmental regulations.

#### B. ENVIRONMENTAL ELEMENTS

#### 1. Earth

- a. General description of the site (circle one): Flat, rolling, hilly, steep slopes, mountainous, other: **Does not apply**.
- b. What is the steepest slope on the site (approximate percent slope)?

#### Does not apply

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

#### Does not apply

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

#### Does not apply

e. Describe the purpose, type and approximate quantities of any filling or grading proposed. Indicate source of fill.

#### Does not apply

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

#### Does not apply

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

#### Does not apply

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any.

#### Does not apply

#### 2. Air

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.

#### Does not apply

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

#### Does not apply

 Proposed measures to reduce or control emissions or other impacts to air, if any.

#### Does not apply

#### 3. Water

#### a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, salt water, lakes, ponds, wetlands)? If yes, describe type. If appropriate, state stream or river it flows into.

#### Does not apply

Will the project require any work over, in or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

#### Does not apply

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

#### Does not apply

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities, if known.

#### Does not apply

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

#### Does not apply

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

#### Does not apply

#### b. Ground:

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities, if known.

The City will not be applying for additional water rights in conjunction with this WSP update.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: domestic sewage; industrial, containing the following chemicals...; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

#### Does not apply

- c. Water Runoff (including storm water):
  - Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

Does not apply

2) Could waste materials enter ground or surface waters? If so, generally describe.

Does not apply

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

Does not apply

4.	PI	laı	nts

a.	Check or circle types of vegetation found on the site:
	Deciduous tree: alder, maple aspen, other
	Evergreen tree: fir, cedar, pine, other
	Shrubs
	Grass

#### City of Kent Planning Services Environmental Checklist – Page 8

	Pasture
	Crop or grain
	Wet soil plants: cattail, buttercup, bulrush, skunk cabbage
	Water plants: water lily, eelgrass, milfoil
	Other types of vegetation
b.	What kind and amount of vegetation will be removed or altered?
	Does not apply
c.	List threatened or endangered species known to be on or near the site.
	Does not apply
d.	Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:
	Does not apply
5.	<u>Animals</u>
a.	Circle any birds and animals which have been observed on or near the site or are known to be on or near the site:
	Birds: hawk, heron, eagle, songbirds, other:
	Mammals: deer, bear, elk, beaver, other:
	Fish: bass, salmon, trout, herring, shellfish, other:
b.	List any threatened or endangered species known to be on or near the site.
	Does not apply
C.	Is the site part of a migration route? If so, explain.
	Does not apply
d.	Proposed measures to preserve or enhance wildlife, if any:
	Does not apply

### 6. Energy and Natural Resources

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

#### Does not apply

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

#### Does not apply

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

#### Does not apply

#### 7. Environmental Health

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

#### No

1) Describe special emergency services that might be required.

#### Does not apply

2) Proposed measures to reduce or control environmental health hazards, if any:

#### Does not apply

#### b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment operation, other)?

#### Does not apply

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

#### Does not apply

3) Proposed measures to reduce or control noise impacts, if any:

#### Does not apply

#### 8. Land and Shoreline Use

a. What is the current use of the site and adjacent properties?

#### Does not apply

b. Has the site been used for agriculture? If so, describe.

#### Does not apply

c. Describe any structures on the site.

#### Does not apply

d. Will any structures be demolished? If so, what?

#### Does not apply

e. What is the current zoning classification of the site?

#### Does not apply

f. What is the current comprehensive plan designation of the site?

#### Does not apply

g. If applicable, what is the current shoreline master program designation of the site?

#### Does not apply

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

#### Does not apply

i. Approximately how many people would reside or work in the completed project?

#### Does not apply

j. Approximately how many people would the completed project displace?

#### None

k. Proposed measures to avoid or reduce displacement impacts, if any:

#### None

I. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any.

#### None

#### 9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low income housing.

#### None

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low income housing.

#### None

c. Proposed measures to reduce or control housing impacts, if any.

#### Does not apply

#### 10. Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

#### Does not apply

b. What views in the immediate vicinity would be altered or obstructed?

#### Does not apply

c. Proposed measures to reduce or control aesthetic impacts, if any.

#### Does not apply

#### 11. Light and Glare

a. What type of light or glare will the proposals produce? What time of day would it mainly occur?

#### Does not apply

b. Could light or glare from the finished project be a safety hazard or

interfere with views?

#### Does not apply

c. What existing off-site sources of light or glare may affect your proposal?

#### None

d. Proposed measures to reduce or control light and glare impacts, if any.

#### Does not apply

#### 12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?

#### Does not apply

b. Would the proposed project displace any existing recreational uses? If so, describe.

#### Does not apply

 Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any.

#### Does not apply

#### 13. Historic and Cultural Preservation

a. Are there any places or objects listed on, or proposed for, national, state or local preservation registers known to be on or next to the site? If so, generally describe.

#### No

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.

#### Does not apply

c. Proposed measures to reduce or control impacts, if any.

#### Does not apply

#### 14. Transportation

 Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

#### Does not apply

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

#### No

c. How many parking spaces would the completed project have? How many would the project eliminate?

#### None

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).

#### No

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

#### No

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

#### None

g. Proposed measures to reduce or control transportation impacts, if any.

#### Does not apply

#### 15. Public Services

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

#### No

b. Proposed measures to reduce or control direct impacts on public

services, if any.

#### Does not apply

#### 16. Utilities

a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.

#### Does not apply

b. Describe the utilities that are proposed for the project, the utilities providing the service and the general construction activities on the site or in the immediate vicinity, which might be needed.

#### Does not apply

#### C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: 2000

Data: 8-7-2019

#### **DO NOT USE THIS SHEET FOR PROJECT ACTIONS**

#### D. SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

The proposed action is the adoption of the City of Kent 2019 WSP Update. The WSP refers to the development and utilization of transmission water supply projects that either are or may become part of Kent's future water system. Environmental impacts would be associated with construction activities as they relate to the construction, maintenance, and operations of the future project activities. These impacts will be evaluated during the environmental review of each specific project.

1. How would the proposal be likely to increase discharge to water; emission to air; production, storage, or release of toxic or hazardous substances; or production of noise?

The construction of some of the proposed components of Kent's water system may involve the creation and discharge or construction stormwater. Effects on surface waters may include increased runoff volumes and increased peak flows. The construction of some facilities may also result in the creation of impervious surfaces and their associated runoff.

Impacts to air quality due to construction of facilities could result in temporary increases in particulate emissions depending on the type of activity, weather and equipment used in construction. Increased carbon monoxide and oxides of nitrogen in the exhaust of construction equipment and power generation may occur during construction. Diesel, gasoline, propane and natural gas emergency electrical power generation equipment located at some facilities would produce emissions to the air during operation and maintenance activities.

The production and release of toxic or hazardous substances is not anticipated although there will likely be some storage and use of chemicals associated with the operation of water treatment facilities. Proposed measures to avoid or reduce such increases are:

Minimization of impacts to surface waters would be achieved through implementation of applicable Best Management Practices (BMPs) and compliance with the regulatory requirements and permits (e.g. NPDES Construction Stormwater Permit, City of Kent Surface Water Design Manual, etc.).

Minimization of impacts to air quality during construction would be achieved by keeping exposed soil damp by spraying with water, covering truck loads, covering dirt and debris piles, properly maintaining equipment and scheduling construction work such as to minimize truck traffic and equipment operations.

All necessary chemical storage would be designed to meet required safety and environmental regulatory requirements including secondary containment, leak detection, alarms, prevention plans and equipment to clean up and contain any spills.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

Transmission and water supply system components would not affect marine life.

Plants, animals and fish could be affected by water facilities, depending on location and function. For buried structures, such as pipelines, the impacts would be temporary and limited to the construction period. For pump stations and treatment facilities the effects would be above ground and extend beyond the construction period.

Proposed measures to protect or conserve plants, animals, fish, or marine life?

The site layout and design of such facilities would emphasize avoidance of impacts to plants, animals and fish. Where complete avoidance may not be possible the minimization of these impacts would be stressed. Impacts would be mitigated and enhancement measures implemented, as appropriate.

3. How would the proposal be likely to deplete energy or natural resources?

Water system components could consume, but not deplete, energy and natural resources.

Proposed measures to protect or conserve energy and natural resources are:

System components would be sited, designed, constructed, maintained and operated to be as efficient as possible.

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

None of the proposed water system components are or would be located on prime farmlands, wild and scenic rivers or wilderness areas. It is possible that some components could be located on or near environmentally sensitive areas. Pipelines could be routed through wetlands or floodplains. Parks, endangered species habitat and historical or cultural sites would be avoided wherever possible.

Proposed measures to protect such resources or to avoid or reduce impacts are:

System components would be sited with the intent to avoid any environmentally sensitive areas. If use of any of these areas were necessary the impact of construction activities would be minimized. Possible minimizations include avoiding construction of above ground facilities in flood plains, using trenchless technologies for crossing fish bearing water courses and observing fish windows for work below the ordinary high water mark.

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

Water system components would not affect land and shoreline use nor allow or courage land or shoreline use that is incompatible with existing plans.

Proposed measures to avoid or reduce shoreline and land use impacts are:

System components would comply with existing land use and shoreline management plans. Construction of facilities in shoreline areas would be avoided whenever possible.

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

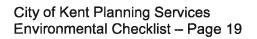
The construction, maintenance and operation of water system components identified in the WSP would, to a varying degree, increase the demands on transportation, public services and utilities. The increase should be insignificant with the possible exception of the need for electrical power associated with the operation of pumps and water treatment equipment.

Proposed measures to reduce or respond to such demand(s) are:

Modern "state of the art" equipment would maximize efficiency and minimize power consumption for components with higher demands. In addition, for pipelines, alignments would be chosen to maximize the use of gravity flow and minimize the need for pumps to move water through the system.

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

Water system projects identified in the WSP do not and will not conflict with local, state or federal laws or requirements for the protection of the environment.



EVALUATION FOR AGENCY USE ONLY

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RPSA-2192101

## CITY OF KENT DETERMINATION OF NONSIGNIFICANCE

**Environmental Checklist No.** ENV-2019-23

Project: 2019 WATER COMPREHENSIVE

PLAN

**Description:** The City of Kent Public Works Department proposes to adopt a new Water System Plan, as required by the Washington State Department of Health and WAC 246-290. The Water System Plan provides a detailed overview of the Kent Water System including current and anticipated storage capacity, demand, and delivery capability, and contains a Capital Improvement Plan describing specific projects that are identified for future implementation.

Kent's current Water System Plan was last updated in 2011.

Location: Citywide

nrocess

Applicant: City of Kent, Public Works Department

**Lead Agency** City of Kent

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

There is no comment period for this DNS pursuant to WAC 197-11-355, Optional DNS

	process.	
	There is no comm	ent period for this DNS.
X_	proposal for 14 d period. Commer	is issued under 197-11-340(2). The lead agency will not act on this days from the date of this decision; this constitutes a 14-day comment its must be submitted by <b>4:30 p.m., August 30, 2019</b> . This DNS is pursuant to Kent City Code section 11.03.520.
Resn	onsible Official	Frin George AICP

Responsible Official Erin George, AICP

Position/Title Current Planning Manager/SEPA Official

Address 220 S. Fourth Avenue, Kent, WA 98032 Telephone: (253) 856-5454

Dated August 16, 2019 Signature

#### **APPEAL PROCESS:**

AN APPEAL OF A DETERMINATION OF NONSIGNIFICANCE (DNS) MUST BE MADE TO THE KENT HEARING EXAMINER WITHIN TWENTY-ONE (21) DAYS FOLLOWING THE DATE OF THIS DECISION PER KENT CITY CODE 11.03.520.

Conditions/Mitigating Measures: NONE



#### **ECONOMIC & COMMUNITY DEVELOPMENT**

Kurt Hanson, Director **PLANNING SERVICES** 

Erin George, AICP, Current Planning Manager

Phone: 253-856-5454 Fax: 253-856-6454

Address: 220 Fourth Avenue S. Kent, WA 98032-5895

#### **ENVIRONMENTAL REVIEW REPORT**

**Decision Document** 

#### K-PWE 2019 WATER COMPREHENSIVE PLAN ENV-2019-23, KIVA # RSPA 2192101

Erin George, AICP Responsible Official

Staff Contact: Jason Garnham, AICP

#### I. PROPOSAL

The City of Kent Public Works department has initiated a non-project environmental review for a proposal to adopt a new Water System Plan, as required by the Washington State Department of Health and WAC 246-290. The Water System Plan provides a detailed overview of the Kent Water System including current and anticipated storage capacity, demand, and delivery capability, and contains a Capital Improvement Plan describing specific projects that are identified for future implementation. Kent's current Water System Plan was last updated in 2011.

#### II. BACKGROUND INFORMATION

Compliance with Kent's Comprehensive Plan (Ordinance 4163), the Washington State Growth Management Act (GMA), The Local Project Review Act (ESHB 1724 and ESB 6094), Kent's Construction Standards (Ordinance 3944) and Concurrency Management (Chapter 12.11, Kent City Code) will be required for current and future projects associated with the City's Water System Plan. Such projects may require additional concurrent improvements or the execution of binding agreements by the Applicant/Owner with Kent to mitigate identified environmental impacts. These improvements and/or agreements may include improvements to roadways, intersections and intersection traffic signals, stormwater detention, treatment and conveyance, utilities, sanitary sewerage and domestic water systems. Compliance with Kent's Construction Standards may require the deeding/dedication of rightof-way for identified improvements. Compliance with Title 11.03 and 11.06 of the Kent City Code may require the conveyance of Sensitive Area Tracts to the City of Kent in order to preserve trees, regulate the location and density of development based upon known physical constraints such as steep and/or unstable slopes or proximity to lakes, or to maintain or enhance water quality. Compliance with the provisions of Chapter 6.12 of the Kent City Code may require provisions for mass transit adjacent to the site.

In addition to the above, Kent follows revisions to the Washington State Environmental Policy Act, Chapter 197-11 WAC (effective November 10, 1997), which implements ESHB 1724 and ESB 6094, and rules which took effect on May 10, 2014 in response to 2ESSB 6406 passed by the State Legislature in 2012.

#### III. ENVIRONMENTAL ELEMENTS

#### A. Earth

The Water System Plan establishes the basis for selecting, financing, and implementing improvements to the City of Kent public water system. Some construction and maintenance activities will entail disturbance of earth and soils. Any impacts to soils will be evaluated during review of individual projects.

#### B. Air

The proposed amendments would impact the maintenance, design, construction, and operation of Kent's water system. No emissions or impacts to air are anticipated.

#### C. Water

As described in the Executive Summary of the draft Water System Plan, water supply in the City's system is supplied predominantly from Kent Springs, Clark Springs, and the Tacoma Regional Water Supply System. Water is also available from ten additional well sources that are not commonly used. No additional water sources are proposed to be acquired or developed as part of this Water System Plan, which demonstrates that the City's existing water sources have sufficient capacity to meet the existing and projected needs for at least 20 years.

While the proposed Water System Plan update would not directly impact surface or ground water resources, future maintenance and upgrades to the water system may impact ground and surface water or stormwater runoff. Impacts from these activities to ground and surface waters would be analyzed during review of individual projects and minimized through administration of City codes and regulations.

#### D. Plants and Animals

No impacts to plants or animals are anticipated by the proposed Water System Plan update. Potential impacts to plants or animals will be evaluated during review of individual projects.

#### Energy and Natural Resources

No impacts to energy or natural resources are anticipated from this proposal.

#### F. Environmental Health

One of the primary goals of the Water System Plan is to ensure a safe and adequate water supply to enhance the health and safety of Kent residents, visitors, and businesses. Water from all of the City's supply sources is treated via chlorination, fluoridation, and other means to ensure its safety for human consumption. The Department of Health requires monitoring of the water system for compliance with health and sanitation standards and has determined that the City complies with these requirements. No lead service lines or components were identified during an assessment that was performed in 2016. Measures to ensure the reliability of the water supply in the event of natural disasters or acts of terrorism were identified in related studies and are being implemented by the City's Public Works Department as part of the current and proposed Water System Plans. The maintenance and facility improvement projects identified in the Water System Plan will, when implemented, help to ensure continuous provision of a secure and ample water supply for the health and safety of Kent's residents and businesses.

#### G. Land and Shoreline Use

The updated Water System Plan establishes the basis for future water system maintenance and improvement projects. These projects are intended to ensure a safe and adequate water supply for current and future residents and businesses in Kent. Areas served by these current and future water facilities are subject to the Land Use Element of Kent's Comprehensive Plan and the provisions of Kent's Zoning Code, which designate different areas of the City for varying types and intensities of land uses and development. No new water service areas are proposed. The current and future water system is intended to support existing and future land uses in the applicable service areas. Specific maintenance and improvement projects will be analyzed for compliance with the City of Kent Comprehensive Plan, Kent Zoning Code, the 2009 City of Kent Design and Construction Standards, and other regulations as applicable during project design and construction. Any work proposed to take place within 200 feet of a waterbody designated as a Shoreline in the City of Kent Shoreline Master Program must be reviewed and approved by Kent Planning Services via submittal of a Shoreline permit application.

The existing water service area includes portions of the Cities of Auburn and Tukwila and unincorporated King County. According to the applicant, the proposed Water System Plan is also consistent with the City of Tukwila Comprehensive Plan, the City of Auburn Comprehensive Plan, the King County Comprehensive Plan, and other regional plans and studies including the South King County Coordinated Water System Plan.

#### H. Housing

The proposed Water System Plan includes current and projected population estimates for determining residential water service needs. While no new housing or direct impacts to existing housing are anticipated to result from the proposed plan, the Plan identifies several zones as having insufficient water pressure or fire flow supply, mostly in the West Hill area of the City. These deficiencies would limit the amount and type of new housing that could be constructed within the applicable water service areas. However, the Water System Plan includes strategies for correcting these deficiencies which, when implemented, will allow for new housing to be constructed in accordance with the applicable regulations. A new water reservoir facility is proposed to be constructed in this service area to address these insufficiencies. Environmental impacts from this facility were reviewed by Kent Planning Services via submittal of an environmental checklist (ENV-2019-15, RPSA-2191030), which resulted in issuance of a Mitigated Determination of Nonsignificance by the SEPA Responsible Official on May 17, 2019. This and any other new housing or water system projects will be reviewed for compliance with the applicable zoning, building, fire, and other codes at the time of permit application submittal for specific development projects.

#### I. Aesthetics, Noise, Light and Glare

No aesthetic impacts or noise, light, or glare are anticipated from the proposed Water System Plan. Aesthetic impacts or noise, light, or glare from future projects will be analyzed during design and review of specific proposals.

#### J. Recreation

No impacts to recreation facilities are anticipated to result from the proposed Water System Plan. Potential impacts to recreation facilities will be reviewed during design and review of specific project proposals.

#### K. Historic and Cultural Preservation

No impacts to historic or cultural resources are anticipated from this proposal. Potential impacts to historic or cultural resources will be reviewed during design and review of specific project proposals.

#### L. Transportation

No impacts to transportation systems are anticipated from the proposed Water System Plan update. Traffic Control Plan(s) will be prepared and implemented in accordance with the applicable standards to ensure safe and continuous access to Kent residences and businesses during construction of specific water system projects.

#### M. Utilities

The proposed Water System Plan includes a detailed overview of the existing water system of wells, springs, reservoirs, pressure zones and stations, pump stations, and mains. Kent's water service area encompasses approximately 23.7 square miles and contains 284 miles of water main. The Plan also includes a description of Kent's water system operation and maintenance program (Chapter 8). Chapter 9 of the proposed Water System Plan describes the key water system improvements that are identified for future implementation. Most of these improvements involve replacement and upgrading of aging or deficient existing systems, installing facilities to address existing water supply or fire flow insufficiencies, or constructing facilities to reinforce connections between City and regional water systems. Environmental impacts from each of the projects described in the Plan will be analyzed separately at the time of development plan review, as applicable. Impacts from these projects will be minimized through adherence with City standards during design and construction.

#### N. Public Services

The proposed Water System Plan update includes recommended projects that will, when implemented, maintain or enhance the available water supply or pressure needs for fire suppression of existing and future development within the Kent water service area. Impacts to other public services are not anticipated from this proposal.

#### IV. SUMMARY AND RECOMMENDATION

- A. It is appropriate per WAC 197-11-660 and RCW 43.21C.060 that the City of Kent establish conditions to mitigate any identified impacts associated with this proposal. Supporting documents for the following conditions and mitigating measures include:
  - 1. City of Kent Comprehensive Plan as prepared and adopted pursuant to the State Growth Management Act
  - 2. The State Shoreline Master Program and the Kent Shoreline Master Program
  - 3. Kent City Code Section 7.07 Surface Water and Drainage code.
  - 4. City of Kent Transportation Master Plan, Green River Valley Transportation Action Plan and Six-year Transportation Plan
  - 5. Kent City Code Section 7.09 Wastewater Facilities Master Plan
  - 6. City of Kent Comprehensive Water Plan and Conservation Element
  - 7. Kent City Code Section 6.02 Required Public Improvements
  - 8. Kent City Code Section 6.07 Street Use Permit Requirements
  - 9. Kent City Code Section 14.09 Flood Hazard Protection
  - 10. Kent City Code Section 12.04 Subdivision Code
  - 11. Kent City Code Section 12.05 Mobile Home Parks and 12.06 Recreation Vehicle Parks

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- 12. Kent City Code Section 8.05 Noise Control
- 13. International Building and Fire Codes
- 14. Kent Zoning Code
- 15. Kent City Code Section 7.13 Water Shortage and Emergency Regulations and Water Conservation Ordinance 2227
- 16. Kent City Code Sections 6.03 Improvement Plan Approval and Inspection Fees
- 17. Kent City Code Section 7.05 Storm and Surface Water Drainage Utility
- 18. City of Kent Comprehensive Sewer Plan.
- 19. City of Kent Fire Master Plan
- 20. Kent City Code Chapter 11.06, Critical Areas
- 21. Department of Ecology Tacoma Smelter Plume Model Remedies Guidance (Publication Number 12-09-086-A)

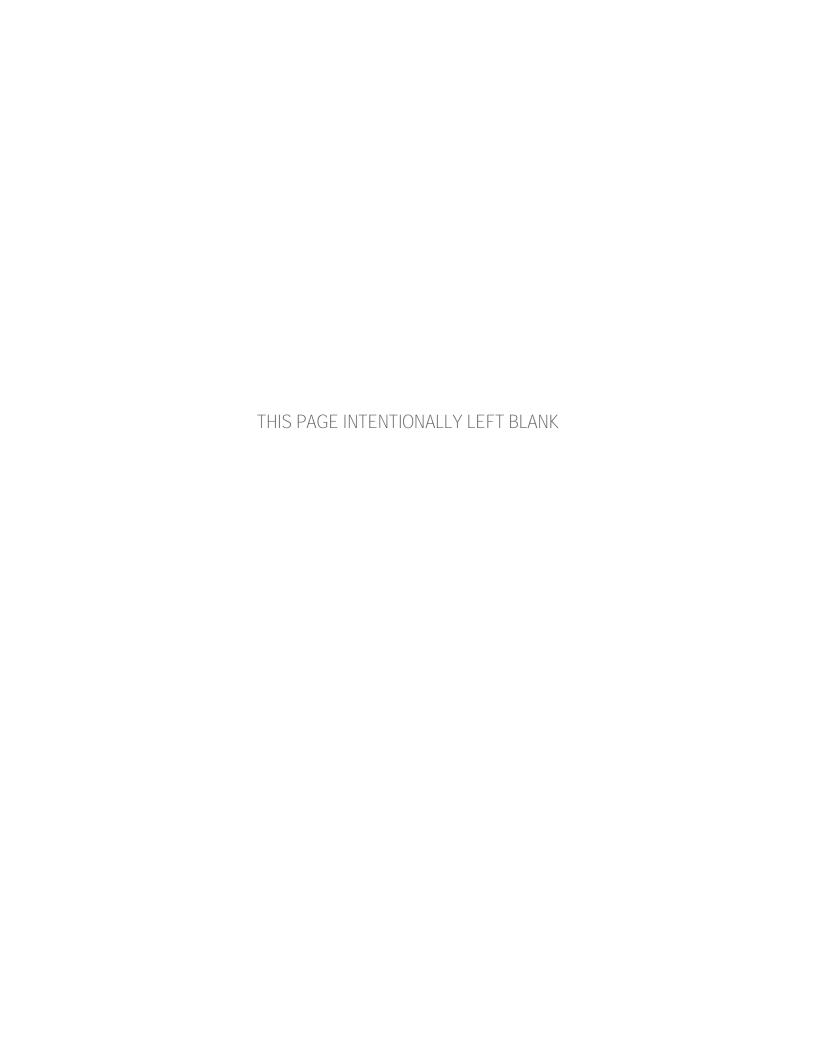
It is recommended that a Determination of Nonsignificance (DNS) be issued for this project.

KENT PLANNING SERVICES

August 16, 2019

## APPENDIX E

Water Use Efficiency Program



### WATER USE EFFICIENCY PROGRAM

#### INTRODUCTION

The City of Kent (City) recognizes that water is a valuable and essential natural resource that needs to be used wisely. This Water Use Efficiency (WUE) Program provides an approach to increase water use efficiency within the City's water service area.

#### BACKGROUND

#### THE WATER USE EFFICIENCY RULE

The Washington State Department of Health (DOH) implemented the WUE Rule, effective on January 22, 2007, as required by the Municipal Water Supply – Efficiency Requirements Act, also known as the Municipal Water Law (MWL), passed by the Washington State Legislature in September 2003. The MWL requires the state to implement the WUE Rule. The intent of the rule is to help reduce the demand that growing communities, agriculture, and industry have placed on the state's water resources, and to better manage these resources for fish and other wildlife. Municipal water suppliers are obligated under the WUE Rule to enhance the efficient use of water by the system and/or its consumers. The requirements of the WUE Rule are set forth in Chapter 246-290, Part 8, Washington Administrative Code (WAC).

#### WATER USE FEFICIENCY REQUIREMENTS

DOH has provided guidance for municipal water suppliers on how to prepare and implement a WUE program that complies with the WUE Rule. The *Water Use Efficiency Guidebook*, published by DOH, was most recently revised and updated in 2017. The guidebook identifies the water use reporting, forecasting, and efficiency program requirements for public water systems. A WUE program meeting these requirements is a necessary element of a water system plan as required by the DOH and is necessary to obtain water right permits from the Washington State Department of Ecology (Ecology). The *Water Use Efficiency Guidebook* defines the necessary components of a WUE program as four fundamental elements.

- 1. Planning requirements, which include collecting data, forecasting demand, evaluating WUE measures, calculating distribution system leakage, and implementing a WUE program to meet goals.
- 2. A distribution system leakage (DSL) standard of 10 percent or less based on a 3-year rolling average.
- 3. Goal setting to provide a benchmark for achievement and to help define the success of the WUE program.
- 4. Annual performance reporting on progress towards meeting WUE goals.

#### WATER USE EFFICIENCY PROGRAM

The City's current WUE Program elements are summarized in this section.

#### PLANNING REQUIREMENTS AND WUE PROGRAM ACTIVITIES

The City's water use data, demand forecasts, supply characteristics, and other planning requirements are contained throughout this Water System Plan (WSP). The City is committed to continue collecting water use data beyond that presented in **Chapter 4** for evaluation of its WUE Program and water use patterns, and for forecasting demands for future facilities. Consistent with WAC 246-290-810, the WUE program effectiveness will continue to be evaluated within each WSP update.

Recent WUE program activities are presented in the Selected Measures section.

#### WATER USE EFFICIENCY GOALS AND THE PUBLIC PROCESS

Per WAC 246-290-830, WUE goals must be set through a public process and shall be evaluated and reestablished as part of a WSP update. The City formally adopted water use efficiency goals in 2007 via its City Council Public Works Committee and last updated its WUE Program as part of its 2011 WSP. The goals and objectives of the City's previous WUE Program, which extends to the approval of this WSP, are as follows.

- Reduce water use by public agencies during the months of June, July, and August by 0.5 percent per year.
- Maintain system-wide DSL at less than 6 percent per year.

Results of the existing WUE program indicate that public consumption in June, July, and August (including the City, school, and government entities) decreased in 2012 and 2016, but increased in 2013, 2014, and 2015 as shown in **Table 1**. The average change over the last 6 years is an approximate 10 percent increase in public customer class consumption in June, July, and August. However, with consideration for additional public water service connections added each year, the average consumption per public customer class connection has increased 9 percent over the last 6 years. **Chart 1** shows the combined June, July, and August consumption totals for 2011 through 2016, and the average consumption per public customer class connection for the same period.

Table 1
Public Customer Class Historical June, July, and August Consumption

		% Change from
Period	Gallons	Year Prior
June 2011	4,848,536	
July 2011	11,202,048	
August 2011	9,421,808	
Total 2011	25,472,392	
June 2012	5,971,284	
July 2012	8,613,968	
August 2012	10,076,308	
Total 2012	24,661,560	-3.2%
June 2013	6,966,124	
July 2013	16,337,816	
August 2013	11,232,716	
Total 2013	34,536,656	40.0%
June 2014	6,250,288	
July 2014	16,117,156	
August 2014	14,242,668	
Total 2014	36,610,112	6.0%
June 2015	11,339,680	
July 2015	20,098,012	
August 2015	17,753,032	
Total 2015	49,190,724	34.4%
	-	
June 2016	8,928,876	
July 2016	15,113,340	
August 2016	11,636,636	
Total 2016	35,678,852	-27.5%

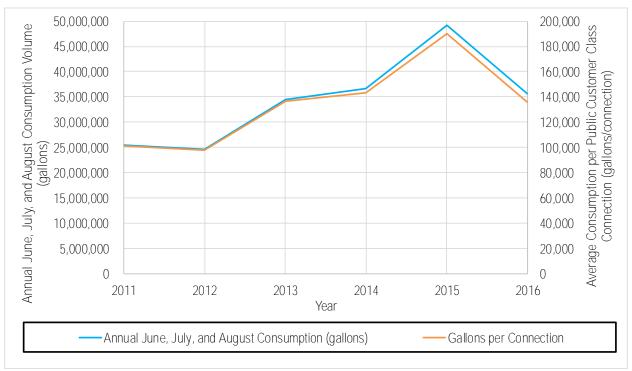


Chart 1
Public Customer Class Historical June, July, and August Consumption Volume

System-wide DSL is discussed in **Chapter 4** and has been less than 6.0 percent each year since 2011, and the City's 3-year rolling average between 2014 and 2016 is 5.0 percent. Based on the relative success the City has had in achieving its WUE goals and objectives, an additional goal has been established that includes the City's multi-family residential customer class. The proposed WUE goals for the 2018 to 2028 water system planning cycle are as follows.

- Reduce water use by public agencies during the months of June, July, and August by 0.5 percent per year.
- Reduce multi-family residential water consumption by 1.0 percent per year.
- Maintain system-wide DSL at less than 6.0 percent per year and based on a 3-year rolling average.

In compliance with the WUE Rule, a public hearing will be held at a City Council meeting to present and discuss the new goals. The City Council will affirm the new goals at the meeting.

## WATER USE EFFICIENCY PROGRAM EVALUATION AND PERFORMANCE REPORTING

The City will continue to evaluate overall demand, per capita water use, and the amount of DSL on an annual basis (coinciding with the production of the Consumer Confidence Report (CCR)). The City will also evaluate the performance of its WUE Program and implemented measures at this time by analyzing demand data and determining the long-term trend towards reducing water usage and meeting WUE goals. If the WUE Program monitoring shows that progress towards meeting the WUE goals is not being accomplished, more rigorous WUE Program

implementation or additional WUE Program items will be considered, along with a cost-effective evaluation of measures.

The City will continue to provide annual WUE performance reports to its consumers in the CCR and detail the results of water use monitoring and progress towards achieving the system's WUE goals. The City will comply with DOH Annual WUE Performance report requirements, due to DOH by July 1<sup>st</sup> of each year.

#### EVALUATION AND SELECTION OF WATER USE FEFICIENCY MEASURES.

The City's evaluation of WUE measures and selected levels of implementation are presented within this section. The measures fall within three categories of implementation: 1) mandatory measures that must be implemented; 2) measures that must be evaluated; and 3) measures selected by the City that either must be evaluated or implemented.

The City served 14,907 water service connections in 2016, which is the base year of the City's WSP. Based on the number of connections, at least nine WUE measures must be evaluated or implemented. Measures that are mandatory cannot be credited towards the system's WUE measures. Since the City implements or plans on implementing all the evaluated measures presented here, a cost-effective evaluation is not required.

#### Mandatory Measures

#### Source Meters

The volume of water produced by the system's sources must be measured using a source meter or other meter installed upstream of the distribution system. Source meters currently are installed and operating at each of the City's sources. If any new sources are installed in the future, they will be equipped with a source meter. Meter testing and repairs are ongoing as-needed as part of the City's preventive maintenance program.

#### Service Meters

All public water systems that supply water for municipal purposes must install individual service meters for all water users. Service meters currently are installed and operating at all connections throughout the distribution system. All future connections that are installed or activated will be equipped with a service meter.

#### Meter Calibration

The City must calibrate and maintain meters based on generally accepted industry standards and manufacturer information. Compliance will be maintained by the City by performing maintenance on the source and service meters every 5 to 10 years at a minimum. Meter calibration verification testing is performed on an as-needed basis, typically annually.

#### Water Loss Control Action Plan

To control leakage, systems that do not meet the DSL standard must implement a Water Loss Control Action Plan (WLCAP). The City's rolling 3-year average DSL is below 10.0 percent based on the information presented in **Chapter 4** of the WSP. Therefore, a WLCAP is not required to be implemented.

#### **Customer Education**

Annual customer education regarding the importance of using water efficiently is a required element of all WUE programs. Customer education is provided in the City's annual CCR to customers and includes information on the system's DSL, progress towards meeting WUE goals, and tips for customers on using water more efficiently. Additional customer education and outreach measures are identified in the **Selected Measures** section.

Measures That Must Be Evaluated

#### Rate Structure

Evaluation of rate structures to increase water demand efficiency is required (WAC 246-290-100(4)(j)(iv)), and actual implementation of a conservation rate structure counts as a WUE measure (WAC 246-290-810(4)(d)). The City implements an inclining block rate structure, which is a conservation rate structure. The City charges a flat monthly meter access fee (based on meter size) and a water usage fee (increasing with the amount of water consumed) in each billing period. The City previously implemented seasonal water rates every May through September to discourage excess water use during peak months, but eliminated that practice to stabilize revenue throughout the year and provide more certainty on rates to customers. The 2018 residential rate structure is shown in **Table 2**, and the 2018 rate structure for non-single-family residential customers is shown in **Table 3**.

Table 2 2018 Single-family Residential Rate Structure

Monthly Meter Access Fees					
Meter Size	Meter Size Base Rate				
3/4" or less	\$23.71				
1"	\$37.12				
Monthly Dedica	ited Fire Line Fees				
Size	Rate				
3/4" or less	\$2.82				
1"	\$3.29				
Water Usage Fee	Water Usage Fee per 100 Cubic Feet				
Consumption	Rate				
0 to 800 cubic feet	\$2.46 per 100 cubic feet				
800+ cubic feet	\$4.84 per 100 cubic feet				

Table 3 2018 Non Single-family Residential Rate Structure

Base Rate
Dase Nate
\$29.80
\$43.21
\$43.21
\$76.75
\$116.99
\$184.06
\$277.96
\$412.11
\$546.25
\$680.40

Monthly Dedicated Fire Line Fees				
Size	Rate			
3/4" or less	\$2.82			
1"	\$3.29			
1.25"	\$4.93			
1.5"	\$6.57			
2"	\$10.52			
3"	\$26.29			
4"	\$52.56			
6"	\$105.13			
8"	\$177.41			
10"	\$262.83			

Water Usage Fee per 100 Cubic Feet				
Consumption Rate				
0 to 800 cubic feet	\$2.46 per 100 cubic feet			
800+ cubic feet	\$4.84 per 100 cubic feet			

#### Reclamation Opportunities

Reclaimed water is treated effluent from a wastewater treatment system that is suitable for a direct beneficial use or a controlled use that would not otherwise occur. The use of reclaimed water is regulated under Chapter 90.46 of the Revised Code of Washington (RCW). Water systems with 1,000 or more connections must evaluate reclamation opportunities (WAC 246-290-100(4)(f)(vii)), but only actual use of reclaimed water counts as a WUE measure (WAC 246-290-810(4)(d)) or multiple WUE measures if the reclaimed water is used for multiple purposes.

The City's wastewater is conveyed to King County's South Treatment Plant in Renton for treatment and disposal. King County operates a reclaimed water program at the South Treatment Plant that provides some reclaimed water for irrigating athletic fields and nurseries, and street sweeping. No reclaimed water is currently provided to the City, but that opportunity may exist in the future.

The City investigated other opportunities for reclaimed water use in 2007 and determined that there were no economically feasible options at that time.

The City will continue to evaluate the feasibility of using reclaimed water in the future as conditions change.

#### Selected Measures

The City has chosen to implement 11 different WUE measures in addition to those that are mandatory or required to be evaluated. Because several of these WUE measures affect multiple customer classes, the City's WUE program counts as 46 WUE measures (**Table 4**), which is greater than the requirement of 9 WUE measures based on the number of service connections.

#### Water Bill Showing Consumption History

The City has presented consumption history charts and information on water bills for all customer classes since 1998 and plans to continue to do so in the future.

#### Washing Machine/Toilet/Sprinkler Rebates

The City offers a \$75 mail-in rebate for customers to replace old washing machines with more energy efficient horizontal axis washing machines. As of 2018, eligibility was limited to applicants who purchased a qualifying Energy Star washing machine and installed it in a residence in the City's water service area.

The City also offers a toilet rebate up to \$50 per toilet to incentivize customers to purchase U.S. Environmental Protection Agency (EPA) certified WaterSense toilets. As of 2018, eligibility was limited to customers who purchased a WaterSense toilet and used it to replace an existing 5 gallon-per-flush toilet installed prior to 1993 in the City's water service area.

In one instance, the City observed a 10- to 15-percent reduction in water consumption by replacing 247 toilets in a single apartment complex. The City has prepared a list of over 75 additional multi-family complexes constructed prior to 1993 that will be eligible for this rebate. This rebate is expected to be a key component of achieving the City's multi-family residential WUE goal of reducing multi-family residential water consumption by 1.0 percent per year.

The City also offers rebates for public customers to install high-efficiency sprinkler system products.

#### School Outreach

Since 2000, the City has co-sponsored the annual H<sub>2</sub>0 Festival, which presents WUE information to approximately 1,500 elementary school children from the City and adjacent communities every year. The program educates children about the importance of WUE and empowers youth to participate in water conservation.

#### Speakers Bureau

The City staff gives periodic presentations about water conservation practices to local groups and organizations on an as-requested basis. The City has prepared a variety of outreach materials for this purpose, and employs a full-time conservation specialist that is available for this purpose.

#### Advertising

The City distributes WUE information through its regular billing system and advertises its fixture rebate programs and education programs on its website. The City also advertises King County's Natural Yard Care program on its website, which is a program that strives to reduce water consumption for irrigation.

#### Displays at Fairs or Events

The City makes staff available to present water conservation materials and displays at local fairs and events, and even distributes brochures and water conservation kits.

#### Customer Leak Detection Education

The City's utility workers regularly inspect meters for abnormal usage and recheck meters when excessive consumption is evident. Staff are encouraged to contact homeowners who have potential leaks and distribute informational pamphlets on how to check for leaks and read their own meters. The City also provides the same information to customers who contact the City with questions.

#### Water Use Audits for Large Users

The City provides water conservation audits for large users and maintains a variety of financial incentives for commercial or industrial users to implement conservation measures.

#### Rain Sensors

Section 15.07.040(C) of the City Code requires irrigation systems constructed as parts of new developments to include rain sensors to promote water conservation.

#### Landscape Ordinances

Section 15.04.180(20) of the City Code prohibits activities that violate water conservation management practices in the development of agricultural and residential lands.

Table 4
Selected WUE Measures

Mandatory WUE Measures				
Measure Implementation Status				
Source Meters Installed	✓			
Service Meters Installed	✓			
Meter Calibration Compliance	✓			
Water Loss Control Action Plan	Not Applicable			
Customer Education	<u> </u>			

WUE Measures that Must Be Evaluated		
Measure	Evaluation Status	
Rate Structure	✓	
Reclamation Opportunities	<b>√</b>	

	Implementation Status				
Measure	Single-family Residential	Multi-family Residential	Commercial	Industrial	Public
Rate Structure	✓	✓	✓	✓	✓
Water Bill Showing Consumption History	✓	✓	✓	✓	✓
Washing Machine/Toilet/Sprinkler Rebates	✓	✓			✓
School Outreach	✓	✓			
Speakers Bureau	✓	✓	✓	✓	✓
Advertising	✓	✓	✓	✓	✓
Displays at Fairs or Events	✓	✓	✓	✓	✓
Customer Leak Detection Education	✓	✓	✓	✓	✓
Water Use Audits for Large Users			✓	✓	✓
Rain Sensors	✓	✓	✓	✓	✓
Landscape Ordinances	✓	✓			✓

#### WATER USE EFFICIENCY PROGRAM SCHEDULE AND BUDGET

The WUE measures described above and selected for implementation by the City are summarized in **Table 5** with their corresponding schedule and budget. The successful implementation of this program is expected to:

- Reduce water use by public agencies during the months of June, July, and August by 0.5 percent per year;
- Reduce multi-family residential water consumption by 1.0 percent per year; and
- Maintain system-wide DSL at less than 6 percent per year.

Accomplishing these goals is expected to reduce the system-wide average daily demand by approximately 3.8 percent by 2028, with the annual savings from each goal shown in **Chart 2**.

Table 5
WUE Schedule and Budget

Mandatory WUE Measures					
Measure Schedule Budget					
Source Meters Installed	Ongoing	O&M Funded			
Service Meters Installed	Ongoing	O&M Funded			
Meter Calibration Compliance	Ongoing	O&M Funded			
Water Loss Control Action Plan	Not Appplicable	Not Appplicable			
Customer Education	Ongoing	O&M Funded			

#### **WUE Measures That Must Be Evaluated**

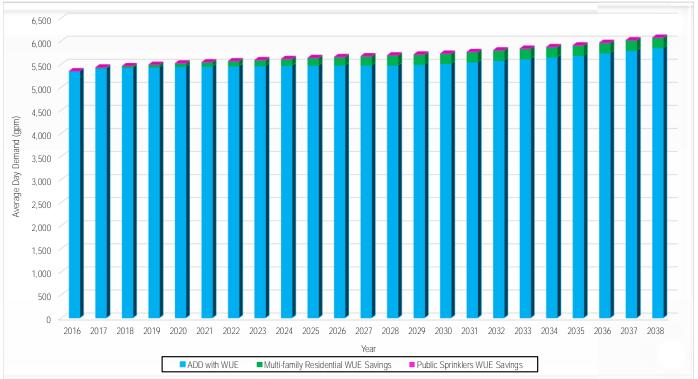
Measure	Schedule	Budget	
Rate Structure	Ongoing	Not Appplicable	
Reclamation Opportunities	Ongoing	Not Appplicable	

#### **Selected WUE Measures**

Measure	Schedule	Budget
Rate Structure	Ongoing	Not Appplicable
Water Bill Showing Consumption History	Ongoing	Not Appplicable
Washing Machine/Toilet/Sprinkler Rebates	Ongoing	\$100,000 per Year
School Outreach	Ongoing	\$35,000 per Year
Speakers Bureau	Ongoing	\$5,000 per Year
Advertising	Ongoing	\$35,000 per Year
Displays at Fairs or Events	Ongoing	\$5,000 per Year
Customer Leak Detection Education	Ongoing	O&M Funded
Water Use Audits for Large Users	Ongoing	\$35,000 per Year
Rain Sensors	Ongoing	Not Appplicable
Landscape Ordinances	Ongoing	Not Appplicable

O&M = Operations and Maintenance

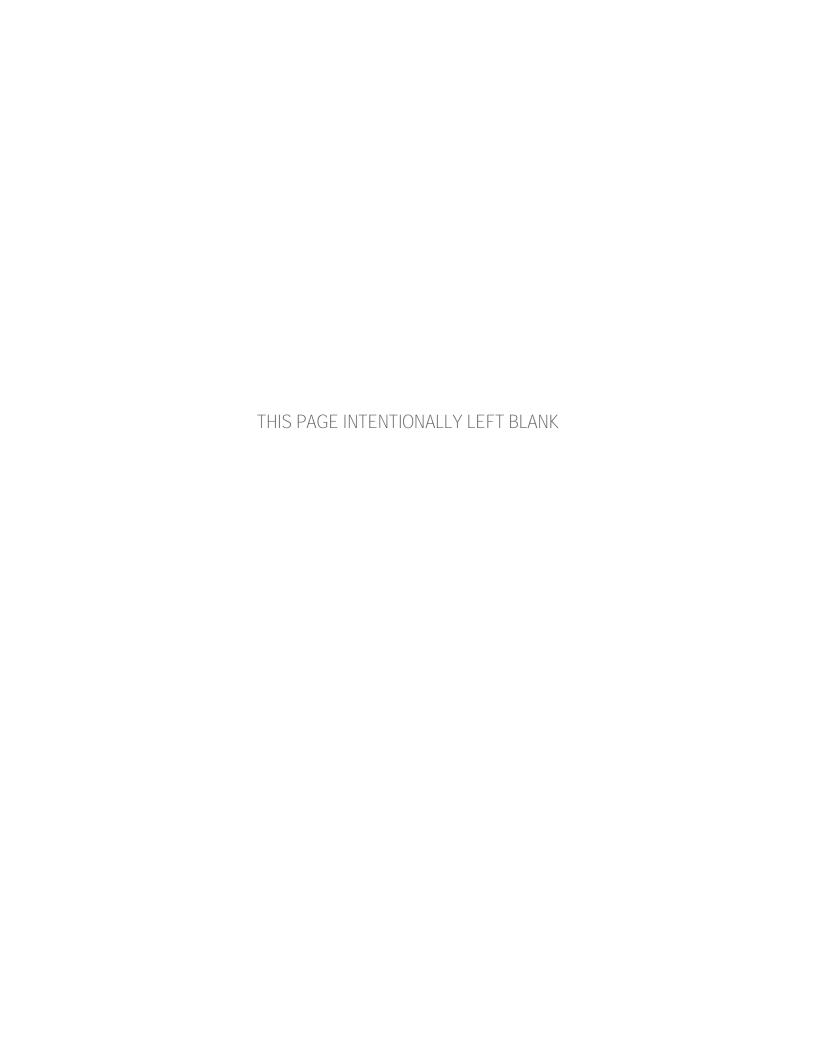




## APPENDIX F

# Cross-Connection Control Program

Please find Appendix F – Cross-Connection Control Program on the flash drive that accompanies this Water System Plan.





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# CITY OF KENT CROSS-CONNECTION CONTROL PROGRAM INTRODUCTION

Congress passed the "Safe Drinking Water Act" with the intent of protecting the public health and welfare of all public water supply users in the United States. The Environmental Protection Agency (EPA) interpreted this mandate to mean that certain contaminants should not be found in water "delivered to the free flowing outlet of the ultimate user." Thus, these contaminants became the responsibility of the water purveyor (City of Kent). The EPA specifically exempted contaminants added to the water under circumstances controlled by the user (except for plumbing corrosion by-products). This was not, however, intended to absolve the purveyor of a responsibility to conduct an aggressive cross connection control program.

In cross connection control, the City of Kent responsibility is to protect the water distribution system from contamination. The greatest public health risk lies in the introduction of a contaminant into the public water supply system because the water distribution system can provide the conduit for the spread of the contaminant to a large population. Cross connections within the customer's plumbing system and within the purveyor's distribution system pose a potential source for the contamination of the public water supply.

Once water leaves the control of the water purveyor (i.e., leaves the distribution system), the water purveyor must consider the possibility that the water could become contaminated. Accordingly, the water purveyor must consider the plumbing systems of all customers to be a potential health hazard. The hazard, and thus the health risk, may vary from minor to severe. The purveyor's cross connection control program should be based on the supposition that all customers should be isolated at the property line (meter) with an approved air gap, unless the purveyor is satisfied with the level of protection provided by the customer. Notwithstanding this basic supposition, the water purveyor should recognize the practical needs of the customer, and the responsibility of other regulatory agencies to protect the customer's plumbing system from becoming contaminated.

The water purveyor's degree of satisfaction in the customer's reduction of their cross connection risk, is a factor in the determination by the purveyor that the purveyor's requirement for premises isolation may be reduced from an approved air gap, to a reduced pressure backflow assembly, double check valve assembly, or no premises isolation.

To protect occupants of the customer's premises, it is necessary to isolate areas of the premises and/or each outlet rather than to install backflow protection at the meter. Generally, the prevention of contamination of a water distribution system or potable water system in a building is of concern to the following:

The water purveyor (City of Kent Public Works Operations Water Section)
The plumbing inspector (City of Kent Building Services)
The local health inspector (King County Health Department)
Worker safety regulations (Washington State Department of Labor & Industries)
The agency with oversight of water systems (Wash. State Dept. of Health)

A Cross connection program may be administered by any or all of the above. To avoid confusion, it is desirable for the water purveyor to have a joint or cooperative program with the other agencies having jurisdiction. Unfortunately, although each has the same overall goal of preventing contamination, each has a different enforcement criteria, authority and responsibility that may prevent a subordination of its authority to another agency.

The need to eliminate cross connections as a source of potential contamination has been long recognized in plumbing design and plumbing code enforcement. However, plumbing codes handled cross connections only in very general terms. Few details are provided to specify methods of identifying and preventing cross connections. This is because it is impractical to cover in a plumbing code all of the information needed to control cross connections.

The plumbing code addresses the plumbing design and installation in new buildings. Generally, once a building occupancy permit is given, plumbing code jurisdiction effectively ceases until a permit is requested to modify the plumbing system. Changes to a plumbing system are often made without a permit. New equipment may be added. Piping, fixtures and appliances may wear out, malfunction, or be relocated. New cross connections may then be created. Backflow prevention assemblies and devises installed under the plumbing code to protect the public could be removed, bypassed or fail to operate due to the lack of maintenance. For these reasons, it is recommended that a water purveyor not place full reliance on the enforcement of the plumbing code to protect the water distribution system from contamination through cross connections.

The history of cross connection control has provided regulatory authorities with sufficient information to establish a list of those premises where high health hazard cross connections exist, or where the potential hazard is so great that these premises must be isolated from the water purveyor's system. Some states and provinces have established mandatory protection for these premises. However, it is important that each premise be surveyed individually to assess the degree of hazard and the corresponding backflow prevention assembly requirements. Never assume that all premises of the same kind will require the same type of backflow protection.

Experience has shown that the water purveyor is in a unique position to implement and administer a cross connection control program. The water purveyor has authority to supply water to a customer and to establish standards and remedies for a breach of those standards. The City of Kent cross connection control program is needed to effectively deal with all aspects of the public health risk posed by cross connections.

# PUBLIC WORKS OPERATIONS STANDARD OPERATING PROCEDURES

#### 9.0 Water

#### 9.16 Cross Connection Control Program

**PURPOSE**: The purpose of the City of Kent (the City) cross-connection control program (CCP) is to protect the public water system from contamination via cross-connection. Ordinance No. - 2394 gives the City the authority to operate the CCP, which meets the requirements of the State of Washington regulation WAC 246-290-490.

#### **9.16.1 Policy**

The City will ensure that cross-connections between the distribution system and a customer's premises are eliminated or controlled by the installation of a State of Washington approved backflow preventer that is equal to the degree of hazard. The City will operate a combination program whereby premises isolation requires backflow protection with an Air Gap (AG) or a Reduced Pressure Backflow Assembly (RPBA). In-premises isolation backflow protection (within the customer's property lines) will be permitted if there is no high health hazard and the CCS coordinates with the Local Administrative Authority (LAA).

The final building construction approval and occupancy shall not be granted by the Local Administrative Authority until final cross-connection compliance is determined by site inspection performed by a Cross-Connection Control Specialist.

The customer is responsible for the expense to protect the public water system from backflow contamination by installing, maintaining and testing backflow assemblies in accordance with the City Cross-Connection Program. Failure of the customer to cooperate in the installation, maintenance, repair, inspection or testing of backflow prevention assemblies required by the City may be grounds for termination of water service to the premises.

In the event the water purveyor must initiate action to enforce compliance with the Ordinance on this program, all costs incurred enforcing the action shall be borne by the property owner/business owner.

The City will refer to the Pacific Northwest Section AWWA Cross-Connection Control Manual Accepted Procedure and Practice (most current edition) and the current Manual of Cross-Connection Control (USC Manual) on issues concerning cross-connection control.

The City will ensure that at least one person certified as a Cross-Connection Specialist (CCS) is provided to develop and implement the cross-connection control program. Responsibilities include:

- 1. Administer the Cross-Connection Control Program (CCP).
- 2. Evaluate service connections for backflow hazards.
- 3. Assess customer's premises for cross connections and potential for cross connections and determine action to be taken.
- 4. Reporting on the annual progress of the CCP.
- 5. Public Education.
- 6. Investigate water quality concerns where backflow is suspected.
- 7. Keep current records of all backflow preventer testing, air gaps installed in-lieu of approved backflow preventers, test kit calibration, and tester certification.
- 8. Responsible to eliminate or control cross-connections between the distribution system and the customer's premises.
- 9. Ensure quality control for backflow testing.
- 10. Complete Backflow Incident Response Forms and inform DOH, and the LAA of incidents involving contamination to the public water system.
- 11. Training and continued education

#### A. Responsibilities

The City will not be responsible for any loss or damage caused by any negligence or wrongful act of a customer or his authorized representative in installing, maintaining, operating or using any and/or all appliances, facilities, or equipment for which water service is supplied. The customer will be held responsible for health and safety impacts on the water system as well as damage to the City facilities and other property resulting from the use and operation of appliances and facilities on the customer's premises, including damage caused by steam, hot water, chemical, etc.

#### 9.16.2 Service Connections

Water service connections to the City public water system must meet the state of Washington Cross-connection Control requirements WAC-246-290-490. The City shall ensure that the customer installs a State of Washington approved backflow preventer that is equal with the degree of hazard. All high hazard service connections to the City public water system are required to have premises isolation backflow protection that shall be a CCS approved air gap (AG) or a State of Washington approved RPBA directly behind the City water meter installed by the customer at the customer's expense. The RPBA shall be installed to the City specifications and the customer is responsible to have the RPBA tested in accordance with the City cross-connection control test schedule annually or as required by City and State regulations. Inpremises isolation will be permitted if the criteria for premises isolation is met and the CCS and LAA agree that the level of backflow protection is equal to the hazard.

There is no grandfathering that can exempt an existing cross-connection violation from meeting current cross-connection requirements of the adopted codes. Where public health protection for the public water system is required, no facility shall be exempt from compliance with current standards.

A cross-connection permit is required for the installation or alteration of a backflow prevention assembly. Backflow assembly permits may be acquired at the City Permit Center located at 400 W Gowe St.

The City shall ensure that the customer installs approved backflow preventers that equal the degree of hazard in accordance with the following time frame:

- For a cross-connection that poses an <u>immediate</u> or <u>direct</u> high hazard, the City will terminate water service immediately and will not restore service until the cross-connection is protected to the CCS's satisfaction.
- High health cross-connection hazards within 30 days of the City notifying the customer of the high health cross-connection hazard, or to the CCS's discretion.
- Low health cross-connection hazards within 90 days of the City notifying the customer of the cross-connection hazard or to the CCS's discretion.

#### 9.16.3 Schedule for Evaluation and Continued Reevaluation

- a. Facilities that pose an immediate high health hazard cross-connection have priority.
- b. Facilities with severe or high health hazard cross-connections.
- c. Facilities with high hazard equipment will be evaluated before facilities with no high hazard equipment.
- d. Annually when backflow assembly testing is due.
- e. When there is a history of backflow incidents.
- f. When there is a history of failed backflow test reports.
- g. When there is a change in the use of the premises.
- h. When a plumbing permit is issued.
- i. When there is a backflow incident.
- j. Known sites with high or severe hazards will have a routine evaluation once a year as time and resources allow.

#### 9.16.4 New Connections

The City representative will review all pre-application documents, new construction plans submitted to the City, all water service applications, City business license applications and any other documents which may indicate that a requirement for cross-connection control exists. Consultations prior to service installation will be conducted to assist the customer in meeting

State Regulations and the City Cross-Connection Control Ordinance to minimize retrofits and revisions.

For new connections made on or after the effective date of these regulations, the following conditions shall be met before water service is provided;

- 1. They shall be controlled by eliminating the cross-connection or by installation of approved backflow preventers equal with the degree of hazard.
- 2. A satisfactory completion of a test by a backflow assembly tester (BAT) must be submitted to the City in accordance with the description of backflow preventer inspection and testing.

<u>Note:</u> Water service will not be provided to new construction until the cross-connection control requirements are addressed satisfactorily.

#### **9.16.5** Existing Connections

The City CCS will survey the premises to determine whether the requirement for cross-connection control exists.

For existing connections where the City identifies a high health cross-connection hazard, they shall be controlled by installation of approved backflow preventers equal with the degree of hazard. Photos or drawings indicating the installation point will be provided by the inspector.

Backflow Preventers shall be installed within thirty days of the City notifying the consumer of the high health cross-connection hazard; or in accordance with an alternate schedule acceptable to the City.

For existing connections where the City identifies a low health cross-connection hazard, they shall be controlled by installation of approved backflow preventers equal with the degree of hazard with a schedule acceptable to the City. Photos or drawings indicating the installation point will be provided by the inspector.

#### 9.16.6 Existing Commercial Connections

Existing commercial connections that do not have a backflow assembly and any cross-connection hazard, do not need to have a backflow assembly installed. This will be determined by a field evaluation and requires continued reevaluations. At the time of remodel, reconstruction, ownership change etc., the connection may be required to have or convert to premises isolation backflow protection with an AG, RPBA, or RPDA. If the existing commercial connection is found to have a high health hazard cross-connection an AG, RPBA, or RPDA shall be required.

The City may allow a State of Washington approved DCVA or DCDA for premises isolation, if the DCVA is <u>already</u> installed correctly and there are <u>no</u> potential high health hazard cross-connections at the facility (determined by a field evaluation and requires continue reevaluations).

The primary enforcement action will be to work with the LAA or CCS to get the customer to comply. The secondary action shall be to start the process of discontinuing water service. Restricted access would require an Air Gap or RPBA (to be determined by the CCS) behind the City water meter. **No facility is exempt from complying with the most current standards**. The customer is responsible to have the assembly tested annually in accordance with the City cross-connection program.

#### 9.16.7 All Service Connections

Facilities not found on the list below will be evaluated for appropriate premises or in-premises protection based upon potential or actual cross-connection(s) found. The City CCS will coordinate with the Local Administrative Authority (LAA) regarding in-premises protection.

#### A. Premises Isolation

The minimum criteria required for backflow prevention stated below shall be used during The above mentioned evaluations.

The City will have a CCS assess the degree or hazard posed by the customer's water system upon the City's distribution system. The CCS will determine the appropriate method of backflow protection by the following table.

## Appropriate Methods of Backflow Protection for Premises Isolation

Degree of Hazard	Application Conditions	Appropriate Approved Backflow Preventer
High health cross-connection hazard	Back siphonage or back pressure backflow	AG, RPBA, or RPDA
Low health cross-connection	Back siphonage or back pressure	AG, RPBA, RPDA,
hazard	backflow	DCVA, DCDA

The following facilities shall have an Air Gap (AG) or a RPBA unless there is no immediate potential for a cross-connection. In that case, a waiver form must be filled out and document why that facility does not need backflow prevention. Such a facility will be kept on record.

High health hazard cross-connections requiring premises isolation by AG or RPBA, including but not limited to the following WAC 246-290-490(4)(b)(iii)(Table 9):

Agricultural (farms and dairies)
Beverage bottling plants
Car washes
Chemical plants
Commercial laundries and dry cleaners

Premises where both reclaimed water and potable water are provided.

Film process facilities

Food processing plants

Hospitals, medical centers, nursing homes, veterinary, medical and dental clinics, and blood plasma centers.

Premises with separate irrigation systems using the City water supply and with chemical addition such as parks, playgrounds, golf courses, cemeteries, estates, Etc.

Laboratories

Metal plating industries

Mortuaries

Petroleum processing or storage plants

Piers and docks

Survey access denied or restricted

Wastewater lift stations and pumping stations.

Wastewater treatment plants, radioactive material processing plants or nuclear reactors. May use RPBA's only when used in combination with an in-plant approved air gap, otherwise an air gap behind the meter shall be used.

Premises with an unapproved auxiliary water supply interconnected with the potable water supply.

The City may require backflow preventers equal with the degree of hazard determined by the City to be installed for premises isolation for connections serving premises that have characteristics such as, but not limited to, the following:

- Complex plumbing arrangements or plumbing potentially subject to frequent changes that make it impracticable to assess whether cross-connection hazards exist;
- A repeated history of cross-connections being established or reestablished; or
- Cross-connection hazards that are unavoidable or not correctable, such as, but not limited to tall buildings.
- Facilities not found on the above list and above special cases will be evaluated for appropriate premises or in-premises protection based upon potential or actual crossconnection(s) found. The CCS will coordinate with the LAA personnel regarding inpremises protection.

#### **B.** In-Premises Isolation

The City will have a CCS assess the level of protection equal with the degree of hazard.

If the hazard does not need premises isolation as described above and in WAC 246-290-490 then backflow protection provided at the point of hazard in accordance with WAC 51-46-0603 of the

UPC for hazards such as, but not limited to: irrigation systems, swimming pools or spas, ponds and boilers may be used.

For example, the City may accept an approved AVB on a residential irrigation system, if the AVB is properly installed in accordance with the UPC.

#### **9.16.8 Fire Connections**

#### A. Backflow Protection for Fire Systems

The City shall ensure that backflow protection consistent with WAC 51-46-0603 of the UPC is installed. The UPC requires minimum protection as follows: A RPBA or RPDA shall be used for fire protection systems with chemical addition or using unapproved auxiliary water supply. A DCVA or DCDA shall be used for all other fire protection systems.

#### **B.** New Fire Connections

For new connections made on or after the effective date of these regulations, the City shall ensure that backflow protection is installed before water service is provided.

#### C. Existing Fire Connections

With chemical addition or using unapproved auxiliary supplies, the City shall ensure that backflow protection is installed within thirty days of the City notifying the customer of the high health cross-connection hazard or in accordance with an alternate schedule acceptable to the City.

Without chemical addition, without on-site storage, and using only the City water (i.e., no unapproved auxiliary supplies on or available to the premises), the City shall ensure that backflow protection is installed within thirty days of the City notifying the customer of the cross-connection hazard or in accordance with a schedule acceptable to the CCS or at an earlier date if required by the LAA

When establishing backflow protection retrofitting schedules for fire protection systems that have the characteristics listed above, the City may consider factors such as, but not limited to, impacts of assembly installation on sprinkler performance, cost of retrofitting, and difficulty of assembly installation.

#### 9.16.9 <u>Procedures for Field Evaluation (Surveying)</u>

The customer's water system shall be open for a "Field Evaluation" to the City within normal business hours or as otherwise arranged to determine whether cross-connections or other structural or sanitary hazard including violations of these regulations exist.

The initial inspection shall proceed according to the following steps:

- 1. Contact (form letter, or phone call) each customer explaining the need for a water system inspection, and requesting a convenient date and time for the inspection. Request that someone familiar with the plumbing system be on hand to answer questions, if possible.
- 2. On the appointed date, the CCS will meet with the customer/owner (and/or individual from the facility that is knowledgeable with the plumbing system). The CCS will inspect any blueprints or drawings of the "In-plant" system that are available, discuss any questions or other problems that arise, and conduct the inspection. The CCS will make a complete physical survey of all exposed piping, the underground system is to be checked as accurately as possible. All lines will be sketched on a field drawing except where intricate plumbing arrangements make it impractical. In this case, an "as-built" drawing will be requested. Each line shall be followed to its end and a survey made to determine whether there are any actual or potential cross-connections or conditions that have the potential to pollute or contaminate the potable water system.
- 3. Immediately upon completion of the survey, the inspector will orally brief the customer/owner (or representative) of the findings, if desired.
- 4. The Cross-Connection Specialist will prepare a written report that will include, but is not limited to, the following:
  - a. A list of all cross-connections found in their location, and any optional methods of control.
  - b. Any applicable drawings, sketches, blueprints, photographs etc.
  - c. A summary of the findings, and the recommendations or requirements for corrective actions, and a time (normally 30 days) in which the corrective action must be completed.
  - d. <u>Immediate</u> or <u>direct</u> Cross Connections will be isolated immediately at the source or by any other means of isolation and will not be returned to service until backflow prevention has been installed, inspected and tested determined by the CCS.
- 5. The Cross Connection specialist shall mail one copy of the completed report and a copy of the City installation specification requirements to the customer, water system manager and the LAA. The completed report shall include the recommendations and requirements for corrective actions and a corrective action completion date. One copy of the completed report shall reside in the CCS's permanent cross-connection file for the facility.
- 6. On the corrective action completion date, the CCS shall contact the customer and ask if the corrective actions have been completed. If the corrective actions have been completed, the

- CCS shall make a re-inspection of the facility. If the corrective actions have not been completed, a new completion date will be set, or enforcement action begun, depending on the degree of hazard and other mitigating circumstances.
- 7. When all required actions have been completed, the file copy of the completed actions shall be placed in the cross-connection control file for the facility, and a copy will be sent to the LAA together with any completed backflow assembly test report forms.
- 8. Re-inspection of each premise found to be subject to this procedure shall be accomplished annually or more often if the degree of hazard so indicates.
- 9. If entry is refused the LAA shall secure entry and premise isolation shall be required (see Appendix F Enforcement Action).
- 10. If a cross-connection is a high hazard then the plumbing causing the cross-connection must be disconnected immediately. If the disconnection is disregarded water may be shut off and locked out until the cross-connection is disconnected.
- 11. If corrections have not been made by the completion date, the CCS will review the status with the Water Superintendent and Manager before filling out an "Order to Correct Violation Notice."
- 12. If corrections have not been made by the completion date, and the water superintendent and manager give permission, the CCS shall fill out an "Order to Correct Violation Notice" and notify the fire marshall of the proposed water shut-off.
- 13. Upon re-inspection, if the violation has been corrected, the CCS shall update the notice and a copy sent to the owner and/or occupant, LAA, Water System Manager and into the cross-connection control file.
- 14. The City purveyor reserves the right to suspend water service at any time during the enforcement case if it is determined that the public water system is in danger of contamination.
- 15. If water is turned off due to non-compliance, and the violation **is corrected**, the customer shall do the following to have water service restored:
  - A. Call the CCS for a violation correction re-inspection.
  - B. Upon re-inspection if the violation has been corrected, the notice shall be updated by the CCS and a copy given to the customer, LAA, Water System Manager and into the cross-connection control file.
  - C. Water service may be restored by the City.
- 16. If water is turned off, the BAT must make arrangements with the CCS to restore water for testing purposes only.

If water is turned off due to non-compliance, and the violation **is not corrected**, the CCS shall update the notice, give a copy to the customer, LAA, the cross-connection control file and leave the water turned off and locked out.

#### 9.16.10 Backflow Preventers

The City will eliminate cross-connections whenever possible. When cross-connections cannot be eliminated, they will be controlled by installation of approved backflow preventers equal with the degree of hazard. The following table will be used to determine the appropriate method of backflow protection.

## Appropriate Methods of Backflow Protection for Premises Isolation

Degree of Hazard	Application Conditions	Appropriate Approved Backflow Preventer
High health cross-connection hazard	Back siphonage or back pressure backflow	AG, RPBA, or RPDA
Low health cross-connection hazard	Back siphonage or back pressure backflow	AG, RPBA, RPDA, DCVA, DCDA

Approved backflow preventers will be selected and installed in accordance with the following requirements:

WAC 246-290-490, the most current edition of the Accepted Procedure and Practice in Cross-Connection Control (prepared by the Cross-Connection Control Committee of the Pacific Northwest Section American Water Works Association) which shall be used as a guideline, as well as the University of Southern California manual, and the Uniform Plumbing Code.

The City will monitor all backflow assemblies. These assemblies are required to have a backflow assembly test performed at least annually and the City CCS may require backflow assembly testing more frequently in cases such as:

- a. Failed backflow assembly tests.
- b. Backflow contamination incident.
- c. High hazards.
- d. Required by CCS

#### A. Approval of Backflow Preventers

The City requires backflow preventers protecting the public water systems to be on the current State of Washington approved list unless the next paragraph applies.

The City may rely on testable backflow prevention assemblies that are not currently approved by the State of Washington, if the assemblies:

- a. Were included on the department and/or USC list of approved backflow prevention assemblies at the time of installation.
- b. Have been properly maintained.
- c. Are equal with the City assessed degree of hazard.
- d. Have been inspected and tested at least annually and have successfully passed the annual tests.

The City shall ensure that an unlisted backflow assembly is replaced by an approved assembly equal with the degree of hazard, when the unlisted assembly:

- a. Does not meet the conditions of (a) through (d) above of this section.
- b. Is moved.
- c. Cannot be repaired using spare parts from the original manufacturer.

#### **B.** Installation of Backflow Preventers

The City shall ensure that approved backflow preventers are installed in a manner that:

Facilitates their proper operation, maintenance, inspection, and in-line testing (as applicable) using standard installation procedures acceptable to the department such as those in the USC Manual or PNWS-AWWA Manual; ensures that the assembly will not become submerged due to weather-related conditions such as flooding; and ensures compliance with all applicable safety regulations.

The City shall ensure that approved backflow assemblies for premises isolation are installed at a location adjacent to the meter or property line or an alternate location acceptable to the City.

When premises isolation assemblies are installed at an alternate location acceptable to the City, the City shall ensure that there are no connections between the point of delivery from the public water system and the approved backflow assembly, unless the installation of such a connection meets the City cross-connection control requirements and is specifically approved by the City.

The City shall ensure that by-pass piping installed around any approved backflow preventer is equipped with an approved backflow preventer that affords at least the same level of protection as the approved backflow preventer that is being bypassed and complies with all applicable requirements of this section.

Backflow preventers shall be installed to the City specifications and in compliance with the LAA. The City requires that when a backflow assembly that protects the public water system is improperly installed, defective, an unapproved assembly, or does not equal the degree of hazard, it shall be properly reinstalled, repaired, overhauled, or replaced.

The City requires a Cross-Connection Specialist (CCS) to inspect new installations of Reduced Pressure Backflow Assemblies (RPBA's), Reduced Pressure Detector Assemblies (RPDA's), Double Check Valve Assemblies (DCVA's), Double Check

Detector Assemblies (DCDA's), Pressure Vacuum Breaker Assemblies (PVBA's), and Spill Resistant Vacuum Breaker Assemblies (SVBA's) that protect the public water system to ensure that protection is equal with the degree of hazard and that installation is in accordance with standards. These assemblies are required to be tested:

- a. At the time of installation.
- b. Annually after installation, or more frequently, if required by the City for facilities that pose a high health cross-connection hazard or for assemblies that repeatedly fail.
- c. After a backflow incident.
- d. After an assembly is repaired, reinstalled, or relocated.

#### C. Inspection and/or Testing of Backflow Preventers

A CCS inspects backflow preventer installations to ensure that protection is provided equal with the assessed degree of hazard.

A BAT tests approved backflow prevention assemblies for proper operation.

The Backflow Assembly Tester (BAT) or a Cross-Connection Specialist (CCS) inspects:

- a. Air gaps installed in-lieu of approved backflow prevention assemblies for compliance with the approved air gap definition.
- b. Backflow prevention assemblies for correct installation and approval status.
- 1. The City shall ensure that inspections and/or tests of approved air gaps and approved backflow assemblies are conducted:
  - a. At the time of installation.
  - b. Annually after installation, or more frequently if required by the City for facilities that pose a high health cross-connection hazard, or for assemblies that repeatedly fail;
  - c. After a backflow incident, and after an assembly is repaired, reinstalled, or relocated or an air gap is replumbed. The City will notify customers annually before their due date informing them that their backflow preventer is due to be tested, However, this reminder process does not relieve the owner of the responsibility for testing their device(s) annually and providing the test reports to the City.

- 2. The City shall ensure that inspections of Atmospheric Vacuum Breakers (AVB's) that protect the public water system installed on irrigation systems are conducted:
  - a. At the time of installation;
  - b. After a backflow incident; and
  - c. After repair, reinstallation, or relocation

The City shall ensure that approved backflow prevention assemblies are tested using procedures acceptable to the department, such as those specified in the most recently published edition of the USC Manual. When circumstances, such as, but not limited to, configuration or location of the assembly, preclude the use of USC test procedures, the City may allow, on a case-by case basis, the use of alternate (non-USC) test procedures acceptable to the department. These procedures must be approved by the City prior to proceeding with any testing.

The City shall ensure that results of backflow prevention assembly inspections and tests are documented and reported on a form and in a manner acceptable to the City.

The City shall ensure that an approved backflow prevention assembly or AVB, whenever found to be improperly installed, defective, not equal with the degree of hazard, or failing a test (if applicable) is properly reinstalled, repaired, overhauled, or replaced.

The City shall ensure that an approved air gap, whenever found to be altered or improperly installed, is properly replumbed or, if equal with the degree of hazard, is replaced by an approved RPBA.

#### 9.16.11 Backflow Assembly Testing and Quality Control

To meet the WAC regulation the City requires the following:

- 1. All backflow assemblies that protect the public water system require a backflow assembly test annually by a State of Washington certified tester in accordance with the City Cross-Connection Program.
- 2. The City will only accept backflow assembly test reports from current State of Washington certified Backflow Assembly Tester's (BAT's)..
- 3. Each tester is required to have current BAT certification and current test kit calibration on file with the City.
- 4. It is the customer's responsibility to ensure that the backflow test reports are submitted to the City in a timely manner. Test reports submitted more than 30 days after the test has been performed may not be accepted (unless approved by the City).

- 5. All test report forms (Appendix H) must be filled out with:
  - a. Customer's name or property owner.
  - b. Address.
  - c. Location of the assembly on the premise.
  - d. Phone number.
  - e. Assembly manufacturer.
  - f. Model.
  - g. Size.
  - h. Serial number.
  - i. Test kit calibration date.
  - j. Test kit model and serial number.
  - k. BAT certification number
  - 1. Date of test.
  - m. Line pressure.
  - n. Pressure that the check valves held at.
  - o. RPBA's opening pressure of the relief valve and measurement of the \*minimum air gap.
  - p. Results of the test, did the assembly pass or fail.
  - q. Type of assembly
  - r. BAT phone number
  - s. BAT printed name and signature.
  - \* Twice the diameter of the supply piping measured vertically from the overflow rim.
- 6. The City will only accept tests that have been performed using the most recent State approved (U.S.C.) test procedures. When circumstances preclude the use of State approved test procedures, the City may allow on case by case basis, the use of alternate test procedures acceptable to the City.

#### 9.16.12 Backflow Incident Response Procedures

When a water quality problem occurs where backflow is the suspected cause the City will ensure that:

- 1. The Cross-Connection Specialist will investigate the water quality problem as soon as possible and notify the Water System Manager of the findings.
- 2. Isolate the area of contamination and flush thoroughly, monitor water quality parameters until satisfactory.
- 3. The City shall notify the Local Administration Authority (LAA) and the Department of Health as soon as possible, but no later than the end of the next business day when a backflow incident is known by the City to have contaminated the public water system or occurred within the premises of a customer served by the City.
- 4. The City will document details of backflow incidents on a DOH approved form (such as the most recent edition of the PNWS-AWWA Manual).
- 5. Include all backflow incident report(s) in the annual cross-connection program summary report.
- 6. If entry is refused, the CCS shall notify the LAA who shall secure entry and premises isolation will be needed (See Appendix F Enforcement Action)
- 7. If entry cannot be made, the CCS can perform temporary water quality tests at the meter if needed.

#### 9.16.13 Cross-Connection Public Education Program

The City shall implement an education program for the City's customer. The education program will consist of but not limited to:

- 1. Sharing knowledge and training with inspectors, engineers, architects, plumbing contractors, suppliers and, irrigation contractors and suppliers, fire protection contractors, wastewater personnel and the customer.
- 2. Educating the staff of the City. Utilize locators, meter readers, maintenance workers, Building Official, Inspectors and Engineering staff to assist in identifying cross-connections.
- 3. Public education using billing inserts, newspapers, newsletters, and brochures.
- 4. Have education information available for community events.

#### 9.16.14 Cross-Connection Control Record Keeping

The CCS and the LAA will be responsible for entering their own data into the respective data bases.

The CCS shall develop and maintain cross-connection control records that include:

#### A. Service Connection Master List

A master list of service connections where the City relies upon approved backflow preventers to protect the public water system from contamination by premises isolation and/or in-premises protection and the assessed hazard level of each, as well as an inventory of all water system service connections and summary of the history of inspections at each location. The required backflow preventer(s) records shall be kept as long as the premises pose a cross-connection hazard to the City distribution system.

- 1. The Inspection Services Section of Public Works Operations shall establish a separate jacket file, for each individual customer that requires the installation of a backflow prevention assembly. Jacket files shall be filed by section in numerical order. The following information shall be maintained in each individual jacket file:
  - a. Copies of all correspondence with customer relative to cross-connection control.
  - b. Copies of inspection reports complete with field drawings.
  - c. Copy of application and completed installation order.
  - d. Copies of test reports on all assemblies.
- 2. All backflow assembly test report forms shall be entered into a computer program that tracks backflow testing and dates of tests and DOH requirements for the annual summary reports.

#### **B.** Inventory Information

Records regarding inventory information shall be kept for five years or the life of the approved backflow preventer whichever is longer in the City's respective database. Inventory information will be kept on:

- 1. Approved air gaps installed in-lieu of approved assemblies:
  - a. Exact air gap location, design and dimensions with photos
  - b. Assessed degree of hazard.
  - c. Installation date.
  - d. History of inspections.
  - e. Inspection results.
  - f. Person conducting inspection.

#### g. What the assembly protects against

#### 2. Approved backflow assemblies including:

- a. Exact assembly location, design and dimensions with photos
- b. Type of assembly.
- c. Manufacturer.
- d. Model.
- e. Size.
- f. Serial number.
- g. Assessed degree of hazard.
- h. Installation date.
- i. History of inspections, tests, and repairs.
- j. Test results.
- k. Person performing test.
- 1. What the assembly protects against

#### 3. Approved AVB's used for irrigation systems including:

- a. Location, design and dimensions with photos
- b. Manufacturer.
- c. Model.
- d. Size.
- e. Installation date.
- f. History of inspections(s).
- g. Person performing inspection.
- h. What the assembly protects against

#### C. Annual Summary Report

The CCS will complete and submit to the Department of Health an annual summary report. All records will be kept on file for at least ten years. Records will include:

- 1. Types of connections:
  - a. Residential.
  - b. Commercial.

#### 2. High health hazard facilities that the water system serves:

- a. Number of facilities served.
- b. The number currently protected by an AG or RPBA installed for premise isolation.

c. The number exempted from premise isolation. The City shall document reasons for not applying premises isolation for facilities that are considered high hazard facilities.

#### 3. AG and AVB's used for irrigation systems that are:

- a. Installed in the system (total).
- b. New installations for reporting year.
- c. Inspected.
- d. Failing initial inspection, including incorrect installations.
- e. Re-plumbed or reinstalled correctly.
- f. Replaced by assembly.
- g. Replaced by new AVB.
- h. Re-inspected.

#### 4. All assemblies (RPBA, RPDA, DCVA, DCDA, PVBA, SVBA):

- a. Installed in system by type and total.
- b. New installations during year by type and total.
- c. Inspected and tested.
- d. Installed incorrectly.
- e. Failing initial test.
- f. Repaired.
- g. Replaced.
- h. Replaced with different assembly type.
- i. Re-tested.

#### 5. The CCS will record test report information that includes:

- a. Customer's name.
- b. Address.
- c. Location of the assembly.
- d. Phone number.
- e. Assembly manufacturer.
- f. Model.
- g. Size.
- h. Serial number.
- i. Test kit calibration date.
- j. BAT certification number and signature.
- k. Date of test.
- 1. Line pressure
- m. Pressure that the check valve held at.
- n. RPBA's opening relief valve pressure and measurement of the \*minimum air gap
- o. Results of the test, did the assembly pass or fail.

<sup>\*</sup> Twice the diameter of the supply piping measured vertically from the

### 9.16.15 Reclaimed Water Additional Requirements

The City does not connect, distribute and/or have facilities that receive reclaimed water within their water service area. If in the future this does occur the City will meet any additional cross-connection control requirements imposed by the department under a permit issued in accordance with chapter 90.46 RCW.

Any facility that uses reclaimed water and which is also supplied by the City water supply shall have an A/G or RPBA protecting the City water distribution from that premises.

#### 9.16.16 <u>Notification Procedures for Backflow Assembly Testing</u>

- 1. Customers with backflow assemblies that protect the public water system will be required to have these assemblies tested in accordance with the City Cross-Connection Program (section 9.16.10) at the owner's expense.
- 2. A first letter will be sent to the customer annually (usually giving 30 days compliance).
- 3. If there is no response from the first letter, a second letter (usually giving 15 days compliance) will be sent notifying the customer that the City shall shut their water off.
- 4. If there is no response to the second letter, a third letter, <u>Mailed Certified</u>, (usually giving 15 days compliance) will be sent notifying the customer that the City shall shut their water off.
- 5. If there is no response from the third letter, a door hanger will be hung at the property (and the property owner will be notified if rental property) notifying them that the water shall be shut off. The City may elect to use other methods of enforcement, such as requiring "premises isolation" at the customer's water meter.

#### 9.16.17 <u>Tanker Truck & Trailer Requirements</u>

- 1. Tanker trucks and trailers require a cross-connection inspection in accordance with the City Cross-Connection Program (Section 9.16.10).
- 2. Tanker trucks and trailers will be assessed the same risk as an unapproved auxiliary supply, a high health hazard.
- 3. Air Gap or Reduced Pressure Backflow Assembly is the required protection for all tanker trucks and trailers (unless otherwise approved by the City in writing by the Water Superintendent).

#### 9.16.18 **Hydrant Use Requirements**

Authorization must be obtained to use a City hydrant. Permits can be obtained at the City Public Works office located at 5820 SE 240<sup>th</sup> St Kent WA 98032 with paid receipt from utility billing located at 400 W Gowe St Kent WA 98032.

- 1. Any portable pressure spray or cleaning unit that is connected to a hydrant shall be fitted with a double check valve assembly if it does not contain an approved air gap. If chemicals are used, a RPBA must be used in place of the DCVA. Testing of all assemblies must be in accordance with the City Cross-Connection Program (Section 9.16.10)
- 2. Flushing storm drains and sanitary sewers from a hydrant is prohibited, unless approved by the CCS. In all cases an air gap must separate the potable water piping from the storm or sewer system, as above. The configuration must be approved by the CCS.
- 3. Filling tanker trucks and trailers from a hydrant is assessed the same risk as an unapproved auxiliary supply; a high health hazard.
- 4. When using a hydrant to flush newly constructed water mains prior to acceptance by the City and purity sample results, a double check valve assembly is required to separate the potable water system from the new water main. (See Appendix M SOP 9.3 New Water main Connection Procedures).

### **APPENDIX**

- A. DEFINITIONS, ABBREVIATIONS AND ACRONYMS
- B. ORDINANCE# 2394 AND SECTION 7.02 KENT CITY CODE
- C. AGREEMENT BETWEEN CITY OF KENT PURVEYOR AND LAA
- D. WAC 246-290-490
- E. CHAPTER 6 OF THE UNIFORM PLUMBING CODE
- F. ENFORCEMENT ACTION AND BUSINESS PROCESS
- G. INCIDENT RESPONSE FORM
- H. BACKFLOW PREVENTION TEST REPORT
- I. WASHINGTON STATE TEST PROCEDURES
- J. WASHINGTON STATE APPROVED ASSEMBLIES
- K. AWWA RECOMMENDED PROTECTION AT FIXTURES AND EQUIPMENT
- L. CITY OF KENT SPECIFICATIONS
- M. SOP 9.3 NEW WATER MAIN CONNECTION PROCEDURES
- N. REFERENCE GUIDE

## **DEFINITIONS, ABBREVIATIONS AND ACRONYMS**

Per cross-connections which have been extracted from WAC 246-290-010.

"Approved air gap" means a physical separation between the free-flowing end of a potable water supply pipeline and the overflow rim of an open or non-pressurized receiving vessel. To be an air gap approved by the department, the separation must be at least:

- Twice the diameter of the supply piping measured vertically from the overflow rim of the receiving vessel, and in no case be less than one-inch, when unaffected by vertical surfaces (sidewalls); and:
- Three times the diameter of the supply piping, if the horizontal distance between the supply pipe and a vertical surface (sidewall) is less than or equal to three times the diameter of the supply pipe, or if the horizontal distance between the supply pipe and intersecting vertical surfaces (sidewalls) is less than or equal to four times the diameter of the supply pipe and in no case less than on and one-half inches.
- "Approved atmospheric vacuum breaker" means an AVB of make, model, and size that is approved by the department. AVB's that appear on the current approved backflow prevention assemblies list developed by the University of Southern California foundation for Cross-Connection Control and Hydraulic Research or that are listed or approved by other nationally recognized testing agencies (such as IAPMO, ANSI, or UL) acceptable to the local administrative authority are considered approved by the department.
- "Approved backflow preventer" means an approved air gap, an approved backflow prevention assembly, or an approved AVB. The terms "approved backflow prevention" "approved air gap," or "approved backflow prevention assembly" refer only to those approved backflow preventers relied upon by the purveyor for the protection of the public water system. The requirements of WAC 246-290-490 do not apply to backflow preventers installed for other purposes.
- "Approved backflow prevention assembly" means an RPBA, RPDA, DCVA, DCDA, PVBA, or SVBA of make, model, and size that is approved by the department. Assemblies that appear on the current approved backflow prevention assemblies list developed by the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research or other entity acceptable to the department are considered approved by the department.

Definitions - 1

- "Backflow" means the undesirable reversal of flow of water or other substances through a cross-connection into the public water system or consumer's potable water system.
- **"Backflow assembly tester"** means a person holding a valid BAT certificate issued in accordance with chapter 246-292 WAC.
- **"Backpressure"** means a pressure (caused by a pump, elevated tank or piping, boiler, or other means) on the consumer's side of the service connection that is greater than the pressure provided by the public water system and which may cause backflow.
- "Backsiphonage" means backflow due to a reduction in system pressure in the purveyor's distribution system and/or consumer's water system.
- "Combination fire protection system" means a fire sprinkler system that:
  - Is supplied only by the purveyor's water;
  - Does not have a fire department pumper connection; and
  - Is constructed of approved potable water piping and materials that serve both the fire sprinkler system and the consumer's potable water system.
- "Consumer" means any person receiving water room a public water system from either the meter, or the point where the service line connects with the distribution system if no meter is present. For purposes of cross-connection control, "consumer" means the owner or operator of a water system connected to a public water system through a service connection.
- "Consumer's water system" as used in WAC 246-290-490, means any potable and/or industrial water system that begins at the point of delivery from the public water system and is located on the consumer's premises. The consumer's water system includes all auxiliary sources of supply, storage, treatment, and distribution facilities, piping, plumbing, and fixtures under the control of the consumer.
- "Cross-connection" means any actual or potential physical connection between a public water system or the consumer's water system and any source of non-potable liquid, solid, or gas that could contaminate the potable water supply by backflow.

Definitions - 2

- "Cross connection control program" means the administrative and technical procedures the purveyor implements to protect the public water system from contamination via cross-connections as required in WAC 246-290-490.
- "Cross-connection control specialist" means a person holding a valid CCS certificate issued in accordance with chapter 246-292 WAC.
- "Cross-connection control summary report" means the annual report that describes the status of the purveyor's cross-connection control program.
- "Customer" means any person receiving water from a public water system from either the meter, or the point where the service line connects with the distribution system if no meter is present. For purposes of cross-connection control, "customer" means the owner or operator of a water system connected to a public water system through a service connection.
- "Department" refers to the Washington State Department of Health (DOH).
- "Flow-through fire protection system" means a fire sprinkler system that:
  - Is supplied only by the purveyor's water;
  - Does not have a fire department pumper connection;
  - Is constructed of approved potable water piping and materials to which sprinkler heads are attached; and
  - Terminates at a connection to a toilet or other plumbing fixture to prevent the water from becoming stagnant.
- "High health cross-connection hazard" means a cross-connection which could impair the quality of potable water and create an actual public health hazard through poisoning or spread of disease by sewage, industrial liquids or waste.
- **"In-premises protection"** means a method of protecting the health of consumers served by the consumer's potable water system, located within the property lines of the consumer's premises by the installation of an approved air gap or backflow prevention assembly at the point of hazard, which is generally a plumbing fixture.
- **"Local administrative authority"** means the local official, board, department, or agency authorized to administer and enforce the provisions of the Uniform Plumbing Code as adopted under chapter 19.27 RCW.

Definitions – 3

- "Low health cross-connection hazard" means cross-connection that could cause an impairment of the quality of potable water to a degree that does not create a hazard to the public health, but does adversely and unreasonably affect the aesthetic qualities of such potable waters for domestic use.
- **"Premises Isolation"** means a method of protecting a public water system by installation of approved air gaps or approved backflow prevention assemblies at or near the service connection or alternative location acceptable to the purveyor to isolate the consumer's water system from the purveyor's distribution system.
- "Reclaimed water" means effluent derived in any part from sewage from a wastewater treatment system that has been adequately and reliably treated, so that as a result of that treatment, it is suitable for beneficial use or a controlled use that would not otherwise occur, and it is no longer considered wastewater.
- "Unapproved auxiliary water supply" means a water supply (other than the purveyor's water supply) on or available to the consumer's premises that is either not approved for human consumption by the health agency having jurisdiction or is not otherwise acceptable to the purveyor.
- "Uniform Plumbing Code" means the code adopted under RCW 19.27.031 (4) and amended under chapter 51-46 WAC. This code establishes statewide minimum plumbing standards applicable within the property lines of the consumer's premises.
- "Used water" means water which has left the control of the purveyor.

#### **Abbreviations and Acronyms**

AG Air Gap

AVB Atmospheric Vacuum Breaker

AWWA American Water Works Association

BAT Backflow Assembly Tester (for WAC 246-290-490)

DOH State of Washington Department of Health

CCP Cross-Connection Control Program

CCS Cross-Connection Control Specialist

CITY Refers to the City of Kent

DCDA Double Check Detector Assembly

DCVA Double Check Valve Assembly

IAPMO International Association of Plumbing and Mechanical Officials

LAA Local Administrative Authority

PVBA Pressure Vacuum Breaker Assembly

RPBA Reduced Pressure Backflow Assembly

RPDA Reduced Pressure Detector Assembly

SVBA Spill Resistant Vacuum Breaker Assembly

Table 9 Refers to WAC 246-290-490(4)(iii)(Table 9)

UBC Uniform Building Code

UL Underwriters Laboratories Inc.

UPC Uniform Plumbing Code

#### ORDINANCE NO. 2394

AN ORDINANCE of the City of Kent, Washington, relating to water services; amending Chapter 7.06 Kent City Code by adding new sections 7.06.180 - 7.06.185 adopting Rules and Regulations of the State Board of Health relating to and regulating cross-connections in public water systems.

THE CITY COUNCIL OF THE CITY OF KENT, WASHINGTON, DOES HEREBY ORDAIN AS FOLLOWS:

Section 1. Chapter 7.06 Kent City Code is amended to add the following sections 7.06.180, 7.06.181, 7.06.182, 7.06.183, 7.06.184, and 7.06.185:

7.06.180. Purpose. It is the purpose of KCC 7.06.180 - KCC 7.06.185 to protect the health of consumers receiving water from the City of Kent by protecting the public water system of the City of Kent from actual or potential contamination.

 $\frac{7.06.181.}{\text{Definitions}}. \hspace{0.2cm} \textbf{The following are established as definitions for purposes of KCC } 7.06.180 - 7.06.185 :$ 

- A. "Cross connection" shall mean any physical arrangement whereby a public water supply is connected, directly or indirectly, with any other water supply system, sewer, drain, conduit, pool, storage reservoir, plumbing fixture, or other device which contains or may contain contaminated water, sewer, or other waste or liquid of unknown or unsafe quality which may be capable of imparting contamination to the public water supply system of this district as a result of backflow.
- B. "Backflow" shall mean the flow, other than the intended direction of flow, of any foreign liquids, gases or substances into the City public water supply or distribution system.
- C. "Backflow prevention device" shall mean a device to counteract back pressure or to prevent back siphonage.
- D. "Director" shall mean the Director of Public Works of the City of Kent Department of Public Works.

E. Upon the filing of one copy with the City Clerk, all definitions contained in the State of Washington Administrative Code (WAC) 248-54-830, as now or hereafter amended, shall by this reference be considered definitions within this section.

#### 7.06.182. Service Connection.

- A. No water service connection from the City of Kent's water system to any premise(s) shall be installed or maintained unless the City of Kent's water supply is protected by backflow prevention devices as required by the Director or her/his Designee and the rules and regulations of the State Board of Health and this Code. The installation or maintenance of a cross-connection which will endanger the water quality of the City of Kent's water supply is prohibited. Any such cross-connection now existing or hereafter installed is hereby declared a nuisance and shall be abated. The control and/or elimination of cross-connections within the City of Kent's systems shall be in accordance with WAC 248-54-820 to 248-54-850. as now or hereafter amended.
- B. Service to any property, landowner, or water user receiving its water supply from the City of Kent water supply system shall be contingent upon compliance with all requirements of the rules and regulations of the State Board of Health and of this Code pertaining to cross-connections. Service shall be discontinued to any premise(s), water user or property owner for failure to comply with such regulations of the State Board of Health and of this Code pertaining to cross-connections, and any discontinued service will not be re-established until the Department of Public Works of the City of Kent has approved compliance with such requirement of the rules and regulations of the State Board of Health and of this Code pertaining to cross-connection.

7.06.183. Public Works to Administer. The Department of Public Works of the City of Kent shall be responsible for administering this ordinance including the development of the necessary procedures and practices to accomplish same, consistent with the standards in this Code and Chapter 248-54 WAC.

7.06.184. Inspection - Right of Entry. The Director and other duly authorized employees of the Department of Public Works bearing proper credentials and identification shall be permitted to enter upon all properties receiving water service from the City of Kent water supply system for the purposes of inspection, observation and testing in accordance with the provisions of this Code.

7.06.185. Administrative Code Adopted. The provisions of Sections 248-54-820 through 248-54-850, Washington Administrative Code, as now or hereafter amended relating to cross-connection control and elimination and the use of backflow prevention devices when such are considered to be advisable are upon the filing of one copy with the City Clerk, hereby adopted and made a part hereof, and all provisions of said Code may be executed and applied by the Department of Public Works in determining when cross-connection are prohibited and when backflow prevention devices shall be required.

Section 2. Severability. If any section, subsection, sentence, clause, phrase, part or portion of this Ordinance is for any reason held to be invalid or unconstitutional by any court of competent jurisdiction, such decision shall not affect the validity of the remaining portions of this Ordinance.

 $\underline{Section \ 3}. \ \underline{Effective \ Date}. \ \ This \ ordinance \ shall \ take$  effect and be in force five (5) days from and after its passage, approval and publication as provided by law.

ATTEST:

MARTE JENSEN, CATY CLERK

APPROVED AS TO FORM:

P. STEWNEN DIJULIO, CITY ATTORNEY

I hereby certify that this is a true copy of Ordinance No. 2394, passed by the City Council of the City of Kent, Washington, and approved by the Mayor of the City of Kent as hereon indicated.

MARIE JENSEN, BITY CLERK (SEAL)

5078-25A

- 4 -

#### **Kent City Code**

#### 7.02.050 Cross-connection restrictions – Purpose.

It is the purpose of KCC 7.02.050 through 7.02.100 to protect the health of consumers receiving water from the city by protecting the public water system of the city from actual or potential contamination. (Ord. No. 2394, § 1. Formerly Code 1986, § 7.06.180)

#### **7.02.060 Same – Definitions.**

The following are established as definitions for purposes of KCC 7.02.050 through 7.02.100: Cross-connection shall mean any physical arrangement whereby a public water supply is connected, directly or indirectly, with any other water supply system, sewer, drain, conduit, pool, storage reservoir, plumbing fixture, or other device which contains or may contain contaminated water, sewer, or other waste or liquid of unknown or unsafe quality which may be capable of imparting contamination to the public water supply system of this district as a result of backflow.

Backflow shall mean the flow, other than the intended direction of flow, of any foreign liquids, gases or substances into the city public water supply or distribution system.

Backflow prevention device shall mean a device to counteract back pressure or to prevent back siphonage.

Director shall mean the director of public works of the department of public works.

All definitions contained in WAC 248-54-830, as now or hereafter amended, shall by this reference be considered definitions within this section.

(Ord. No. 2394, § 1. Formerly Code 1986, § 7.06.181)

Cross reference(s) – Definitions and rules of construction generally, § 1.01.030.

#### 7.02.070 Same – Service connection.

A. No water service connection from the city water system to any premises shall be installed or maintained unless the city water supply is protected by backflow prevention devices as required by the director or his designee and the rules and regulations of the state board of health and this code. The installation or maintenance of a cross-connection which will endanger the water quality of the city water supply is prohibited. Any such cross-connection is hereby declared a nuisance and shall be abated. The control and/or elimination of cross-connections within the city systems shall be in accordance with WAC 248-54-820 through 248-54-850, as amended.

B. Service to any property, landowner or water user receiving its water supply from the city water supply system shall be contingent upon compliance with all requirements of the rules and regulations of the State Board of Health and of this code pertaining to cross-connections. Service shall be discontinued to any premises, water user or property owner for failure to comply with such regulations of the State Board of Health and of this code pertaining to cross-connections, and any discontinued service will not be reestablished until the department of public works has approved compliance with such requirement of the rules and regulations of the State Board of Health and of this code pertaining to cross-connection. (Ord. No. 2394, § 1. Formerly Code 1986, § 7.06.182)

#### 7.02.080 Same – Administration.

The department of public works shall be responsible for administering KCC 7.02.050 through 7.02.100 including the development of the necessary procedures and practices to accomplish same, consistent with the standards in this code and Chapter 248-54 WAC.

(Ord. No. 2394, § 1. Formerly Code 1986, § 7.06.183)

#### 7.02.090 Same – Inspection – Right of entry.

The director and other duly authorized employees of the department of public works bearing proper credentials and identification shall be permitted to enter upon all properties receiving water service from the city water supply system for the purposes of inspection, observation and testing in accordance with the provisions of this code.

(Ord. No. 2394, § 1. Formerly Code 1986, § 7.06.184)

#### 7.02.100 Same – Administrative code adopted.

The provisions of WAC 248-54-820 through 248-54-850, as now or hereafter amended relating to cross-connection control and elimination and the use of backflow prevention devices when such are considered to be advisable are upon the filing of are hereby adopted and made a part hereof. All provisions of the Washington Administrative Code may be executed and applied by the department of public works in determining when cross-connections are prohibited and when backflow prevention devices shall be required. A copy of such provisions is on file in the city clerk's office.

(Ord. No. 2394, § 1. Formerly Code 1986, § 7.06.185)

#### 7.02.110 Right of entry, shutting off water.

Employees of the water utility or finance department when in the course of their employment shall have the right to go upon private property to read, inspect, repair, install or remove a water meter or to inspect, repair or remove any connection between the water main to and including the water meter, or to shut off a water service. A water meter may be removed from the premises for purpose of inspection or repair, or when a bill for consumed water or sewer service is not paid.

(Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.200)

#### 7.02.120 Separate meters required – Exceptions.

Except as provided in this chapter, each separate building occupied as a dwelling or as a place of business must have a separate water service and water meter. Where the applicant desires to have two (2) or more service pipes on the same premises, he shall state in his application for a water connection, and separate service pipes shall be run with individual stop cocks to each water meter. Each mobile home park and each condominium may be served by one (1) water meter. The city council may enter into agreements with commercial and industrial users to allow more than one (1) building to be served by a single meter.

(Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.240)

#### 7.02.130 Existing service to more than one (1) building.

At the time of the adoption of this chapter where more than one (1) building is served through one (1) meter, the consumption of water for each billing period shall be divided by the number of buildings served and the charge will then be calculated as if each building were a separate account. (Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.280)

#### 7.02.140 Connection with other water supply.

A. No service connection shall be allowed from the city mains to any premises supplied by water from any other source, unless special permission is given by the director of public works, which special

permission may be terminated at any time if in the judgment of the director of public works the public interest requires it.

B. No cross-connection shall be made or maintained between any city service connection and pipe supplying water from any other source unless the water supplied from the other source, by tests by the State Board of Health, is shown to conform with the United States bacteriological standard fordrinking water. Such tests must be made by a professional tester and submitted to the city at least once each month.

(Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.320)

#### 7.02.150 Connections outside of city limits.

A. Whenever any person outside the limits of the city, not already furnished with water by the city, shall desire the system to be extended, such person shall apply to the city council to have such water service extended. Such application shall designate the premises to be supplied and the number of services desired. If a permit is granted by the city council, the applicants shall, at their own expense, install all necessary mains or pipes in accordance with the requirements of the city engineer and the comprehensive water plan of the city which is on file in the office of the director of public works. All regulations concerning the size of service and meter shall apply.

B. Whenever any water district desires to purchase water from the city, it shall make application to the city council and if accepted, install all mains and services in accordance with the rules and regulations of the city. An individual contract will be negotiated for the purchase of water. Whenever any portion of a water district is annexed to the city, the ownership of the mains, meters and services shall become the property of the city in accordance with RCW 35.13A.020.

(Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.360)

#### 7.02.160 Installation and connection charges inside city limits.

A. Any property owner within the city limits applying for water service shall pay in full a tap charge plus a system development charge prior to issuance of the water service permit. The tap charge will include the cost of connection and laying the pipe from the city water main to the property line of the property to which service is desired, or at a distance of sixty (60) feet from the main toward such property line, whichever is shorter. The minimum tap charge so established for service installed by the water utility is as follows:

- 1. Two hundred seventy-five dollars (\$275) for each five-eighth (5/8) inch by three-quarter (3/4) inch connection.
- 2. Three hundred twenty-five dollars (\$325) for each three-quarter (3/4) inch connection.
- 3. Three hundred fifty dollars (\$350) for each one (1) inch connection.
- 4. Six hundred dollars (\$600) for each one and one-half (1 1/2) inch connection.
- 5. Eight hundred dollars (\$800) for each two (2) inch connection.

On any connection over two (2) inches, the minimum tap charge shall be the actual cost of the meter and installation, plus twenty-five (25) percent.

- B. If the workload of the water utility as determined by the director of public works is such that the installation of the water connection would interfere with the proper operation and maintenance of the water system, the director of public works may require that the property owner employ a licensed contractor to make the connection and install the necessary line and materials except the water meter. All such water services shall meet or exceed the standards and specifications approved by the director of public works. The minimum tap charge is as follows:
- 1. One hundred dollars (\$100) for each five-eighth (5/8) inch by three-quarter (3/4) inch connection.
- 2. One hundred twenty-five dollars (\$125) for each three-quarter (3/4) inch connection.

- 3. One hundred seventy-five dollars (\$175) for each one (1) inch connection.
- 4. Three hundred sixty dollars (\$360) for each one and one-half (1 1/2) inch connection.
- 5. Five hundred dollars (\$500) for each two (2) inch connection.

All such contractor-installed connections shall be guaranteed by the contractor for a period of one (1) year.

- C. The system development charge is as follows:
- 1. One thousand one hundred dollars (\$1,100) for each meter less than one (1) inch in size.
- 2. One thousand nine hundred fifty-eight dollars (\$1,958) for each one (1) inch meter.
- 3. Four thousand four hundred dollars (\$4,400) for each one and one-half (1 1/2) inch meter.
- 4. Seven thousand eight hundred twenty-two dollars (\$7,822) for each two (2) inch meter.
- 5. Seventeen thousand six hundred dollars (\$17,600) for each three (3) inch meter.
- 6. Thirty-one thousand two hundred eighty-four dollars (\$31,284) for each four (4) inch meter.
- 7. Forty-eight thousand eight hundred eighty-four dollars (\$48,884) for each five (5) inch meter.
- 8. Seventy thousand four hundred dollars (\$70,400) for each six (6) inch meter.
- 9. One hundred twenty-five thousand one hundred fifty-eight dollars (\$125,158) for each eight (8) inch meter.
- 10. One hundred ninety-five thousand five hundred fifty-eight dollars (\$195,558) for each ten (10) inch meter.
- D. If an undersized meter is installed, a deduction will be allowed from the above charges, including system development charges, which will reflect the difference in cost between the undersized meter and the regular size meter. All service material (including water meter) will remain the property of the city.
- E. If the tap is changed to one of a larger size, the cost and expense of such charge must be paid before the larger size tap is installed.
- F. If it becomes necessary during the installation of such connection on a time and material basis to break and replace either concrete or blacktop paving, then in each instance an additional charge shall be made to cover the cost of such repair.
- (Ord. No. 2370, § 1; Ord. No. 3486, § 1, 11-16-99; Ord. No. 3534, § 1, 12-5-00. Formerly Code 1986, § 7.06.400)

#### 7.02.170 Installation and connection charges outside city.

Any property owner outside the city limits applying for water service shall pay in full the tap charge plus a system development charge prior to the issuance of a water service permit. The minimum charge established shall be the cost as established for inside the city limits plus fifty (50) percent, except the system development charge. The system development charge shall be the same as for inside city limits. (Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.440)

#### 7.02.180 Temporary water meters.

- A. When water service is required for a specific short-term duration, upon approval of the director of public works, a temporary water meter may be obtained from the water utility.
- B. Such meters shall only be used for a designated project and shall be promptly returned to the water utility upon completion of the project or at the end of sixty (60) days, whichever comes first. The meters are to be returned in the same condition as when rented, and the user shall be held responsible for any damage thereto including paying all repair or replacement costs. While in the user's possession, the user shall be solely responsible for the meter and as such, should it be lost or stolen, the user shall pay the water utility the cost of its replacement.
- C. The director of public works shall require that a cash bond be deposited with the city prior to receipt of a temporary meter. The amount of the bond shall equal the replacement cost of the respective meter.

Upon return of the meter, the payment of all outstanding charges including any meter repair or replacement costs, the cash bond shall be released back to the user.

- D. Temporary meters may be moved from one (1) hydrant to another within the same project; provided, the water utility is notified in advance of the proposed relocation and that hydrant wrenches are used to make all connections and disconnections.
- E. The charge for water used through the temporary meter shall be at a rate of one dollar and thirty-three cents (\$1.33) per one hundred (100) cubic feet, plus a meter charge as established in subsections (E)(1) and (E)(2) of this section. Effective December 31, 1999, the charge for water used through the temporary meter shall be at a rate of two dollars and thirty cents (\$2.30) per one hundred (100) cubic feet, plus a meter charge as established in subsections (E)(1) and (E)(2) of this section.
- 1. Up to one and one-half (1 1/2) inch meter, fifty dollars (\$50);
- 2. Two (2) inch and larger meter, one hundred dollars (\$100).

Payment shall be made in full upon return of the meter. If a meter is lost or stolen, payment for water used shall be based on an estimate made by the director of public works.

(Ord. No. 2370, § 1; Ord. No. 3486, § 2, 11-16-99; Ord. No. 3534, § 1, 12-5-00. Formerly Code 1986, § 7.06.460)

#### **7.02.190** Stop cocks.

All service pipes must come directly from the street main and shall be laid at such depth and at such point as the water utility shall designate. All stop cocks and connections thereto shall be maintained by and under the control of the water utility.

(Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.480)

#### 7.02.200 Turn on and off service by water utility employees.

No person except employees of the water utility or the finance department will be allowed to turn the water on or off at the city's stop cock after the plumbing has been completed and the water turned on by the water utility, except to repair the special stop and waste cock or the pipe between it and the city's stop cock.

(Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.520)

#### 7.02.210 Special stop and waste cock.

A special stop and waste cock with a key attached thereto shall be placed on the pipe leading from the city's stop cock outside of the building or inside if basement is available. No branch pipe, bibb or fixture of any kind shall be placed between this stop cock and the city's main. If this stop cock does not thoroughly drain all pipes throughout the premises, additional ones shall be placed in all sags, bends and traps that cannot otherwise be drained. If the service is to a business building adjacent to a city sidewalk, a valve type stop and waste cock in a cast iron valve box, with traffic type lid shall be installed near the outside wall of the building.

(Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.560)

#### 7.02.220 Replacement – Permit credit.

If a property owner, lessee or occupant requests a change in meter size and/or water line size, an application shall be made to the city engineer. The city engineer shall review the application for compliance with KCC 7.02.030. If the request results in an increase flow capability to the property, the charge for this service shall include the respective system development charge, otherwise, the charge shall be limited to a time and material basis. In all cases a credit on this charge will be made for the meter removed. This credit will be based on a depreciation schedule of twenty (20) percent per year for the

number of years the meter has been in service, with a minimum credit of two dollars and fifty cents (\$2.50). No credit will be allowed for the valves, meter box, or pipe originally installed. Where a system development charge is included, a credit will also be given for that previously paid system development charge.

(Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.600)

#### 7.02.230 Connections from stop cock at owner's expense and care.

All pipes and connections from the city's adapter or coupling located on or near the property line or near the meter box shall be put in at the expense of the property owner, who shall be responsible for all damages resulting from leaks and breaks.

(Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.640)

#### 7.02.240 Plumber's permit for turn on and off.

No plumber or other person will be allowed to make connection with the city mains or make alterations in conduit, pipe or other fixture connecting therewith, or to connect pipes when they have been disconnected, or to turn water off or on, upon any premises at the city's stop cock without a permit from the director of public works.

(Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.680)

#### 7.02.250 Water turned on by owner or tenant prohibited.

If the water is turned on to the premises by anyone other than an employee of the water utility or the finance department after it has been turned off at city stop cock, it will be turned off again at the city stop cock and locked, and will not be turned on again until the charges as prescribed in this chapter have been paid. Such charges will consist of the actual cost per hour, including overhead, of sending water utility employees to return service to the account, plus a turn on charge of fifteen dollars (\$15). In no case will the charge be less than fifteen dollars (\$15).

(Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.720)

#### 7.02.260 Vacant premises – Water supply.

If it is decided to discontinue the use of water supply to vacant premises for a period of not less than thirty (30) days, notice in writing must be given to the finance department. The water will be turned off and will be turned on again upon written application at a charge of fifteen dollars (\$15) for such turn on. No remission of charges will be made for a lesser period than thirty (30) days or without receipt of notice by the finance department.

(Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.760)

#### 7.02.270 Size of water main.

No water main shall be installed unless it is at least six (6) inches in diameter and is the size indicated in the comprehensive water plan.

(Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.800)

#### 7.02.280 Turning off-turning on charges.

A. For the purpose of paying the expense to the water utility or finance department, a charge as set forth in this chapter is hereby fixed and made to turn off or turn on the water service to any building for the making within the building of any inspection, repair, maintenance, enlargement, replacement, addition, or change in or to the water line or lines, or plumbing, or plumbing fixtures, or for the purpose of connection any kind of machine, appliance, toilet or bath facilities, or any kind of plumbing in or to the

water system located within the building when the building does not have stop and waste cock as required in KCC 7.02.210.

- B. The charge shall be twenty-five dollars (\$25) if the turn-off or turn-on is done within a period of forty-eight (48) hours, which charge shall be paid to the finance director before any water service is turned off or turned on for any of the purposes set forth in this section.
- C. If the turn-off and turn-on is not done within a period of forty-eight (48) hours, the charge is fifteen dollars (\$15) to turn off the water service and fifteen dollars (\$15) to turn on the service. The charge shall be paid to the finance director before any water service is turned off or turned on for any of the purposes set forth in this section.

(Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.820)

#### 7.02.290 Prohibited uses.

No person shall:

- 1. Use water from the city water system for sprinkling or irrigating when requested by a police officer or firefighter of the city to cease such use during a fire which the fire department is seeking to control or when use of water for sprinkling or irrigation is forbidden by the city council;
- 2. Bathe in, fish in, or throw any substance into any reservoir or water tank or standpipe or into any pipe or connection to the city water system, or upon the premises where any reservoir, water tank or standpipe is located;
- 3. Obstruct the access to any fire hydrant or place lumber, dirt, rubbish or other material upon public right-of-way or city owned property within twenty (20) feet of a fire hydrant or to open or operate a fire hydrant except a member of a fire department or employee of the city in pursuance of his employment or duty;
- 4. Break or deface the seal of a water meter or tamper with, damage, obstruct or alter a water meter in service;
- 5. Make any connection with a water main, water pipe or fire hydrant for delivery of water from the city water system to a consumer without a permit from the water utility and a means of measuring the quantity of water taken prior to consumption;
- 6. Turn on or turn off a water service at the water box or any place between the water meter and the water main of the city water system other than by an employee of the water utility or finance department who is authorized to either turn on or turn off a water service;
- 7. Interfere with, obstruct or prevent free or safe access to any water meter or water service for purpose of reading, inspection, repair, removal or installation by any employee of the water utility or finance department in pursuit of his employment;
- 8. Tamper with, destroy, break or interfere with any part of the water system; or
- 9. Make, construct, buy, sell or in any way dispose of to any person any curb cock key or hydrant wrench that fits or may be used on any part of the city water system without permission of the director of public works of the city.

(Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.840)

#### 7.02.300 Water rates within the city.

A. The monthly rate from October 1 to April 30 is one dollar and twenty-four cents (\$1.24) per one hundred (100) cubic feet plus a monthly demand charge for service and meter, and from May 1 to September 30 the monthly rate is one dollar and sixty-four cents (\$1.64) per one hundred (100) cubic feet plus a monthly demand charge for service and meter. Effective December 31, 1999, the monthly rate from October 1 to April 30 is one dollar and twenty-four cents (\$1.24) per one hundred (100) cubic feet for all use less than or equal to seven hundred (700) cubic feet plus one dollar and sixty-nine cents

(\$1.69) per one hundred (100) cubic feet for all use greater than seven hundred (700) cubic feet, plus a monthly demand charge for service and meter. Effective December 31, 1999, the monthly rate from May 1 to September 30 is one dollar and sixty-four cents (\$1.64) per one hundred (100) cubic feet for all use less than or equal to seven hundred (700) cubic feet plus two dollars and nine cents (\$2.09) per one hundred (100) cubic feet for all use greater than seven hundred (700) cubic feet, plus a monthly demand charge for service and meter. The monthly demand charge for service and meter is as follows:

Meter size		Charge
(inches	s)	
$5/8 \times 3$	3/4	\$2.20
1	2.45	
1 1/2	3.30	
2	4.00	
3	13.95	
4	16.80	
6	28.10	
8	37.59	
10	48.46	

- B. For lifeline-qualified water service customers, the monthly rate is forty-five cents (\$0.45) per one hundred (100) cubic feet plus a monthly demand charge for service and meter as set forth in subsection (A) of this section.
- C. Eligibility criteria for lifeline rate shall be as established by city council.
- D. 1. Subject to the right of access and inspection by a representative of the city, water service customers of the city may apply for a one-time rate adjustment for any single billing period under the following circumstances:
- a. An accidental water leak has been discovered on the subject property; or
- b. A water line failure has occurred on the subject property; or
- c. An unexplained, abnormal water meter reading has occurred on the subject property even though subsequent city inspection of the water meter indicates that the meter is functioning properly. This rate adjustment shall not exceed fifty (50) percent of the difference between the total amount of the billing period sought for adjustment minus the customer's average water usage. For the purposes of this subsection, the "average water usage" shall be computed by determining the total volume of water consumed, under normal use conditions, during the preceding twelve (12) months and dividing that total volume by the number of times the city would typically read the customer's water meter in a twelve (12) month period.
- 2. This rate adjustment is permitted on a one-time basis only and can only be applied to one (1) billing period. To be eligible for this rate adjustment, the affected water system must be owned by or subject to the exclusive control of the customer and be located between the city's water meter and owner's residence or structure. The bill sought for adjustment must exceed two (2) times the customer's highest usage in any single billing period during the twelve (12) months prior to the billing period sought for adjustment.
- 3. Following a request for rate adjustment provided under this subsection, the city's finance director, or his/her designee, shall review the request and determine whether or not to adjust the customer's monthly billing. In order to make a proper determination, city staff shall be entitled to access, inspect and approve the customer's water system repair prior to granting a rate adjustment.
- 4. If approved, the city shall make this rate adjustment by issuing a credit to the customer's account after verification of leakage or water system failure, inspection of water meter and water system, where

applicable, and verification of corrective repairs. All repairs shall occur within thirty (30) days of application to the city.

5. The owner may request reconsideration of the decision of the finance director, or his/her designee, by the city council through the city council's operation committee.

(Ord. No. 2732, § 3; Ord. No. 2495, § 1; Ord. No. 3043, § 1, 5-5-92; Ord. No. 3143, § 2, 11-16-93; Ord. No. 3486, § 3, 11-16-99. Formerly Code 1986, § 7.06.860)

#### 7.02.310 Water rates outside city.

A. The monthly rate from October 1 to April 30 is one dollar and sixty-four cents (\$1.64) per one hundred (100) cubic feet plus a monthly demand charge for service and meter, and from May 1 to September 30 the monthly charge is two dollars (\$2) per one hundred (100) cubic feet plus a monthly demand charge for service and meter. Effective December 31, 1999, the monthly rate from October 1 to April 30 is one dollar and sixty-four cents (\$1.64) per one hundred (100) cubic feet for all use less than or equal to seven hundred (700) cubic feet plus two dollars and nine cents (\$2.09) per one hundred (100) cubic feet for all use greater than seven hundred (700) cubic feet, plus a monthly demand charge for service and meter. Effective December 31, 1999, the monthly rate from May 1 to September 30 is two dollars (\$2) per one hundred (100) cubic feet for all use less than or equal to seven hundred (700) cubic feet plus two dollars and forty-six cents (\$2.46) per one hundred (100) cubic feet for all use greater than seven hundred (700) cubic feet, plus a monthly demand charge for service and meter. The monthly demand charge for service and meter is as follows:

Meter size		Charge
(inche	s)	
$5/8 \times 3$	3/4	\$ 2.20
1	2.45	
1 1/2	3.30	
2	4.00	
3	13.95	
4	16.80	
6	28.10	
8	37.59	
10	48.46	

- B. For lifeline-qualified water service customers, the monthly rate is forty-eight cents (\$0.48) per one hundred (100) cubic feet plus a monthly demand charge for service and meter as set forth in subsection (A) of this section.
- C. Eligibility criteria for lifeline rate shall be as established by city council.
- D. 1. Subject to the right of access and inspection by a representative of the city, water service customers of the city may apply for a one-time rate adjustment for any single billing period under the following circumstances:
- a. An accidental water leak has been discovered on the subject property; or
- b. A water line failure has occurred on the subject property; or
- c. An unexplained, abnormal water meter reading has occurred on the subject property even though subsequent city inspection of the water meter indicates that the meter is functioning properly. This rate adjustment shall not exceed fifty (50) percent of the difference between the total amount of the billing period sought for adjustment minus the customer's average water usage. For the purposes of this subsection, the "average water usage" shall be computed by determining the total volume of water consumed, under normal use conditions, during the preceding twelve (12) months and dividing that total

volume by the number of times the city would typically read the customer's water meter in a twelve (12) month period.

- 2. This rate adjustment is permitted on a one-time basis only and can only be applied to one (1) billing period. To be eligible for this rate adjustment, the affected water system must be owned by or subject to the exclusive control of the customer and be located between the city's water meter and owner's residence or structure. The bill sought for adjustment must exceed two (2) times the customer's highest usage in any single billing period during the twelve (12) months prior to the billing period sought for adjustment.
- 3. Following a request for rate adjustment provided under this subsection, the city's finance director, or his/her designee, shall review the request and determine whether or not to adjust the customer's monthly billing. In order to make a proper determination, city staff shall be entitled to access, inspect and approve the customer's water system repair prior to granting a rate adjustment.
- 4. If approved, the city shall make this rate adjustment by issuing a credit to the customer's account after verification of leakage or water system failure, inspection of water meter and water system, where applicable, and verification of corrective repairs. All repairs shall occur within thirty (30) days of application to the city.
- 5. The owner may request reconsideration of the decision of the finance director, or his/her designee, by the city council through the city council's operation committee.

(Ord. No. 2732, § 3; Ord. No. 2495, § 2; Ord. No. 3043, § 2, 5-5-92; Ord. No. 3143, § 3, 11-16-93; Ord. No. 3486, § 4, 11-16-99; Ord. No. 3534, § 1, 12-5-00. Formerly Code 1986, § 7.06.880)

#### 7.02.320 Billing for service.

All billing for water shall be made to the nearest five cents (\$0.05). (Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.900)

#### 7.02.330 Charges when meter is out of order.

If a meter fails to register the amount of water used, the customer will be charged at the average rate of monthly consumption as shown by the meter when the meter was in working order. (Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.920)

#### 7.02.340 Request for meter check.

A customer may request a meter check. If it is found that the meter is registering less than or more than the requirements of the state for meter accuracy, no charge will be made. If it is found that the meter is registering in accordance with state regulations, a charge which is on file in the city clerk's office will be made. This charge will be added to the next water billing.

(Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.930)

#### 7.02.350 Fire protection service.

- A. Pipes for fire protection purposes must be fitted with such fixtures as are needed for fire protection and such fixtures shall be sealed by the water utility. In no case shall such seal be broken, except in case of fire or by the fire chief for the purpose of testing the pipes, fixtures or hose.
- B. When seals are broken in case of fire, it shall be the duty of the owner or tenant of the premises to notify the water utility within twenty-four (24) hours after its occurrence, and the seal will be replaced by the water utility.

(Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.940)

#### 7.02.360 Emergency shutoff without notice.

A. The water may at any time be shut off from the mains without notice for repairs, extensions or other necessary purposes and persons having boilers supplied by direct pressure from the mains are cautioned against danger of explosion or collapse. Where meters are in use, a safety valve shall be placed between the boiler on such service and the meter at the owner's expense, and the owner shall be held responsible to the city for any and all damages to meters caused by hot water.

B. The city will not be responsible for the safety of boilers or other fixtures on the premises of any water consumer.

(Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.960)

#### 7.02.370 Penalty for violation.

Any person found guilty of violating this chapter or any part thereof shall be guilty of a misdemeanor, and, upon conviction thereof, shall be subject to a fine not exceeding three hundred dollars (\$300). (Ord. No. 2370, § 1. Formerly Code 1986, § 7.06.950)

### <u>Cross Connection Control Agreement Between Water Purveyor and Local</u> <u>Administrative Authority</u>

#### 1.0 Purpose:

To establish a policy and procedure for a joint cross-connection program between the City of Kent Water Purveyor (Public Works Operations), the City of Kent Engineering Department, and the City of Kent Local Administrative Authority (Building Services).

#### 2.0 Responsibilities:

The Water Purveyor will be responsible for the protection of the water distribution system at the property line from cross-connections through the enforcement of the city's cross connection control program. The Local Administrative Authority will be responsible for cross-connection control within the property lines as required by the city's adopted plumbing code.

#### 3.0 Procedures:

#### 3.1 New Construction (Public Works Engineering Responsibility)

Public Works Engineering Cross Connection Control Specialist (CCS) will be responsible for conducting the new construction plan review to determine whether or what type of backflow preventers are needed. This will include:

- Conduct new backflow device and site or facility inspections (premise and in-premise) for new construction
- Direct all Building owners, Land Owners and Contractors in the City to acquire permits for backflow prevention installation.
- Inspections to ensure that installation and testing are done properly.
- Forward a copy of each permit to Public Works Operations to add to the system database for future cross connection requirement surveys and annual backflow testing.

#### 3.2 Existing Facilities (Public Works Operations Responsibility)

The Public Works Operations Cross Connection Control Specialist (CCS) will administer the Cross-Connection Control Program (CCP) and assure

that the program meets or exceeds Department of Health requirements. This will include:

- A. Evaluate service connections for backflow hazards
- B. Create a priority list for inspections of high hazard facilities
- C. Inspection of existing system facilities
- D. Report the annual progress of the CCP to the Department of Health
- E. Plan and implement public education programs for cross connection control with government agencies as well as planning and implementation of the CCP.
- F. Investigate drinking water quality concerns or incidents where backflow is suspected
- G. Eliminate or control cross connections between the distribution system and the customer's premises
- H. Keep current records of all backflow preventer testing, air gaps installed in-lieu of approved backflow preventers, test kit calibration, and tester certification; and share information with Building Services.
- I. Ensure quality control for backflow testing.
- J. Inform the Department of Health and Building Services of incidents involving contamination to the public water system

#### 3.3 New and Existing Facilities (Building Services Responsibility)

Building Services will work jointly with the Public Works Department to protect the public water supply of the City of Kent in compliance with the "Safe Drinking Water Act," WAC 246-290-490 and Chapter 51-56 WAC. Building Service's primary function in this endeavor will be to initially identify potential sources of cross-connections within the buildings and structures of this City. Once identified, these potential problem areas will be addressed by the Public Works Cross-Connection Control Specialist prior to any final plumbing inspection approval. Since cross-connection protection is also covered under Chapter 6 of the 2000 Uniform Plumbing Code, Building Services has a vested interest, mandated by state law, in protecting the potable water system.

AGREED TO THIS 26th DAY OF FEBRUARY, 2003:

Don E. Wickstrom, P.E. Director of Public Works

Fred Satterstrom, Community Development Director

- WAC 246-290-490 Cross-connection control. (1) Applicability, purpose, and responsibility.
- (a) All community water systems shall comply with the cross-connection control requirements specified in this section.
- (b) All noncommunity water systems shall apply the principles and provisions of this section, including subsection (4)(b) of this section, as applicable to protect the public water system from contamination via cross-connections. Noncommunity systems that comply with subsection (4)(b) of this section and the provisions of WAC <u>51-56-0600</u> of the UPC (which addresses the installation of backflow preventers at points of water use within the potable water system) shall be considered in compliance with the requirements of this section.
- (c) The purpose of the purveyor's cross-connection control program shall be to protect the public water system, as defined in WAC 246-290-010, from contamination via cross-connections.
- (d) The purveyor's responsibility for cross-connection control shall begin at the water supply source, include all the public water treatment, storage, and distribution facilities, and end at the point of delivery to the consumer's water system, which begins at the downstream end of the service connection or water meter located on the public right of way or utility-held easement.
- (e) Under the provisions of this section, purveyors are not responsible for eliminating or controlling cross-connections within the consumer's water system. Under chapter 19.27 RCW, the responsibility for cross-connection control within the consumer's water system, i.e., within the property lines of the consumer's premises, falls under the jurisdiction of the local administrative authority.
  - (2) General program requirements.
- (a) The purveyor shall develop and implement a cross-connection control program that meets the requirements of this section, but may establish a more stringent program through local ordinances, resolutions, codes, bylaws, or operating rules.
- (b) Purveyors shall ensure that good engineering and public health protection practices are used in the development and implementation of cross-connection control programs. Department publications and the most recently published editions of references, such as, but not limited to, those listed below, may be used as guidance for cross-connection program development and implementation:
- (i) *Manual of Cross-Connection Control* published by the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California (USC Manual); or
- (ii) Cross-Connection Control Manual, Accepted Procedure and Practice published by the Pacific Northwest Section of the American Water Works Association (PNWS-AWWA Manual).
- (c) The purveyor may implement the cross-connection control program, or any portion thereof, directly or by means of a contract with another agency or party acceptable to the department.
- (d) The purveyor shall coordinate with the local administrative authority in all matters concerning cross-connection control. The purveyor shall document and describe such coordination, including delineation of responsibilities, in the written cross-connection control program required in (e) of this subsection.
- (e) The purveyor shall include a written description of the cross-connection control program in the water system plan required under WAC <u>246-290-100</u> or the small water system management program required under WAC <u>246-290-105</u>. The cross-connection control program shall include the minimum program elements described in subsection (3) of this section.
- (f) The purveyor shall ensure that cross-connections between the distribution system and a consumer's water system are eliminated or controlled by the installation of an approved backflow preventer commensurate with the degree of hazard. This can be accomplished by implementation of a cross-connection program that relies on:
  - (i) Premises isolation as defined in WAC 246-290-010; or
  - (ii) Premises isolation and in-premises protection as defined in WAC <u>246-290-010</u>.

- (g) Purveyors with cross-connection control programs that rely both on premises isolation and inpremises protection:
- (i) Shall comply with the premises isolation requirements specified in subsection (4)(b) of this section; and
- (ii) May reduce premises isolation requirements and rely on in-premises protection for premises other than the type not addressed in subsection (4)(b) of this section, if the conditions in (h) of this subsection are met.
  - (h) Purveyors may rely on in-premises protection only when the following conditions are met:
- (i) The in-premises backflow preventers provide a level of protection commensurate with the purveyor's assessed degree of hazard;
- (ii) Backflow preventers which provide the in-premises backflow protection meet the definition of approved backflow preventers as described in WAC 246-290-010;
- (iii) The approved backflow preventers are installed, inspected, tested (if applicable), maintained, and repaired in accordance with subsections (6) and (7) of this section;
- (iv) Records of such backflow preventers are maintained in accordance with subsections (3)(j) and (8) of this section; and
- (v) The purveyor has reasonable access to the consumer's premises to conduct an initial hazard evaluation and periodic reevaluations to determine whether the in-premises protection is adequate to protect the purveyor's distribution system.
  - (i) The purveyor shall take appropriate corrective action within its authority if:
- (i) A cross-connection exists that is not controlled commensurate to the degree of hazard assessed by the purveyor; or
- (ii) A consumer fails to comply with the purveyor's requirements regarding the installation, inspection, testing, maintenance or repair of approved backflow preventers required by this chapter.
  - (j) The purveyor's corrective action may include, but is not limited to:
- (i) Denying or discontinuing water service to a consumer's premises until the cross-connection hazard is eliminated or controlled to the satisfaction of the purveyor;
- (ii) Requiring the consumer to install an approved backflow preventer for premises isolation commensurate with the degree of hazard; or
- (iii) The purveyor installing an approved backflow preventer for premises isolation commensurate with the degree of hazard.
- (k) Purveyors denying or discontinuing water service to a consumer's premises for one or more of the reasons listed in (i) of this subsection shall notify the local administrative authority prior to taking such action except in the event of an emergency.
- (l) The purveyor shall prohibit the intentional return of used water to the purveyor's distribution system. Such water would include, but is not limited to, water used for heating, cooling, or other purposes within the consumer's water system.
  - (3) Minimum elements of a cross-connection control program.
- (a) To be acceptable to the department, the purveyor's cross-connection control program shall include the minimum elements identified in this subsection.
- (b) Element 1: The purveyor shall adopt a local ordinance, resolution, code, bylaw, or other written legal instrument that:
  - (i) Establishes the purveyor's legal authority to implement a cross-connection control program;
- (ii) Describes the operating policies and technical provisions of the purveyor's cross-connection control program; and
- (iii) Describes the corrective actions used to ensure that consumers comply with the purveyor's cross-connection control requirements.

- (c) Element 2: The purveyor shall develop and implement procedures and schedules for evaluating new and existing service connections to assess the degree of hazard posed by the consumer's premises to the purveyor's distribution system and notifying the consumer within a reasonable time frame of the hazard evaluation results. At a minimum, the program shall meet the following:
- (i) For new connections made on or after the effective date of these regulations, procedures shall ensure that an initial evaluation is conducted before service is provided;
- (ii) For existing connections made prior to the effective date of these regulations, procedures shall ensure that an initial evaluation is conducted in accordance with a schedule acceptable to the department; and
- (iii) For all service connections, once an initial evaluation has been conducted, procedures shall ensure that periodic reevaluations are conducted in accordance with a schedule acceptable to the department and whenever there is a change in the use of the premises.
  - (d) Element 3: The purveyor shall develop and implement procedures and schedules for ensuring that:
  - (i) Cross-connections are eliminated whenever possible;
- (ii) When cross-connections cannot be eliminated, they are controlled by installation of approved backflow preventers commensurate with the degree of hazard; and
- (iii) Approved backflow preventers are installed in accordance with the requirements of subsection (6) of this section.
- (e) Element 4: The purveyor shall ensure that personnel, including at least one person certified as a CCS, are provided to develop and implement the cross-connection control program.
- (f) Element 5: The purveyor shall develop and implement procedures to ensure that approved backflow preventers are inspected and/or tested (as applicable) in accordance with subsection (7) of this section.
- (g) Element 6: The purveyor shall develop and implement a backflow prevention assembly testing quality control assurance program, including, but not limited to, documentation of tester certification and test kit calibration, test report contents, and time frames for submitting completed test reports.
- (h) Element 7: The purveyor shall develop and implement (when appropriate) procedures for responding to backflow incidents.
- (i) Element 8: The purveyor shall include information on cross-connection control in the purveyor's existing program for educating consumers about water system operation. Such a program may include periodic bill inserts, public service announcements, pamphlet distribution, notification of new consumers and consumer confidence reports.
- (j) Element 9: The purveyor shall develop and maintain cross-connection control records including, but not limited to, the following:
- (i) A master list of service connections and/or consumer's premises where the purveyor relies upon approved backflow preventers to protect the public water system from contamination, the assessed hazard level of each, and the required backflow preventer(s);
  - (ii) Inventory information on:
- (A) Approved air gaps installed in lieu of approved assemblies including exact air gap location, assessed degree of hazard, installation date, history of inspections, inspection results, and person conducting inspections;
- (B) Approved backflow assemblies including exact assembly location, assembly description (type, manufacturer, model, size, and serial number), assessed degree of hazard, installation date, history of inspections, tests and repairs, test results, and person performing tests; and
- (C) Approved AVBs used for irrigation system applications including location, description (manufacturer, model, and size), installation date, history of inspection(s), and person performing inspection(s).

- (iii) Cross-connection program summary reports and backflow incident reports required under subsection (8) of this section.
- (k) Element 10: Purveyors who distribute and/or have facilities that receive reclaimed water within their water service area shall meet any additional cross-connection control requirements imposed by the department under a permit issued in accordance with chapter 90.46 RCW.
  - (4) Approved backflow preventer selection.
  - (a) The purveyor shall ensure that a CCS:
- (i) Assesses the degree of hazard posed by the consumer's water system upon the purveyor's distribution system; and
- (ii) Determines the appropriate method of backflow protection for premises isolation in accordance with Table 8.

## TABLE 8 APPROPRIATE METHODS OF BACKFLOW PROTECTION FOR PREMISES ISOLATION

Degree of Hazard	Application Condition	Appropriate Approved Backflow Preventer
High health cross- connection hazard	•	AG, RPBA, or RPDA
Low health cross- connection hazard	*	AG, RPBA, RPDA, DCVA, or DCDA

- (b) Premises isolation requirements.
- (i) For service connections with remises posing a high health cross-connection hazard including, but not limited to, those premises listed in Table 9, the purveyor shall ensure that an approved air gap or RPBA is installed for premises isolation.
- (ii) If the purveyor's CCS determines that no hazard exists for a connection serving premises of the type listed in Table 9, the requirements of (b)(i) of this subsection do not apply.
- (iii) The purveyor shall document, on a case-by-case basis, the reasons for not applying the requirements of (b)(i) of this subsection to a connection serving premises of the type listed in Table 9 and include such documentation in the cross-connection control program summary report required in subsection (8) of this section.

# TABLE 9 HIGH HEALTH CROSS-CONNECTION HAZARD PREMISES REQUIRING PREMISES ISOLATION BY AG OR RPBA

Agricultural (farms and dairies)

Beverage bottling plants

Car washes

Chemical plants

Commercial laundries and dry cleaners

Premises where both reclaimed water and potable water are

provided

Film processing facilities

Food processing plants

Hospitals, medical centers, nursing homes, veterinary, medical and dental clinics, and blood plasma centers

Premises with separate irrigation systems using the purveyor's water supply and with chemical addition<sup>+</sup>

Laboratories

Metal plating industries

Mortuaries

Petroleum processing or storage plants

Piers and docks

Radioactive material processing plants or nuclear reactors\*

Survey access denied or restricted

Wastewater lift stations and pumping stations

Wastewater treatment plants\*

Premises with an unapproved auxiliary water supply interconnected with the potable water supply

- + For example, parks, playgrounds, golf courses, cemeteries, estates, etc.
- \* RPBAs for connections serving these premises are acceptable only when used in combination with an in-plant approved air gap; otherwise, the purveyor shall require an approved air gap at the service connection.
  - (c) Backflow protection for single-family residences.
- (i) For single-family residential service connections, the purveyor shall comply with the requirements of (b) of this subsection when applicable.
- (ii) If the requirements of (b) of this subsection do not apply and the requirements specified in subsection (2)(h) of this section are met, the purveyor may rely on backflow protection provided at the point of hazard in accordance with WAC <u>51-56-0600</u> of the UPC for hazards such as, but not limited to:
  - (A) Irrigation systems;
  - (B) Swimming pools or spas;
  - (C) Ponds; and
  - (D) Boilers.

For example, the purveyor may accept an approved AVB on a residential irrigation system, if the AVB is properly installed in accordance with the UPC.

- (d) Backflow protection for fire protection systems.
- (i) Backflow protection is not required for residential flow-through or combination fire protection systems constructed of potable water piping and materials.
- (ii) For service connections with fire protection systems other than flow-through or combination systems, the purveyor shall ensure that backflow protection consistent with WAC <u>51-56-0600</u> of the UPC is installed. The UPC requires minimum protection as follows:
- (A) An RPBA or RPDA for fire protection systems with chemical addition or using unapproved auxiliary water supply; and
  - (B) A DCVA or DCDA for all other fire protection systems.
- (iii) For new connections made on or after the effective date of these regulations, the purveyor shall ensure that backflow protection is installed before water service is provided.
  - (iv) For existing fire protection systems:
- (A) With chemical addition or using unapproved auxiliary supplies, the purveyor shall ensure that backflow protection is installed within ninety days of the purveyor notifying the consumer of the high

health cross-connection hazard or in accordance with an alternate schedule acceptable to the purveyor.

- (B) Without chemical addition, without on-site storage, and using only the purveyor's water (i.e., no unapproved auxiliary supplies on or available to the premises), the purveyor shall ensure that backflow protection is installed in accordance with a schedule acceptable to the purveyor or at an earlier date if required by the agency administering the Uniform Building Code as adopted under chapter 19.27 RCW.
- (C) When establishing backflow protection retrofitting schedules for fire protection systems that have the characteristics listed in (d)(iv)(B) of this subsection, the purveyor may consider factors such as, but not limited to, impacts of assembly installation on sprinkler performance, costs of retrofitting, and difficulty of assembly installation.
- (e) Purveyors may require backflow preventers commensurate with the degree of hazard determined by the purveyor to be installed for premises isolation for connections serving premises that have characteristics such as, but not limited to, the following:
- (i) Complex plumbing arrangements or plumbing potentially subject to frequent changes that make it impracticable to assess whether cross-connection hazards exist;
  - (ii) A repeated history of cross-connections being established or reestablished; or
- (iii) Cross-connection hazards are unavoidable or not correctable, such as, but not limited to, tall buildings.
  - (5) Approved backflow preventers.
- (a) The purveyor shall ensure that all backflow prevention assemblies relied upon by the purveyor are models included on the current list of backflow prevention assemblies approved for use in Washington state. The current approved assemblies list is available from the department upon request.
- (b) The purveyor may rely on testable backflow prevention assemblies that are not currently approved by the department, if the assemblies:
- (i) Were included on the department and/or USC list of approved backflow prevention assemblies at the time of installation;
  - (ii) Have been properly maintained;
  - (iii) Are commensurate with the purveyor's assessed degree of hazard; and
  - (iv) Have been inspected and tested at least annually and have successfully passed the annual tests.
- (c) The purveyor shall ensure that an unlisted backflow prevention assembly is replaced by an approved assembly commensurate with the degree of hazard, when the unlisted assembly:
  - (i) Does not meet the conditions specified in (b)(i) through (iv) of this subsection;
  - (ii) Is moved; or
  - (iii) Cannot be repaired using spare parts from the original manufacturer.
- (d) The purveyor shall ensure that AVBs meet the definition of approved atmospheric vacuum breakers as described in WAC 246-290-010.
  - (6) Approved backflow preventer installation.
- (a) The purveyor shall ensure that approved backflow preventers are installed in the orientation for which they are approved (if applicable).
  - (b) The purveyor shall ensure that approved backflow preventers are installed in a manner that:
- (i) Facilitates their proper operation, maintenance, inspection, and/or in-line testing (as applicable) using standard installation procedures acceptable to the department such as those in the USC Manual or PNWS-AWWA Manual:
- (ii) Ensures that the assembly will not become submerged due to weather-related conditions such as flooding; and
  - (iii) Ensures compliance with all applicable safety regulations.
- (c) The purveyor shall ensure that approved backflow assemblies for premises isolation are installed at a location adjacent to the meter or property line or an alternate location acceptable to the purveyor.

- (d) When premises isolation assemblies are installed at an alternate location acceptable to the purveyor, the purveyor shall ensure that there are no connections between the point of delivery from the public water system and the approved backflow assembly, unless the installation of such a connection meets the purveyor's cross-connection control requirements and is specifically approved by the purveyor.
- (e) The purveyor shall ensure that approved backflow preventers are installed in accordance with the following time frames:
- (i) For new connections made on or after the effective date of these regulations, the following conditions shall be met before service is provided:
  - (A) The provisions of subsection (3)(d)(ii) of this section; and
  - (B) Satisfactory completion of a test by a BAT in accordance with subsection (7) of this section.
- (ii) For existing connections where the purveyor identifies a high health cross-connection hazard, the provisions of (3)(d)(ii) of this section shall be met:
- (A) Within ninety days of the purveyor notifying the consumer of the high health cross-connection hazard; or
  - (B) In accordance with an alternate schedule acceptable to the purveyor.
- (iii) For existing connections where the purveyor identifies a low health cross-connection hazard, the provisions of subsection (3)(d)(ii) of this section shall be met in accordance with a schedule acceptable to the purveyor.
- (f) The purveyor shall ensure that bypass piping installed around any approved backflow preventer is equipped with an approved backflow preventer that:
- (i) Affords at least the same level of protection as the approved backflow preventer that is being bypassed; and
  - (ii) Complies with all applicable requirements of this section.
  - (7) Approved backflow preventer inspection and testing.
  - (a) The purveyor shall ensure that:
- (i) A CCS inspects backflow preventer installations to ensure that protection is provided commensurate with the assessed degree of hazard;
  - (ii) Either a BAT or CCS inspects:
- (A) Air gaps installed in lieu of approved backflow prevention assemblies for compliance with the approved air gap definition; and
  - (B) Backflow prevention assemblies for correct installation and approval status.
  - (iii) A BAT tests approved backflow prevention assemblies for proper operation.
- (b) The purveyor shall ensure that inspections and/or tests of approved air gaps and approved backflow assemblies are conducted:
  - (i) At the time of installation;
- (ii) Annually after installation, or more frequently, if required by the purveyor for connections serving premises or systems that pose a high health cross-connection hazard or for assemblies that repeatedly fail:
  - (iii) After a backflow incident; and
  - (iv) After an assembly is repaired, reinstalled, or relocated or an air gap is replumbed.
  - (c) The purveyor shall ensure that inspections of AVBs installed on irrigation systems are conducted:
  - (i) At the time of installation;
  - (ii) After a backflow incident; and
  - (iii) After repair, reinstallation, or relocation.
- (d) The purveyor shall ensure that approved backflow prevention assemblies are tested using procedures acceptable to the department, such as those specified in the most recently published edition of the USC Manual. When circumstances, such as, but not limited to, configuration or location of the

assembly, preclude the use of USC test procedures, the purveyor may allow, on a case-by-case basis, the use of alternate (non-USC) test procedures acceptable to the department.

- (e) The purveyor shall ensure that results of backflow prevention assembly inspections and tests are documented and reported in a manner acceptable to the purveyor.
- (f) The purveyor shall ensure that an approved backflow prevention assembly or AVB, whenever found to be improperly installed, defective, not commensurate with the degree of hazard, or failing a test (if applicable) is properly reinstalled, repaired, overhauled, or replaced.
- (g) The purveyor shall ensure that an approved air gap, whenever found to be altered or improperly installed, is properly replumbed or, if commensurate with the degree of hazard, is replaced by an approved RPBA.
  - (8) Recordkeeping and reporting.
  - (a) Purveyors shall keep cross-connection control records for the following time frames:
- (i) Records pertaining to the master list of service connections and/or consumer's premises required in subsection (3)(j)(i) of this section shall be kept as long as the premises pose a cross-connection hazard to the purveyor's distribution system;
- (ii) Records regarding inventory information required in subsection (3)(j)(ii) of this section shall be kept for five years or for the life of the approved backflow preventer whichever is shorter; and
- (iii) Records regarding backflow incidents and annual summary reports required in subsection (3)(j)(iii) of this section shall be kept for five years.
- (b) Purveyors may maintain cross-connection control records in original form or transfer data to tabular summaries.
  - (c) Purveyors may maintain records or data in any media, such as paper, film, or electronic format.
- (d) The purveyor shall complete the cross-connection control program summary report annually. Report forms and guidance on completing the report are available from the department.
- (e) The purveyor shall make all records and reports required in subsection (3)(j) of this section available to the department or its representative upon request.
- (f) The purveyor shall notify the department, local administrative authority, and local health jurisdiction as soon as possible, but no later than the end of the next business day, when a backflow incident is known by the purveyor to have:
  - (i) Contaminated the public water system; or
  - (ii) Occurred within the premises of a consumer served by the purveyor.
  - (g) The purveyor shall:
- (i) Document details of backflow incidents on a form acceptable to the department such as the backflow incident report form included in the most recent edition of the PNWS-AWWA Manual; and
- (ii) Include all backflow incident report(s) in the annual cross-connection program summary report referenced in (d) of this subsection, unless otherwise requested by the department.

[Statutory Authority: RCW  $\underline{43.20.050}$  (2) and (3) and  $\underline{70.119A.080}$  . 03-08-037, § 246-290-490, filed 3/27/03, effective 4/27/03. Statutory Authority: RCW  $\underline{43.02.050}$  [ $\underline{43.20.050}$ ].  $\underline{99-07-021}$ , § 246-290-490, filed 3/9/99, effective 4/9/99. Statutory Authority: RCW  $\underline{43.20.050}$ . 91-02-051 (Order 124B), recodified as § 246-290-490, filed 12/27/90, effective 1/31/91. Statutory Authority: P.L. 99-339. 89-21-020 (Order 336), § 248-54-285, filed 10/10/89, effective 11/10/89. Statutory Authority: RCW  $\underline{34.04.045}$ . 88-05-057 (Order 307), § 248-54-285, filed 2/17/88. Statutory Authority: RCW  $\underline{43.20.050}$ . 83-19-002 (Order 266), § 248-54-285, filed 9/8/83.]

#### WAC 51-56-0600 Chapter 6 -- Water supply and distribution.

**603.0 Cross-Connection Control.** Cross-connection control shall be provided in accordance with the provisions of this chapter. Devices or assemblies for protection of the public water system must be models approved by the department of health under WAC <u>246-290-490</u>. The administrative authority shall coordinate with the local water purveyor where applicable in all matters concerning cross-connection control within the property lines of the premises.

No person shall install any water operated equipment or mechanism, or use any water treating chemical or substance, if it is found that such equipment, mechanism, chemical or substance may cause pollution or contamination of the domestic water supply. Such equipment or mechanism may be permitted only when equipped with an approved backflow prevention device or assembly.

<u>603.3.3</u> For devices and assemblies other than those regulated by the Washington department of health in conjunction with the local water purveyor for the protection of public water systems, the administrative authority shall ensure that the premise owner or responsible person shall have the backflow prevention assembly tested by a Washington state department of health certified backflow assembly tester:

- (1) At the time of installation, repair or relocation; and
- (2) At least on an annual schedule thereafter, unless more frequent testing is required by the administrative authority.

**603.4.6.1** Potable water supplies to systems having no pumps or connections for pumping equipment, and no chemical injection or provisions for chemical injection, shall be protected from backflow by one of the following devices:

- (1) Atmospheric vacuum breaker.
- (2) Pressure vacuum breaker.
- (3) Reduced pressure backflow preventer.
- (4) A double check valve may be allowed when approved by the water purveyor and the administrative authority.
- (5) A spill proof pressure vacuum breaker may be allowed when approved by the water purveyor and the administrative authority.

<u>603.4.13</u> **Potable Water Supply to Carbonators** shall be protected by a listed reduced pressure principle backflow preventer as approved by the administrative authority for the specific use.

**603.4.18.1** Except as provided under Sections 603.4.18.2 and 603.4.18.3, potable water supplies to fire protection systems that are normally under pressure, including but not limited to standpipes and automatic sprinkler systems, except in one or two family residential flow-through or combination sprinkler systems piped in materials approved for potable water distribution systems, shall be protected from back-pressure and back-siphonage by one of the following testable devices:

- 1. Double check valve assembly.
- 2. Double check detector assembly.
- 3. Reduced pressure backflow preventer.
- 4. Reduced pressure detector assembly.

Potable water supplies to fire protection systems that are not normally under pressure shall be protected from backflow and shall meet the requirements of the appropriate standard(s) referenced in Table 14-1.

**604.1** Water distribution pipe, building supply water pipe and fittings shall be of brass, copper, cast iron, galvanized malleable iron, galvanized wrought iron, galvanized steel or other approved materials. Except as provided in Section 604.13, asbestos-cement, CPVC, PE, PVC, or PEX water pipe materials manufactured to recognized standards may be used for cold water distribution systems outside a building. CPVC, PEX water pipe, tubing, and fittings, manufactured to recognized standards may be used for hot and cold water distribution systems within a building. Other products not listed in this section are acceptable for their intended use, provided that such materials or distribution systems are listed and approved in accordance with nationally recognized standards. All materials used in the water supply system, except valves and similar devices shall be of like material, except where otherwise approved by the administrative authority.

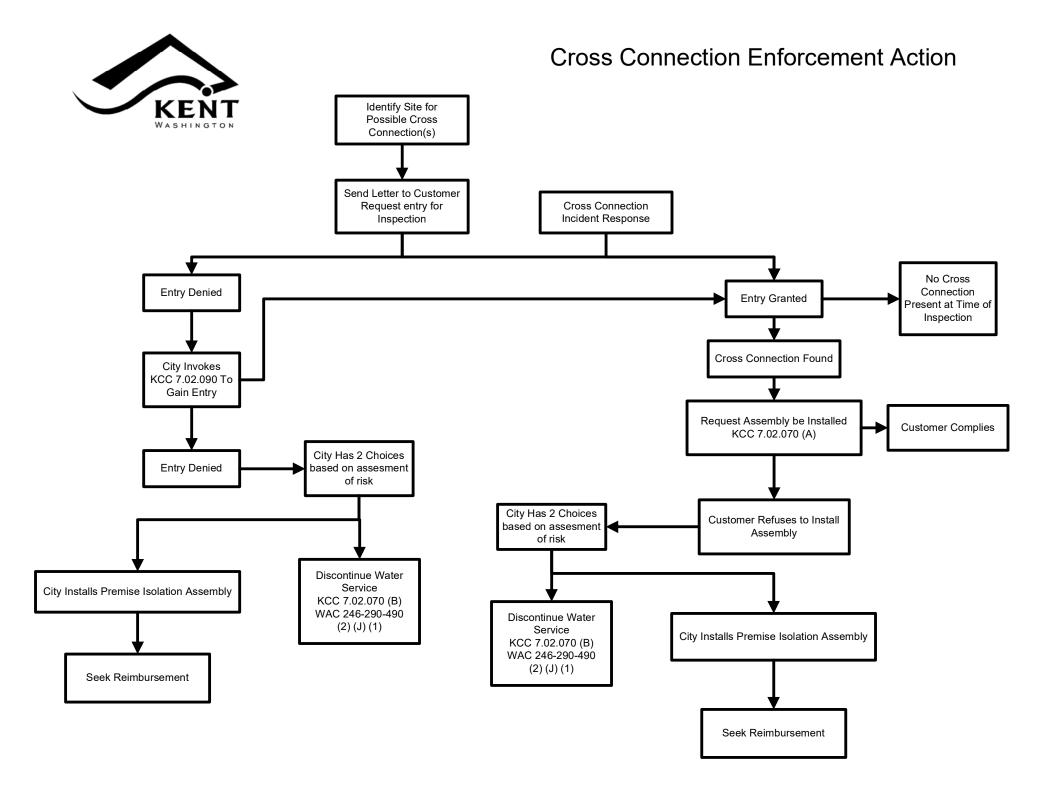
**604.13** Plastic water service piping may terminate within a building, provided the connection to the potable water distribution system shall be made as near as is practical to the point of entry and shall be accessible. Barbed insert fittings with hose clamps are prohibited as a transition fitting within the building.

**608.5** Relief valves located inside a building shall be provided with a drain, not smaller than the relief valve outlet, of galvanized steel, hard drawn copper piping and fittings, CPVC, or listed relief valve drain tube with fittings which will not reduce the internal bore of the pipe or tubing (straight lengths as opposed to coils) and shall extend from the valve to the outside of the building with the end of the pipe not more than two (2) feet (610 mm) nor less than six (6) inches (152 mm) above the ground or the flood level of the area receiving the discharge and pointing downward. Such drains may terminate at other approved locations. No part of such drain pipe shall be trapped or subject to freezing. The terminal end of the drain pipe shall not be threaded.

EXCEPTION: Replacement water heating equipment shall only be required to provide a drain pointing downward from the relief valve to extend between two feet (610 mm) and six inches (152 mm) from the floor. No additional floor drain need be provided.

**610.4** Systems within the range of Table 6-5 may be sized from that table or by the method set forth in Section 610.5.

Listed parallel water distribution systems shall be installed in accordance with their listing. [Statutory Authority: RCW 19.27.031, 19.27.074. 02-01-114, § 51-56-0600, filed 12/18/01, effective 7/1/02.]



## Figure 2 Backflow Incident Report Form

There are many backflow incidents which occur that are not reported. This is usually because they are of short duration and are not detected, the customer is not aware they should be reported, or it may not be known to whom they should be reported.

The PNWS-AWWA Cross Connection Control Committee is making an effort to bring these incidents to the attention of water purveyors and the public. If you have any knowledge regarding incidents, please fill out a copy of this form and return it to the committee, c/o the individual named on the reverse side. In addition, the state or provincial health agency should be notified.

Reporting Agency:		Report Date:
Reported By:		Title:
Mail Address:		City:
State: Zip Code:		Telephone:
Date of Incident:	Time of Occurrence:	
General Location (Street, etc.):		
Backflow Originated From:		
Name of Premise:		
Street Address:		
Contact Person:		Telephone:
Type of Business:		
Description of Contaminants: (Attach Chemical Analysis or MSDS if available)		
Distribution of Contaminants:		
Contained within customer's premise:	Yes:	No:
Number of persons affected:	_	
Effect of Contamination:		
Illness Reported:	****	
Physical irritation reported:		

BACKFLOW INCIDENT INVESTIGATION PRO	OCEDURES PNWS-AWY
Backflow Incident Report Form Page 2	
Cross Connection Source of Contaminant (boiler, chemical pump, irrigation system, etc.)	
Cause of Backflow: (main break, fire flow, etc.)	
Corrective Action Taken to Restore Water Quality: (main flushing, disinfection, etc.)	
Corrective Action Ordered to Eliminate or Protect from Cross (type of backflow preventer, location, etc.)	Connection:
Previous Cross Connection Survey of Premise:	
Date:	Ву:
Types of Backflow Preventer Isolating Premise:	
RPBA: RPDA: DCVA:	_DCDA: PVBA: SVBA:
AVB: Air Gap: None: _	Other Type:
Date of Latest Test of Assembly:	
Notification of State [Provincial] Health Authority:	
Date: Time:	Person Notified:
Attach sheets with additional information, sketche	es, and/or media information, and mail to:
	PNWS-AWWA
	c/o George Bratton
	1252 S. Farragut Drive
	Coupeville WA 98239
72	©



Public Works
Location: 400 W. Gowe
Mail to: 220 4th Avenue South • Kent, WA 98032-5895
(253) 856-5300 FAX: (253) 856-6454

# **Backflow Prevention Device Test**

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NEW									
PARTS									
AND									
REPAIRS									
REMARKS									
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DISTRIBUTION: W	HITE - ENGINEER	RING YELLO	W - APPLICANT	PINK - CERTIFI	ED TESTER				



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## Chapter 8 ASSEMBLY TEST PROCEDURES

#### INTRODUCTION

Several methods may be used to test backflow prevention assemblies. To ensure that test results obtained from certified testers are reliable, standardized testing procedures should be used. The acceptable procedures should be specified by the state or provincial health departments and the water purveyor (see Chapter 9).

The following are some of the publications or sources that provide test procedures for the reduced pressure backflow assembly, double check valve assembly and pressure vacuum breaker assemblies (PVBA and/or SVBA):

- Manufacturer's literature differential pressure gauges.
- Manufacturer's literature backflow prevention assemblies.
- Cross Connection Control Manual, 6th Edition, Appendix F, PNWS-AWWA
- Cross-Connection Control Manual, June 1989, US EPA Publication 570/9-89-007
- Backflow Prevention Assemblies Series 5000, 1991, American Society of Sanitary Engineers
- Manual of Cross-Connection Control, Ninth Edition, Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California

The test procedures listed above may vary in the test equipment used, the type of test performed to determine the operating performance of the assembly, and the criteria used to determine compliance with the operating requirements. Some tests may vary only in the sequence of the steps, or in the method of troubleshooting or diagnosing problems.

Recommended are those test procedures based on evaluating the operating requirements specified in the design standard for assembly using a differential pressure gauge. Testing of all components of a backflow prevention assembly to their performance criteria provides an addition safety factor, and thus, increases the reliability of an "approved assembly". The important operating requirements for assemblies, such as those established in American Water Works Association standards, are summarized in Appendix B.

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In this Chapter, detailed step by step procedures are not provided for the testing of backflow prevention assemblies. It is assumed that the backflow assembly tester using this Manual has received step-by-step training through a backflow assembly tester certification course. And, that the tester is familiar with the procedures for purging test cocks, isolating the assembly, connecting test equipment, bleeding air from the test equipment, etc.

In the place of step-by-step procedures, this Manual provides an outline of the recommended test objective, a summary of the recommended test method, and the minimum reporting requirements for each type of assembly. The purposes of this information is to establish a recommended minimum performance requirements of the tester in testing the various types of assemblies.

Included in Appendix F are alternate test procedures that may be approved by some jurisdictions to test assemblies. The backflow assembly tester must verify with the local authority the acceptability of any alternate test procedure. These alternate test procedures were included in previous editions of this Manual. There application may be desirable when physical constraints may prohibit the proper use of a differential pressure gauge, or completion of the recommended minimum performance requirements outlined in this Chapter (e.g., a leaking Shutoff Valve # 2).

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#### **PRELIMINARY STEPS TO TESTING ASSEMBLIES**

Prior to initiating a test of any backflow prevention assembly, the following procedures should be followed<sup>(1)</sup>

Obtain permission from the owner, or their representative, to shut down the water supply. This is necessary to insure that since all testing is accomplished under no-flow conditions, the owner is aware that the water supply will be temporarily shut off while the testing is being performed. Some commercial and industrial operations require constant and uninterrupted water supplies for cooling, boiler feed, seal pump water, etc., and water service interruptions cannot be tolerated. The water supply to hospitals and continuous process industries cannot be shut off without planned and coordinated shut downs.

For premise isolation assemblies, although notice can be given by the purveyor for an interruption of service, whenever possible, it is preferable to cooperate with the owner to arrange a mutually agreeable time for a shutdown.

The request to shut down the water supply is a necessary prerequisite to protect the customer as well as limit the liability of the tester (see also Chapter 2).

Concurrent with the request for permission to shut off the water, it is advisable to point out to the owner that while the water is shut off during the test period, any inadvertent use of water within the building will reduce the water pressure to zero. Backsiphonage could result in the building's plumbing system being contaminated through cross connections. To address this situation, it is recommended that the owner caution the inhabitants of the building not to use water until the backflow assembly test is completed and the water pressure restored. Additional options available to the owner would be the installation of two backflow assemblies in parallel that would enable a protected by-pass flow around the assembly to be tested (see Chapter 7). Also if all water outlets are properly equipped with backflow assemblies and devices within the building, backsiphonage would not occur while assemblies are being tested, or for other reasons.

- 2. Determine the type of assembly to be tested, i.e. RPBA, DCVA, PVBA or SVBA.
- Determine the flow direction (reference directional flow arrows or wording provided by the manufacturer on the assembly).

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(C)

<sup>(1)</sup> Portions copied with permission from work by Howard D. Hendrickson, P.E., Water Service Consultants. Mr. Hendrickson's work is also printed in the Cross-Connection Control Manual, 1989, US EPA

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- 4. Number the test cocks (mentally), flush them of potential debris, and assemble appropriate test cock adapters and bushings that may be required.
- 5. Shut off the downstream isolating valve (Shutoff Valve # 2).
- Hook up the test equipment in the manner appropriate to the assembly being tested and the specific test being performed.

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# TEST PROCEDURES FOR REDUCED PRESSURE BACKFLOW AND REDUCED PRESSURE DETECTOR ASSEMBLIES USING DIFFERENTIAL PRESSURE GAUGE

#### RELIEF VALVE:

#### Performance Criteria:

During normal operating conditions, whether or not there is flow through the assembly, the pressure in the zone between the check valves (zone of reduced pressure) shall be at least 2 psi less than the pressure on the inlet (supply) side of the assembly. When there is no flow from the inlet (supply) side of the assembly and the inlet pressure drops to 2 psi, the pressure within the zone of reduced pressure shall be atmospheric. If the inlet pressure drops below 2 psi, the Relief Valve shall continue to open. [AWWA C511 Sec. 4.2.1, 4.2.2]

#### Test Objective, Method and Reporting Requirements:

The first test objective is to determine the opening point and operation of differential pressure Relief Valve. To do so, the pressure between the check valves (zone of reduced pressure) must be increased by slowly bypassing water from upstream of Check Valve # 1 until the differential pressure begins to decrease. This is done through the differential pressure gauge test kit by bypassing higher supply pressure from Test Cock # 2 into the lower pressure of the zone of reduced pressure through Test Cock # 3. Closely observe the differential pressure as it slowly drops. When the first drop of water is observed, note the differential pressure. This value is the opening point of the Relief Valve and must be 2.0 psid or greater ['psid' refers to differential pressure].

## Record on the Test Report Form the differential pressure gauge reading of the point of initial opening of the Relief Valve.

The second test is to verify that the Relief Valve will continue to open with a decrease in the differential pressure below the point which the Relief Valve begins to drip. This is considered an import factor in the issue of verification of the continued performance of an RPBA or RPDA. Although it is preferable to also verify that the Relief Valve will open fully when the supply pressure drops to atmospheric, space restriction around the assembly often make it impractical to do so in the field test on all assemblies.

To determine that the Relief Valve will continue to open with a decrease in the differential pressure, the flow of water must be increased between Test Cock # 2 and Test Cock # 3. This may be done by fully opening the low side control valve on the differential pressure gauge. On 2.5" and larger assemblies, it may be necessary to install a by-pass hose separate

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from test equipment between Test Cock # 2 and Test Cock # 3 to provide a significant flow to check that the Relief Valve will continue to open.

If flow from the Relief Valve increases, as an increased supply of water is bypassed into the zone of reduced pressure, the Relief Valve shall be considered to continue to open.

#### Record on the Test Report Form that the Relief Valve "Continued to Open".

#### CHECK VALVE # 1:

#### Performance Criteria:

Check Valve # 1 shall seal tight in the direction of flow at an adequate pressure to prevent the Relief Valve from opening, and, to prevent excessive discharge due to pressure fluctuation, the minimum pressure drop (differential) across the Check Valve # 1 under normal flow conditions shall be at least 3.0 psi greater than the pressure differential necessary to cause the Relief Valve to open [AWWA C511 Sec. 4.2.1, 4.2.6].

#### Test Objective, Method and Reporting Requirements:

To test Check Valve # 1 for tightness in the direction of flow, determine the static pressure drop across the check valve using a differential pressure gauge test kit.

The pressure differential gauge reading shows the "apparent" pressure drop (differential) across Check Valve # 1. If the gauge reading remains steady, Check Valve # 1 shall be considered to hold tight in the direction of flow. This test assumes that the Relief Valve operates. This test is valid only after the test of the Relief Valve is completed, and the Relief Valve is confirmed to be operable. However, the test may be performed before the test of the Relief Valve.

Record this differential pressure gauge reading on the Test Report Form as the Check Valve # 1 pressure drop and state that check valve held tight in direction of flow.

This test does not confirm that the check valve will hold tight against backpressure. It is assumed that if the check valve hold at least 1.0 psi differential in the normal direction of flow, it will hold tight in the reverse direction of flow.

To check for the minimum 3.0 psi "buffer", subtract the pressure differential gauge reading for the Relief Valve to drip from the pressure drop across Check Valve # 1. The actual test is under static conditions, since the pressure drop "under normal flow conditions" varies with flow rate. This value shall be 3.0 psi or greater.

#### Record this value on the Test Report Form.

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#### CHECK VALVE # 2:

#### Performance Criterion:

Check Valve # 2 shall be internally loaded so that when the pressure on the inlet (supply) side of the valve is at least 1 psi and the outlet (downstream) pressure is atmospheric, the check valve will be drip tight in the normal direction of flow [AWWA C511 Sec. 4.2.5].

#### Test Objective, Method and Reporting Requirements:

To test Check Valve # 2 for tightness in the direction of flow, determine the static pressure drop across the check valve using a differential pressure gauge test kit. The test differs from the test of Check Valve # 1, in that the downstream pressure is atmospheric.

This test may be made with the differential pressure gauge high side hose is connected only to Test Cock # 3, and Test Cock # 4 open. The test kit must be held at the centerline of the assembly or at the elevation of Test Cock # 4 if the test cock is located on the top of the check valve. After water stops flowing from Test Cock # 4 and the gauge stabilizes, the differential pressure indicated by the gauge is the static pressure drop across Check Valve # 2. The pressure drop must be 1.0 psid or greater.

## Record this differential pressure gauge reading as the Check Valve # 2 pressure drop and state that check valve held tight in direction of flow.

It is recommended that Check Valve #2 be tested for tightness in the reverse direction of flow (backpressure condition) if the above noted direction of flow test is prevented by leaking isolating valves. See Alternate Test Procedures in Appendix G.

#### BYPASS METER ON RPDA:

#### Performance Criterion:

The bypass meter must register any flow (e.g., 3 to 5 gallons) that occurs through the assembly (mainline or bypass). However, it is not necessary that the meter accurately register the flow.

#### Test Objective, Method and Reporting Requirements:

Partially open the mainline assembly's Test Cock # 4. Observe bypass meter; meter dial should move to register flow.

In addition, if Test Cock # 4 of the mainline assembly is located on the bypass piping (rather than on the body of the main line assembly), close Shutoff Valve # 2 on the by-pass

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\_ • \_\_ psi

assembly, partially open Test Cock # 4. If flow continues from test cock, this indicates that bypass connection to the body of the mainline assembly is not restricted.

#### Record on Test Report Form that 'detector' meter registered flow.

#### AIR GAP:

#### Performance Criterion:

The distance of the air gap below the Relief Valve discharge vent (port) shall be in compliance with the requirements for an Approved Air Gap (see Table 6-1).

Test Objective, Method and Reporting Requirements:

Measure the distance between the Relief Valve vent and the overflow rim of the receiving drain fixture.

Dripped at:

or failed to open? \_\_\_\_ (check)

#### Record on the Test Report Form that the air gap is in compliance.

#### RPBA/RPDA

Relief Valve

 $[ \ge 2.0 \text{ psid } ]$ 

	Continued to open?	yes, no
Check Valve # 1	Pressure drop:	psi
[ ≥ 1.0 psid ]	Valve Tight?	Yes, no
Check Valve # 1	C V #1 pressure drop	psi
Buffer [≥ 3.0 psi]	minus relief valve psid	·
Check Valve # 2	Pressure drop:	psi
[ ≥ 1.0 psid ]	Valve Tight,	
	Flow direction?	yes, no
	Backpressure?	yes, no
Air Gap distance adequate?		yes, no
Test Cock # 4 opened, meter move	d?	yes, no
Detector Meter Reading:		
	******	
		<del></del> -
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#### TEST PROCEDURE FOR DOUBLE CHECK VALVE AND DOUBLE CHECK DETECTOR ASSEMBLIES USING DIFFERENTIAL PRESSURE GAUGE

#### CHECK VALVE # 1 AND CHECK VALVE # 2:

#### Performance Criteria:

Check valves shall be loaded so that when the supply pressure is at least 1.0 psi and the outlet pressure is atmospheric, each check valve shall be drip tight in the normal direction of flow. There shall be no leakage past any check valve when the pressure conditions that causes backflow are present. [AWWA C510, Sec. 4.2].

Test Objective, Method and Reporting Requirements:

To test either Check Valve # 1 or # 2 for tightness in the direction of flow, determine the static pressure drop across the check valve using a differential pressure gauge test kit.

Both Shutoff Valve # 1 and # 2 must be closed. For Check Valve # 1, this test may be made with the differential pressure gauge high side hose connected only to Test Cock # 2, and Test Cock # 3 open (to atmosphere). For Check Valve # 2, this test may be made with the differential pressure gauge high side hose connected only to Test Cock # 3, and Test Cock # 4 open. For a valid pressure gauge reading, the test kit must be held at the centerline of the assembly or at the elevation of Test Cock # 4 (or Test Cock #3, for testing Check Valve #1) if the test cock is located on the top of the check valve. After water stops flowing from Test Cock # 4 and the gauge stabilizes, the differential pressure indicated by the gauge is the static pressure drop across the check valve. The pressure drop must be 1.0 psid or greater.

Record this differential pressure gauge reading on the Test Report Form as the Check Valve # 1 or Check Valve # 2 pressure drop and state that check valve held tight in direction of flow.

It is recommended that Check Valve # 2 be tested first to prevent entrapped air from giving an inaccurate test of Check Valve # 1.

The second operating requirement is that there shall be no leakage past any check valve when the pressure conditions that cause backflow are present. It is assumed that if the check valve hold at least 1.0 psi differential in the normal direction of flow, it will hold tight in the reverse direction of flow.

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#### BYPASS METER ON DCDA:

#### Performance Criterion:

The bypass meter shall register any flow that occurs through the assembly (mainline or bypass). However, it is not necessary that the meter accurately register the flow.

Test Objective, Method and Reporting Requirements:

Partially open the mainline assembly's Test Cock # 4. Observe bypass meter; meter dial should move to register flow.

In addition, if Test Cock # 4 of the mainline assembly is located on the bypass piping (rather than on the body of the main line assembly), close Shutoff Valve # 2 on the by-pass assembly, partially open Test Cock # 4. If flow continues from test cock, this indicates that bypass connection to the body of the mainline assembly is not restricted.

#### Record on Test Report Form that 'detector' meter registered flow.

#### DCVA/DCDA

Check Valve # 2 [ ≥ 1.0 psid ]	Pressure drop: Valve Tight	psi
	Flow direction?	yes, no
Check Valve # 1	Pressure drop:	psi
[ ≥ 1.0 psid ]	Valve Tight	·
	Flow direction?	yes, no
Test Cock # 4 opened, metered moved?		yes, no
Detector Meter Reading:		

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#### TEST PROCEDURE FOR PRESSURE VACUUM BREAKER AND SPILL-RESISTANT VACUUM BREAKER ASSEMBLIES USING DIFFERENTIAL PRESSURE GAUGE

#### AIR INLET:

#### Performance Criteria:

The Air Inlet Valve shall be open when the differential pressure in the body is no less than 1.0 psi above atmospheric pressure. The Air Inlet Valve shall also be fully open when the water has drained from the body.

#### Test Objective, Method and Reporting Requirements:

To determine the opening point of the Air Inlet of the PVBA, using a differential pressure gauge test kit. Both Shutoff Valve # 1 and # 2 must be closed. The differential pressure gauge high side hose should be connected only to Test Cock # 2. For a valid pressure gauge reading, the test kit must be held at the centerline of Test Cock # 2. Slightly open the high side bleed valve while observing the Air Inlet. Observe the differential pressure at which the Air Inlet Valve opens. This value must be 1.0 psid or greater.

#### Record this pressure reading on the Test Report Form.

To determine the opening point of the Air Inlet of the SVBA, using a differential pressure gauge test kit, follow the above method, but slightly open the Air Bleed Screw rather than the high side bleed valve of the differential pressure gauge.

#### CHECK VALVE:

#### Performance Criteria:

The static pressure drop across the Check Valve shall be at least 1.0 psi.

#### Test Objective, Method and Reporting Requirements:

To test the Check Valve for tightness in the direction of flow, determine the static pressure drop across the check valve using a differential pressure gauge test kit. This test may be made with the differential pressure gauge high side hose is connected to Test Cock # 1. For a valid gauge reading, the centerline of the test kit must be maintained at the center of the SVBA during the test. Slightly open Test Cock # 2. The Air Inlet Valve will open as water flows out of Test Cock # 2. After water stops flowing from Test Cock # 2 and the gauge stabilizes, the differential pressure indicated by the gauge is the static pressure drop across Check Valve. The pressure drop must be 1.0 psid or greater.

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#### Record this pressure reading on the Test Report Form.

To determine the opening point of the Air Inlet of the SVBA, using a differential pressure gauge test kit, follow the above method, but slightly open the Air Bleed Screw rather Test Cock # 2.

#### PVBA/SVBA

Check Valve # 1 [≥ 1.0 psid]	Pressure drop: Valve Tight?	psi Yes, no
Air Inlet [≥ 1.0 psid]	Opened at: Air Inlet opened	psi yes, no

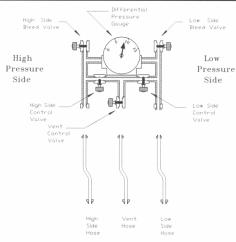


Figure 8-1 Major Component Parts Of A Five Valve **Differential Pressure Gauge** 

#### **Equipment Description:**

- Differential Pressure Gauge 0 15 PSID (0.1 or 0.2 psid graduations)
  Three 6 ft. lengths minimum 1/4" 1.D. high pressure hose with screw type couplings 1/4" needle valves, for fine control of flows
  Appropriate adapter fittings for connection to various size test cocks.

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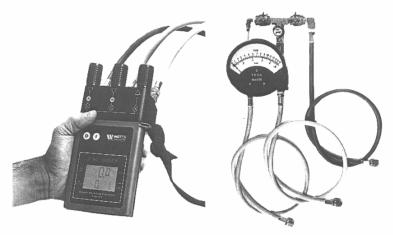


Figure 8-2 Figure 8-3
Differential Pressure Gauge Test Kits
Photos courtesy of WATTS

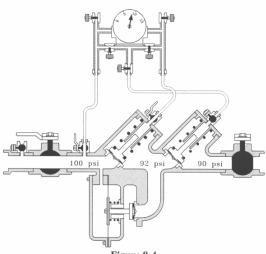


Figure 8-4 Illustration Of A RPBA Test With A Differential Pressure Gauge

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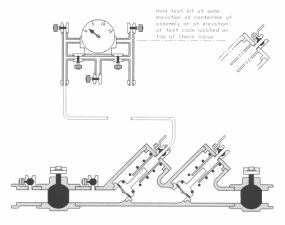


Figure 8-5 Illustration Of A DCVA Test With A Differential Pressure Gauge

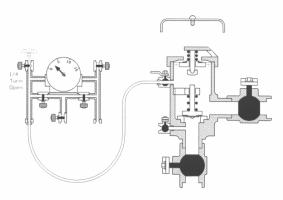


Figure 8-6 Illustration Of A PVBA Test With A Differential Pressure Gauge

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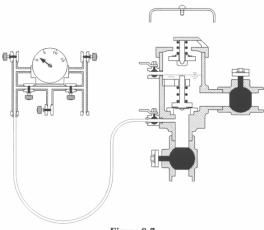


Figure 8-7 Illustration Of A PVBA Test With A Differential Pressure Gauge

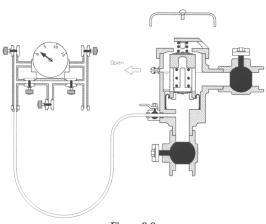


Figure 8-8 Illustration Of A SVBA Test With A Differential Pressure Gauge

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# List of Approved

# Backflow Prevention Assemblies

To look something up select one of the following, or use the search tool in Adobe Acrobat<sub>TM</sub>. You may also browse through the list.

**New Additions (Since Last Published List)** 

Shut off valve designations

**Double Check Valve Assemblies** 

**Double Check Detector Assemblies** 

**Reduced Pressure Principle Detector Assemblies** 

**Reduced Pressure Principle Backflow Prevention Assemblies** 

**Atmospheric Vacuum Breaker Assemblies** 

**Pressure Vacuum Breaker Assemblies** 

**Spill Resistant Vacuum Breaker Assemblies** 

**Manufacturer's Addresses and Phone Numbers** 

**Index of Special Notices** 

# 4 June 2003

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# List of Approved Backflow Prevention Assemblies

4 June 2003

### Supersedes All Prior Lists

The List of Approved Backflow Prevention Assemblies, includes the following modifications:

#### **ORIENTATION**

The List has been modified so that the orientation of each assembly is clearly shown with the listing of each assembly. Page 4 contains the legend for the various orientations.

#### **ADDITIONS**

#### **Double Check Valve Assemblies**

Ames

Colt 200Na - 2 1/2",3",4" (VUVD)

Maxim 200Na - 2 1/2",3" (VUVD)

Watts

757Na - 2 1/2", 3",4" (VUVD)

767Na - 2 1/2",3" (VUVD)

Wilkins

350 - 10" (VU)

450 - 8" (VUVD)

450G - 8" (VUVD)

#### **Double Check Detector Assemblies**

```
Wilkins
```

350DA - 10" (VU)

Reduced Pressure Principle Assemblies

Ames

Colt 400N - 2 1/2", 3", 4" (VUVD)

Colt 400Z - 2 1/2", 3", 4" (VUVU)

Maxim 400N - 2 1/2", 3" (VUVD)

Maxim 400Z - 2 1/2", 3" (VUVU)

Watts

957N - 2 1/2", 3", 4" (VUVD)

957Z - 2 1/2", 3", 4" (VUVU)

967N - 2 1/2", 3" (VUVD)

967Z - 2 1/2", 3" (VUVU)

**DELETIONS** (these assemblies are all being removed from the List at the re

quest of the manufacturer)

#### **Double Check Valve Assemblies**

Cla-Val

DC6LB - 3/4"

DC6LW - 3/4", 1", 1 1/2" 2"

DC7LW - 2 1/2", 3", 4", 6", 8", 10"

DC7LY - 2 1/2", 3", 4", 6", 8", 10"

DC8LW - 4", 6", 8" 10"

University of

Southern California

Kaprielian Hall 200

Los Angeles,

California 90089-2531

Tel: 213 740 2032

Fax: 213 740 8399

e-mail: fccchr@usc.edu

http://www.usc.edu/fccchr/

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Cross-Connection

Control and

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#### **DELETIONS** (continued)

#### **Double Check Valve Assemblies**

Cla-Val

DC8LY - 4", 6", 8", 10"

DC8VW - 2 1/2", 3", 4", 6", 8", 10"

DC8VY - 2 1/2", 3", 4", 6", 8", 10"

DC8NW - 2 1/2", 3", 4", 6", 8", 10"

DC8NY - 2 1/2", 3", 4", 6", 8", 10"

#### **Double Check Detector Assemblies**

Cla-Val

DD7LY - 3", 4", 6", 8", 10"

DD8LY - 4", 6", 8"

DD8VY - 2 1/2", 3", 4", 6", 8", 10"

DD8NY - 2 1/2", 3", 4", 6", 8", 10"

#### **Reduced Pressure Principle Detector Assemblies**

Cla-Val

RD7LY - 2 1/2", 3", 4", 6", 8", 10"

#### **Reduced Pressure Principle Assemblies**

Cla-Val

```
RP6LW - 3/4", 1", 1 1/4", 1 1/2", 2"
RP6VW - 3/4", 1", 1 1/2", 2"
RP7LW - 2 1/2", 3", 4", 6", 8", 10"
RP7LY - 2 1/2", 3", 4", 6", 8", 10"
RP8LW - 2 1/2", 3", 4", 6", 8"
RP8LY - 2 1/2", 3", 4", 6", 8"
RP8VW - 2 1/2", 3", 4", 6", 8", 10"
RP8VY - 2 1/2", 3", 4", 6", 8", 10"
RP8NW - 2 1/2", 3", 4", 6", 8", 10"
RP8NY - 2 1/2", 3", 4", 6", 8", 10"
MODIFICATIONS (These assemblies are now listed as "Spare Parts Only," notated by ¬)
Double Check Valve Assemblies
```

Cla-Val

D2 - 3/4", 1", 1 1/4", 1 1/2"

#### **Reduced Pressure Principle Detector Assemblies**

Cla-Val

18-4 - 10"

#### **Reduced Pressure Principle Assemblies**

RP-2 - 3/4", 1", 1 1/4", 1 1/2"

RP-4 - 2"

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### Notice:

applications

The original Certificate of Approval - identified by the Edition of the Manual and the Approved date shown below - is valid only if the original or renewal date shown hereon is within three (3) years of the current date. The responsibility to request a renewal of an Approval is that of each manufacturer. The Foundation retains the right of determining the extent of re-evaluation required before renewal is granted. Certificates of Approval are not recalled for the purpose of updating the effective date. This revision of date is only published via the current List of Approved Backflow Prevention Assemblies. Unless otherwise specified by the manufacturer all assemblies are to be installed on cold potable water

- below 110<sub>°</sub>F. Also all of the assemblies listed are Approved for INDICATED ORIENTATION ONLY (Please see the legend on page 3). Use of spare parts other than those of the original manufacturer invalidates the Approval.

# Shutoff Valves

The backflow prevention assemblies shown on this list have been evaluated with a specific set of shutoff valves as an integral part of the assembly. The specific shutoff valves are coded by a parenthetic code shown below the assemblies' model designations. This coding of shutoff valves is defined below. Other shutoff valves having similar performance characteristics which permit the assembly to meet the Specifications are also shown immediately

after the original shutoff valves. The use of any shutoff valve on a specific assembly, other than those listed for that specific assembly invalidates the Approval. Assemblies listed as "only spare parts available," designated by the greek letter psi  $(\neg)$  may not include the shutoff valve designation.

# List of Approved Backflow Prevention Assemblies

#### Identification of shutoff valves:

(aa) American Figure 1 - QT

(bb) American Figure 17 - NRS RW

(cc) American Figure 37 - OSY RW

(dd) Apollo Series 7B - QT

(ee) AVK Series 25 - NRS

(ff) AVK Series 23 - OSY

(Nibco F607RW OSY)

(gg) Clow R/W F6102 - NRS

(hh) Clow R/W F6136 - OSY

(ii) Fortune Figure 620 - QT

Formerly Figure 601

private labeled as:

Ames

Buckner

Febco

Flomatic

Hersey

Wilkins

(jj) Kennedy Ken Seal I - NRS

(kk) Kennedy Ken Seal I - OSY

(II) Kennedy Ken Seal II - NRS

(mm) Kennedy Ken Seal II - OSY

(nn) Lee Brass - QT

(oo) Watts 405-RW

(pp) Watts 408-OSY

(gg) Mueller R/W HP NRS

(rr) Mueller R/W HP OSY

(ss) Toro/Orion Integral Ball Valve - QT

(tt) American Flow Control

(Waterous) Series 500 - NRS

(uu) American Flow Control

(Waterous) Series 500 - OSY

(vv) Watts Figure FBV (& FBV-E) - QT

(ww) Watts G4000FDA - QT

(xx) Watts Series 6080 (& 6080-E) - QT

(yy) Matco-Norca 10RW (NRS)

(zz) Matco-Norca 105U (OSY)

(aaa) American Flow Control Series 2500-NRS

(bbb) American Flow Control Series 2500-OSY

(ccc) M&H Model 4067-02 (NRS)

(ddd) M&H Model 4068-02 (OSY)

(eee) Stockham Model G-610 (OSY)

(fff) Febco Series 620 - QT

(ggg) Fortune Figure 620U - QT

(hhh) Watts Figure S-FBV (& S-FBV-E) - QT

(iii) Mueller Model A2360 - NRS

(int) Shutoff valve is integral part of assembly

(jjj) Febco Series 621 - QT

(kkk) Febco Series 620U - QT

(III) Mueller Model R2360 - OSY

(mmm) Conbraco Series IBVE-125 - QT

(nnn) Kennedy Ken Seal II Post Indicator/Tapping Valve

(ooo) Febco Series 622 - QT

(ppp) Clow Series F6105 - NRS

(qqq) Clow Series F6138 - OSY

(rrr) Apollo Series 7B-308-01 (& 7B-308-31)

(sss) Clow Series F6104 - NRS

(ttt) Clow Series F6137 - OSY

(uuu) Apollo Series 7H - QT

(vvv) Clow R/W F6136-OSY Post Indicator/Tapping

) | | |

(www) Clow R/W F6138-OSY Post Indicator/Tapping

Valve

(xxx) Febco Series 622U QT (yyy) Victaulic Series 702 (Butterfly valves)

# DC, DCDA, RP, RPDA

Horizontal

(H)

(VU)

(VD)

(VUVD)

(VUVU)

(VDVU)

(VDVD)

(HVD)

(VUH)

(H)

(VD)

(VUVD)

(VUH)

### **PVB/SVB**

(H)

(VUH)

# **AVB**

# Key

Vertical Up

Down (H) (D)

(U) (V)

Shutoff Valve

Air inlet Valve

Direction of Flow

# Sample

# (VDVU)

Inlet- Vertical flowing down

Outlet- Vertical flowing up

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Ames – DC - 4", 6" (H) Approved 6th Ed. of Manual (14 June 1985)

Renewed 14 June 2000

 $\neg$  DC - 8" (H) Approved 7th Ed. of Manual (4 August 1987)

Renewed 4 August 2002

2000B - 1/2" (H) Approved 9th Ed. Of Manual (16 June 1997)

(vv), xx Previously Approved 8th Ed. (6 December 1993)

Renewed 16 June 2000

2000B - 1/2" (VU) Approved 9th Ed. of Manual (16 June 1997)

(vv), xx Previously Approved 8th Ed. (19 April 1996)

Renewed 16 June 2000 2000B - 3/4" (H) Approved 8th Ed. of Manual (5 April 1993) (vv),xx Renewed 5 April 2002 2000B - 3/4" (VU) Approved 8th Ed. of Manual (27 August 1996) (vv),xx Renewed 27 August 2002 2000B - 1" (H) Approved 9th Ed. of Manual (18 May 1998) Renewed 18 May 2001 (vv),xx Previously Approved 8th Ed. (26 February 1991) 2000B - 1" (VU) Approved 9th Ed. of Manual (18 May 1998) (vv),xx Renewed 18 May 2001 2000B - 1 1/4" (H,VU) Approved 8th Ed. of Manual (1 October 1996) (vv).xx Renewed 1 October 2002 2000B - 1 1/2" (H) Approved 8th Ed. of Manual (24 May 1994) (vv),xx Renewed 24 May 2000 2000B - 1 1/2" (VU) Approved 8th Ed. of Manual (11 March 1996) (vv), xx Renewed 11 March 2002 2000B - 2" (H) Approved 8th Ed. of Manual (30 June 1992) (vv),xx Renewed 30 June 2001 2000B - 2" (VU) Approved 8th Ed. of Manual (8 March 1996) (vv),xx Renewed 8 March 2002 2000BM3 - 3/4"(H.VU) Approved 9th Ed. of Manual (27 March 2000) 2000 CIV - 4" (H) Approved 6th Ed. of Manual (15 January 1982) (oo),gg,tt,pp,hh,ll,mm,uu,eee Renewed 15 January 2003 2000 CIV - 4" (VU) Approved 8th Ed. of Manual (11 March 1996) (oo),gg,tt,pp,hh,ll,mm,uu,eee Renewed 11 March 2002 2000 CIV - 6" (H) Approved 6th Ed. of Manual (18 May 1982) (oo),gg,tt,pp,hh,ll,mm,uu,eee Renewed 18 May 2000 2000 CIV - 8" (H) Approved 6th Ed. of Manual (6 July 1981) (oo),gg,tt,pp,hh,ll,mm,uu,eee Renewed 6 July 2002 2000 CIV - 10" (H) Approved 6th Ed. of Manual (16 March 1983) (oo),gg,tt,pp,hh,ll,mm,uu,eee Renewed 16 March 2001 2000 CIV - 6", 8", 10" (VU) Approved 8th Ed. of Manual (5 December 1996) (oo),gg,tt,pp,hh,ll,mm,uu,eee Renewed 5 December 2002 2000-DC - 10" (H) Approved 7th Ed. of Manual (4 August 1987) (Formerly Model DC) Renewed 4 August 2002 (tt),ee,ff,gg,hh,ccc,ddd,ll,mm,uu 2000-G-DC - 10" (H) Approved 7th Ed. of Manual (4 August 1987) (Formerly Model DC) Renewed 4 August 2002 (tt),ee,ff,qq,hh,ccc,ddd,ll,mm,uu 2000-DCA - 4", 6", 8" (H) Approved 7th Ed. of Manual (11 January 1988) (Formerly Model DCA) Renewed 11 January 2003 (tt),ee,ff,qq,hh,ccc,ddd,ll,mm,uu

## Double Check Valve Assemblies

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Ames 2000-G-DCA - 4", 6", 8" (H) Approved 7th Ed. of Manual (11 January 1988)

(Formerly Model DCA) Renewed 11 January 2003

(tt),ee,ff,gg,hh,ccc,ddd,ll,mm,uu

2000 SE - 2 1/2" (H) Approved 8th Ed. of Manual (10 September 1996)

(mm),ee,ff,gg,hh,ccc,ddd,ll,tt,uu Renewed 10 September 2002

2000 SE - 6" (H) Approved 8th Ed. of Manual (22 November 1993)

(tt),ee,ff,gg,hh,ccc,ddd,ll,mm,uu Renewed 22 November 2002

2000 SE - 8" (H) Approved 8th Ed. of Manual (9 September 1992)

```
(tt),ee,ff,gg,hh,ccc,ddd,ll,mm,uu Renewed 9 September 2001
-2000 SS - 3/4",1" (H) Approved 8th Ed. of Manual (5 May 1995)
(ii) Renewed 5 May 2001
- 2000 SS - 1 1/4" (H) Approved 8th Ed. of Manual (14 July 1995)
(ii) Renewed 14 July 2001
- 2000 SS - 1 1/2", 2" (H) Approved 8th Ed. of Manual (13 October 1995)
(ii) Renewed 13 October 2001
2000 SS - 2 1/2", 3" (H) Approved 8th Ed. of Manual (11 July 1991)
(tt),ee,ff,gg,hh,ccc,ddd,ll,mm,uu Renewed 11 July 2000
2000 SS - 4" (H) Approved 8th Ed. of Manual (11 July 1991)
(tt),ee,ff,gg,hh,ccc,ddd,ll,mm,uu Renewed 11 July 2000
2000 SS - 6" (H) Approved 8th Ed. of Manual (9 September 1992)
(tt),ee,ff,gg,hh,ccc,ddd,ll,mm,uu Renewed 9 September 2001
2000 SS - 8" (H) Approved 8th Ed. of Manual (16 September 1996)
(mm),ee,ff,gg,hh,ccc,ddd,ll,tt,uu Renewed 16 September 2002
2000 SS - 10" (H) Approved 8th Ed. of Manual (16 February 2001)
(II), mm
2000 SS-M - 4".6" (H) Approved 8th Ed. of Manual (5 May 1995)
(tt),ee,ff,qq,hh,ccc,ddd,ll,mm,uu Renewed 5 May 2001
Colt 200a - 2 1/2", 3", 4" (H,VU) Approved 9th Ed. of Manual (7 October 2002)
(ppp),qqq,yyy
Colt 200Na - 2 1/2",3",4" (VUVD) Approved 9th Ed. of Manual (20 March 2003)
(ppp),qqq,yyy
Maxim 200a - 2 1/2", 3" (H,VU) Approved 9th Ed. of Manual (7 October 2002)
(ppp),qqq,yyy
Maxim 200Na - 2 1/2",3" (VUVD) Approved 9th Ed. of Manual (20 March 2003)
yyy,ppp,(qqq)
Beeco - See Hersey/Grinnell
Buckner – 24100 - 3/4" (H) Approved 8th Ed. of Manual (1 April 1991)
(ii) Renewed 1 April 2003
- 24101 - 1" (H) Approved 8th Ed. of Manual (1 April 1991)
(ii) Renewed 1 April 2003
¬ 24102 - 1 1/4" (H) Approved 8th Ed. of Manual (1 April 1991)
(ii) Renewed 1 April 2003
¬ 24103 - 1 1/2" (H) Approved 8th Ed. of Manual (1 April 1991)
(ii) Renewed 1 April 2003
- 24104 - 2" (H) Approved 8th Ed. of Manual (1 April 1991)
(ii) Renewed 1 April 2003

¬ 24100/25 - 3/4" (H) Approved 8th Ed. of Manual (1 April 1991)
(ii) Renewed 1 April 2003

¬ 24101/25 - 1" (H) Approved 8th Ed. of Manual (1 April 1991)
(ii) Renewed 1 April 2003
¬ 24102/25 - 1 1/4" (H) Approved 8th Ed. of Manual (31 October 1989)
(ii) Renewed 31 October 2001
Double Check Valve Assemblies
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Buckner - 24103/25 - 1 1/2" (H) Approved 8th Ed. of Manual (31 October 1989)

(ii) Renewed 31 October 2001

¬ 24104/25 - 2" (H) Approved 8th Ed. of Manual (31 October 1989)

(ii) Renewed 31 October 2001

Cla-Val – D2 - 1 1/4", 1 1/2" (H) Approved 5th Ed. of Manual (6 November 1976) (nn), dd Renewed 6 November 2000

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¬ D2 - 3/4", 1" (H) Approved 5th Ed. of Manual (19 April 1977)
(nn), dd Renewed 19 April 2001
¬ D4 - 2" (H) Approved 8th Ed. of Manual (22 June 1989)
(nn), dd Renewed 22 June 2001
D4 - 2 1/2", 3", 4", 6", 8", 10" (H) Approved 8th Ed. of Manual (22 June 1989)
(gg),hh,gg,rr Renewed 22 June 2001
Conbraco 1/2DC - 1/2" (H,VU) Approved 9th Ed. of Manual (18 September 2000)
2 1/2DC - 2 1/2" (H,VU) Approved 9th Ed. of Manual (16 October 2000)
(II) mm
2 1/2DC-7 - 2 1/2" (H,VU) Approved 9th Ed. of Manual (23 October 2001)
(mm) [#1 SOV],
(qqq) [#2 SOV]
2 1/2DCU - 2 1/2"(VUVD) Approved 9th Ed. of Manual (10 April 2001)
(II),mm
3DC - 3" (H,VU) Approved 9th Ed. of Manual (16 October 2000)
(II) mm
3DC-7 - 3" (H,VU) Approved 9th Ed. of Manual (23 October 2001)
(mm) [#1 SOV],
(qqq) [#2 SOV]
3DCU - 3" (VUVD) Approved 9th Ed. of Manual (10 April 2001)
(II),mm
4DC - 4" (H,VU) Approved 9th Ed. of Manual (16 October 2000)
4DC-7 - 4" (H,VU) Approved 9th Ed. of Manual (23 October 2001)
(mm) [#1 SOV],
(qqq) [#2 SOV]
4DCU - 4" (VUVD) Approved 9th Ed. of Manual (10 April 2001)
6DC - 6" (H.VU) Approved 9th Ed. of Manual (16 October 2000)
(II) mm
6DC-7 - 6" (H,VU) Approved 9th Ed. of Manual (23 October 2001)
(mm) [#1 SOV].
(qqq) [#2 SOV]
6DCU - 6" (VUVD) Approved 9th Ed. of Manual (10 April 2001)
8DC - 8" (H,VU) Approved 9th Ed. of Manual (16 January 2003)
(mm), II
10DC - 10" (H,VU) Approved 9th Ed. of Manual (16 January 2003)
(mm).ll
40-100-02 - 3" (H) Approved 8th Ed. of Manual (8 April 1991)
(tt),bb.ee.ll Renewed 8 April 2003
40-100-03 - 3" (H) Approved 8th Ed. of Manual (8 April 1991)
(uu).cc.mm Renewed 8 April 2003
40-100-05 - 3" (H) Approved 8th Ed. of Manual (8 December 1998)
(mmm) Renewed 8 December 2001
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Conbraco 40-103-02 - 1/2" (H) Approved 8th Ed. of Manual (1 May 1995)
(dd) Renewed 1 May 2001
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40-104-02 - 3/4" (H) Approved 8th Ed. of Manual (17 March 1989)

40-104-T2- 3/4" (H) Approved 8th Ed. of Manual (27 June 1996)

(dd) Renewed 17 March 2001

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(dd) [formerly 40-104-99T] Renewed 27 June 2002
40-104-A2 - 3/4" (H) Approved 8th Ed. of Manual (21 June 1993)
(dd) Renewed 21 June 2002
40-104-A2T - 3/4" (H) Approved 8th Ed. of Manual (25 March 1992)
(dd) Renewed 25 March 2001
40-104-TC2 - 3/4" (H) Approved 8th Ed. of Manual (30 November 1998)
(dd) Renewed 30 November 2001
40-105-02 - 1" (H) Approved 8th Ed. of Manual (17 March 1989)
(dd) Renewed 17 March 2001
40-105-T2- 1" (H) Approved 8th Ed. of Manual (27 June 1996)
(dd) [formerly 40-105-99T] Renewed 27 June 2002
40-105-A2 - 1" (H) Approved 8th Ed. of Manual (21 June 1993)
(dd) Renewed 21 June 2002
40-105-A2T - 1" (H) Approved 8th Ed. of Manual (25 March 1992)
(dd) Renewed 25 March 2001
40-105-TC2 - 1" (H) Approved 8th Ed. of Manual (30 November 1998)
(dd) Renewed 30 November 2001
40-106-02 - 1 1/4" (H) Approved 8th Ed. of Manual (6 April 1992)
(dd) Renewed 6 April 2001
40-106-A2 - 1 1/4" (H) Approved 8th Ed. of Manual (21 June 1993)
(dd) Renewed 21 June 2002
40-106-A2T - 1 1/4" (H) Approved 8th Ed. of Manual (22 May 1993)
(dd) Renewed 22 May 2002
40-106-T2- 1 1/4" (H) Approved 8th Ed. of Manual (9 October 1996)
(dd) [formerly 10-106-99T] Renewed 9 October 2002
40-107-02 - 1 1/2" (H) Approved 8th Ed. of Manual (17 March 1989)
(dd) Renewed 17 March 2001
40-107-A2 - 1 1/2" (H) Approved 8th Ed. of Manual (22 May 1993)
(dd) Renewed 22 May 2002
40-107-A2T - 1 1/2" (H) Approved 8th Ed. of Manual (22 May 1993)
(dd) Renewed 22 May 2002
40-107-T2 - 1 1/2" (H) Approved 8th Ed. of Manual (9 October 1996)
(dd) [formerly 40-107-99T] Renewed 9 October 2002
40-108-02 - 2" (H) Approved 8th Ed. of Manual (17 March 1989)
(dd) Renewed 17 March 2001
40-108-A2 - 2" (H) Approved 8th Ed. of Manual (22 May 1993)
(dd) Renewed 22 May 2002
40-108-A2T - 2" (H) Approved 8th Ed. of Manual (22 May 1993)
(dd) Renewed 22 May 2002
40-108-T2 - 2" (H) Approved 8th Ed. of Manual (9 October 1996)
(dd) [formerly 40-108-99T] Renewed 9 October 2002
40-109-02 - 2 1/2" (H) Approved 8th Ed. of Manual (8 April 1991)
(tt).bb.ee.ll Renewed 8 April 2003
40-109-03 - 2 1/2" (H) Approved 8th Ed. of Manual (8 April 1991)
(uu),cc,mm Renewed 8 April 2003
40-109-05 - 2 1/2" (H) Approved 8th Ed. of Manual (8 December 1998)
(mmm) Renewed 8 December 2001
40-10A-02 - 4" (H) Approved 8th Ed. of Manual (8 April 1991)
(tt),bb,ee,ll Renewed 8 April 2003
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Conbraco 40-10A-03 - 4" (H) Approved 8th Ed. of Manual (8 April 1991) (uu),cc,mm Renewed 8 April 2003

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40-10A-05 - 4" (H) Approved 8th Ed. of Manual (8 December 1998)
(mmm) Renwed 8 December 2001
40-10A-06 - 4" (H) Approved 8th Ed. of Manual (1 February 2000)
(mm)[#1SOV] (nnn)[#2SOV] Renewed 1 February 2003
40-10C-02 - 6" (H) Approved 8th Ed. of Manual (8 April 1991)
(tt),bb,ee,II Renewed 8 April 2003
40-10C-03 - 6" (H) Approved 8th Ed. of Manual (8 April 1991)
(uu),cc,mm Renewed 8 April 2003
40-10C-05 - 6" (H) Approved 8th Ed. of Manual (8 December 1998)
(mmm) Renewed 8 December 2001
40-10C-06 - 6" (H) Approved 8th Ed. of Manual (1 February 2000)
(mm)[#1SOV] (nnn)[#2SOV] Renewed 1 February 2003
40-10E-02 - 8" (H) Approved 8th Ed. of Manual (22 October 1991)
(tt),bb,ee,ll Renewed 22 October 2000
40-10E-03 - 8" (H) Approved 8th Ed. of Manual (22 October 1991)
(uu),cc,mm Renewed 22 October 2000
40-10E-06 - 8" (H) Approved 8th Ed. of Manual (1 February 2000)
(mm)[#1SOV] (nnn)[#2SOV] Renewed 1 February 2003
40-10G-02 - 10" (H) Approved 8th Ed. of Manual (13 April 1993)
(tt),bb,ee,ll Renewed 13 April 2002
40-10G-03 - 10" (H) Approved 8th Ed. of Manual (13 April 1993)
(uu),cc,mm Renewed 13 April 2002
40-10G-06 - 10" (H) Approved 8th Ed. of Manual (1 February 2000)
(mm)[#1SOV] (nnn)[#2SOV] Renewed 1 February 2003
Febco – 805 - 3/4", 1", 1 1/2", 2" (H) Approved 4th Ed. of Manual (29 April 1974)
Renewed 29 April 2001
- 805 - 3", 4" (H) Approved 4th Ed. of Manual (26 October 1973)
Renewed 7 January 2001
805Y - 3/4", 1" (H) Approved 6th Ed. of Manual (13 May 1982)
(ii).fff.iii.ooo Renewed 13 May 2003
805YR - 3/4", 1" (H) Approved 8th Ed. of Manual (22 January 1993)
(ii),fff,jjj,ooo Renewed 22 January 2002
805YB - 3/4" (H) Approved 8th Ed. of Manual (4 May 1994)
(ii),fff,jjj,ooo Renewed 4 May 2003
805YB - 3/4" (VU) Approved 8th Ed. of Manual (16 April 1996)
(ii) ,fff,jjj,ooo Renewed 16 April 2002
805Y - 1 1/2" (H) Approved 6th Ed. of Manual (5 January 1983)
(ii) ,fff,jjj,ooo Renewed 5 January 2001
805Y - 2" (H) Approved 6th Ed. of Manual (5 January 1983)
(ii) ,fff,ooo Renewed 5 January 2001
¬ 805Y - 2 1/2" (H) Approved 6th Ed. of Manual (7 March 1983)
Renewed 7 March 2001
¬ 805Y - 3", 4" (H) Approved 6th Ed. of Manual (4 August 1982)
Renewed 4 August 2000
¬ 805Y - 6", 8" (H) Approved 5th Ed. of Manual (26 August 1977)
(Formerly 805) Renewed 26 August 2001
¬ 805Y - 10" (H) Approved 5th Ed. of Manual (31 May 1978)
(Formerly 805) Renewed 31 May 2002
805YD - 2 1/2",3",4",6",8",10" (H) Approved 7th Ed. of Manual (19 June 1987)
(ee),ff,ll,mm,tt,uu (Formerly 805 Type YD) Renewed 19 June 2002
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Febco 850 - 1/2" (H) Approved 9th Ed. of Manual (21 November 1997)

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(fff).ooo Renewed 21 November 2000
850 - 1/2" (VU) Approved 9th Ed. of Manual (17 December 1999)
(fff),ooo Renewed 17 December 2002
850 - 1/2" (VD) Approved 9th Ed. of Manual (13 April 2000)
(fff),ooo Renewed 13 April 2003
850 - 3/4" (VD) Approved 9th Ed. of Manual (10 April 2000)
(fff),jjj Renewed 10 April 2003
850 - 3/4" (VU) Approved 9th Ed. of Manual (17 December 1999)
(fff),jjj,ooo Renewed 17 December 2002
850 - 3/4", 1", 1 1/4" (H) Approved 9th Ed. of Manual (21 November 1997)
(fff), jij, ooo Renewed 21 November 2000
850 - 1" (VD) Approved 9th Ed. of Manual (14 January 2000)
(fff),jjj,ooo Renewed 14 January 2003
850 - 1" (VU) Approved 9th Ed. of Manual (7 September 2000)
(fff),jjj,ooo
850 - 1 1/4" (VU) Approved 9th Ed. of Manual (17 July 1999)
(fff),jjj,ooo Renewed 17 July 2002
850 - 1 1/4" (VD) Approved 9th Ed. of Manual (13 April 2000)
(fff),jjj,ooo Renewed 13 April 2003
850 - 1 1/2" (H) Approved 9th Ed. of Manual (19 February 1998)
(fff).iii.ooo Renewed 19 February 2001
850 - 1 1/2" (VU) Approved 9th Ed. of Manual (17 July 1999)
(fff),jjj,ooo Renewed 17 July 2002
850 - 1 1/2" (VD) Approved 9th Ed. of Manual (13 April 2000)
(fff),jjj,ooo Renewed 13 April 2003
850 - 2" (H) Approved 9th Ed. of Manual (19 February 1998)
(fff),ooo Renewed 19 February 2001
850 - 2" (VD) Approved 9th Ed. of Manual (10 April 2000)
(fff),ooo Renewed 10 April 2003
850 - 2" (VU) Approved 9th Ed. of Manual (17 July 1999)
(fff),ooo Renewed 17 July 2002
850 - 2 1/2", 3" (H) Approved 8th Ed. of Manual (14 March 1997)
(ee),ff,ll,mm,tt,uu Renewed 14 March 2003
850 - 2 1/2", 3" (VU) Approved 8th Ed. of Manual (19 March 1997)
(ee),ff,ll,mm,tt,uu Renewed 19 March 2003
850 - 4",6" (H) Approved 8th Ed. of Manual (4 May 1994)
(ee),II,tt,ff,mm,uu,nnn Renewed 4 May 2003
850 - 8" (H) Approved 8th Ed. of Manual (4 October 1995)
(ee),II,tt,ff,mm,uu,nnn Renewed 4 October 2001
850 - 4" (VU) Approved 8th Ed. of Manual (7 February 1995)
(ee),II,tt,ff,mm,uu,nnn Renewed 7 February 2001
850 - 6" (VU) Approved 8th Ed. of Manual (31 May 1995)
(ee),II,tt,ff,mm,uu,nnn Renewed 31 May 2001
850 - 8" (VU) Approved 8th Ed. of Manual (14 October 1996)
(ee),II,tt,ff,mm,uu,nnn Renewed 14 October 2002
850F - 3/4" (H,VU,VD) Approved 9th Ed. of Manual (28 September 2001)
(fff),jjj
850U - 1/2" (H) Approved 9th Ed. of Manual (12 October 1998)
(kkk) Renewed 12 October 2001
850U - 1/2" (VU) Approved 9th Ed. of Manual (17 December 1999)
(kkk) Renewed 17 July 2002
850U - 1/2" (VD) Approved 9th Ed. of Manual (16 October 2000)
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Febco 850U - 3/4" (H) Approved 9th Ed. of Manual (8 March 1999)
(kkk) Renewed 8 March 2002
850U - 3/4" (VD) Approved 9th Ed. of Manual (16 October 2000)
(kkk)
850U - 3/4" (VU) Approved 9th Ed. of Manual (17 December 1999)
(kkk) Renwed 17 December 2002
850U - 1" (H) Approved 9th Ed. of Manual (4 August 1999)
(kkk) Renewed 4 August 2002
850U - 1" (VD) Approved 9th Ed. of Manual (14 January 2000)
(kkk) Renewed 14 January 2003
850U - 1" (VU) Approved 9th Ed. of Manual (16 October 2000)
850U - 1 1/4", 1 1/2", 2" (H) Approved 9th Ed. of Manual (12 October 1998)
(kkk) Renewed 12 October 2001
850U - 1 1/4", 1 1/2", 2" (VU) Approved 9th Ed. of Manual (4 August 1999)
(kkk) Renewed 4 August 2002
850U - 1 1/4" (VD) Approved 9th Ed. of Manual (16 October 2000)
850U - 1 1/2" (VD) Approved 9th Ed. of Manual (16 October 2000)
(kkk)
850U - 2" (VD) Approved 9th Ed. of Manual (16 October 2000)
870 - 2 1/2",3" (VUVD) Approved 8th Ed. of Manual (10 March 1995)
(ee).II.tt.ff.mm.uu Renewed 10 March 2001
870 - 4",6" (VUVD) Approved 8th Ed. of Manual (4 May 1994)
(ee),II,tt,ff,mm,uu Renewed 4 May 2003
870 - 8" (VUVD) Approved 8th Ed. of Manual (24 May 1994)
(ee),II,tt,ff,mm,uu Renewed 24 May 2003
870 - 10" (VUVD) Approved 8th Ed. of Manual (4 October 1996)
(ee),II,tt,ff,mm,uu Renewed 4 October 2002
870V - 2 1/2",3",4",6" (VUVD, VUVU) Approved 8th Ed. of Manual (8 March 1996)
(ee),II,tt,ff,mm,uu Renewed 8 March 2002
870V - 8" (VUVD, VUVU) Approved 8th Ed. of Manual (6 January 1997)
(ee),II,tt,ff,mm,uu Renewed 6 January 2003
870V - 10" (VUVD, VUVU) Approved 8th Ed. of Manual (11 July 1997)
(ee),II,tt,ff,mm,uu Renewed 11 July 2000
Flomatic DCV - 3/4", 1" (H) Approved 8th Ed. of Manual (4 May 1994)
(ii) Renewed 4 May 2003
DCV - 1 1/2",2" (H) Approved 8th Ed. of Manual (10 May 1995)
(ii) Renewed 10 May 2001
DCV - 2 1/2", 3" (H) Approved 8th Ed. of Manual (14 February 1997)
(gg), hh Renewed 14 February 2003
Flomatic DCV - 4" (H) Approved 9th Ed. of Manual (1 July 1999)
(gg),hh Renewed 1 July 2002
DCV - 6" (H) Approved 9th Ed. of Manual (31 January 2002)
(gg),hh
DCVE - 3/4",1",1 1/2",2" (H) Approved 8th Ed. of Manual (7 June 2001)
(ii)
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2 - 3", 4" (H) Approved 5th Ed. of Manual (27 December 1978)
(tt),bb,qq,iii,lll Renewed 27 December 2002
2 - 6" (H) Approved 5th Ed. of Manual (22 December 1978)
(tt),bb,qq,iii,lll Renewed 22 December 2002
2 - 8" (H) Approved 6th Ed. of Manual (6 July 1981)
(tt),bb,qq,iii,lll Renewed 6 July 2002
2 - 10" (H) Approved 6th Ed. of Manual (19 February 1982)
(tt),bb,qq,iii,lll Renewed 19 February 2003
FDC - 3/4" (H) Approved 5th Ed. of Manual (11 October 1976)
(ii) Renewed 5 October 2000
FDC - 1" (H) Approved 8th Ed. of Manual (15 February 1994)
(ii) Renewed 15 February 2003
FDC - 1 1/2" (H) Approved 5th Ed. of Manual (1 August 1979)
(ii) Renewed 1 August 2000
FDC - 2" (H) Approved 5th Ed. of Manual (20 December 1978)
(ii) Renewed 20 December 2002
Neptune - see Wilkins
Richwell - see Wilkins
SMR - see Wilkins
Watts 007 - 2 1/2" (H) Approved 8th Ed. of Manual (30 September 1990)
(oo),gg,hh,ll,mm,pp,tt,uu Renewed 30 September 2002
007 - 3" (H) Approved 8th Ed. of Manual (30 September 1990)
(oo),gg,hh,ll,mm,pp,tt,uu,eee Renewed 30 September 2002
007 - 2 1/2" (VU) Approved 8th Ed. of Manual (27 August 1996)
(oo),gg,hh,ll,mm,pp,tt,uu Renewed 27 August 2002
007 - 3" (VU) Approved 8th Ed. of Manual (27 August 1996)
(oo),gg,hh,ll,mm,pp,tt,uu,eee Renewed 27 August 2002
007QT - 1/2" (H) Approved 9th Ed. of Manual (16 June 1997)
(vv), xx Previously Approved 8th Ed. (6 December 1993)
Renewed 16 June 2000
007QT - 1/2" (VU) Approved 9th Ed. of Manual (16 June 1997)
(vv), xx Previously Approved 8th Ed. (19 April 1996)
Renewed 16 June 2000
¬ 007QT - 3/4", 1" (H) Approved 7th Ed. of Manual (11 January 1988)
Renewed 11 January 2003
¬ 007QT - 1 1/2", 2" (H) Approved 7th Ed. of Manual (21 July 1988)
(vv),xx Renewed 21 July 2000
007PCQT - 1/2" (H) Approved 8th Ed. of Manual (17 February 1995)
(vv),xx Renewed 17 February 2001
¬ 007PCQT - 1 1/2", 2" (H) Approved 8th Ed. of Manual (27 September 1994)
(vv),xx Renewed 27 September 2000
¬ 007M1QT - 3/4" (H) Approved 8th Ed. of Manual (26 February 1991)
(vv),xx Renewed 26 February 2003
007M1QT - 1" (H) Approved 9th Ed. of Manual (18 May 1998)
(vv),xx Previously Approved 8th Ed. (26 February 1991)
Renewed 18 May 2001
007M1QT - 1" (VU) Approved 9th Ed. of Manual (18 May 1998)
(vv),xx Renewed 18 May 2001
¬ 007M1QT - 1 1/2" (H) Approved 8th Ed. of Manual (30 June 1992)
(vv).xx Renewed 30 June 2001
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COMPANY MODEL-SIZE STATUS OF APPROVAL

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Watts 007M1QT - 2" (H) Approved 8th Ed. of Manual (30 June 1992)

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(vv).xx Renewed 30 June 2001
007M1QT - 2" (VU) Approved 8th Ed. of Manual (8 March 1996)
(vv).xx Renewed 8 March 2002
007M1PCQT - 3/4", 1" (H) Approved 8th Ed. of Manual (10 December 1993)
(vv),xx Renewed 10 December 2000
¬ 007M1PCQT - 1 1/2" (H) Approved 8th Ed. of Manual (27 September 1994)
(vv),xx Renewed 27 September 2000
007M1PCQT - 2" (H) Approved 8th Ed. of Manual (27 September 1994)
(vv).xx Renewed 27 September 2000
007M2QT - 3/4" (H) Approved 8th Ed. of Manual (5 April 1993)
(vv),xx Renewed 5 April 2002
007M2QT - 3/4" (VU) Approved 8th Ed. of Manual (27 August 1996)
(vv),xx Renewed 27 August 2002
007M2QT - 1 1/4" (H,VU) Approved 8th Ed. of Manual (1 October 1996)
(vv),xx Renewed 1 October 2002
007M2PCQT - 1 1/4" (H,VU) Approved 8th Ed. of Manual (9 December 1996)
(vv),xx Renewed 9 December 2002
007M2QT - 1 1/2" (H) Approved 8th Ed. of Manual (24 May 1994)
(vv),xx Renewed 24 May 2003
007M2QT - 1 1/2" (VU) Approved 8th Ed. of Manual (11 March 1996)
(vv), xx Renewed 11 March 2002
007M2PCQT - 1 1/2" (H) Approved 8th Ed. of Manual (12 September 1994)
(vv), xx Renewed 12 September 2000
007M3QT - 3/4" (H,VU) Approved 9th Ed. of Manual (18 October 1999)
(vv), xx Renewed 18 October 2002
¬ 007SSQT - 3/4", 1" (H) Approved 7th Ed. of Manual (11 January 1988)
Renewed 11 January 2003
¬ 007SSQT - 1 1/2", 2" (H) Approved 7th Ed. of Manual (21 July 1988)
(vv),xx Renewed 21 July 2000
¬ 007SSPCQT - 1 1/2", 2" (H) Approved 8th Ed. of Manual (27 September 1994)
(vv), xx Renewed 27 September 2000
¬ 007SSM1QT - 3/4", 1" (H) Approved 8th Ed. of Manual (26 February 1991)
(vv),xx Renewed 26 February 2003
¬ 007SSM1PCQT - 3/4", 1" (H) Approved 8th Ed. of Manual (10 December 1993)
(vv),xx Renewed 10 December 2002
¬ 700 - 2 1/2", 3" (H) Approved 5th Ed. of Manual (10 January 1981)
Renewed 10 January 2002
¬ 709 QT - 3/4", 1" (H) Approved 6th Ed. of Manual (4 August 1982)
(vv),xx Renewed 4 August 2000
¬ 709 QT - 1 1/2", 2" (H) Approved 6th Ed. of Manual (27 April 1982)
(vv),xx Renewed 27 April 2003
709 BB - 2 1/2", 3" (H) Approved 6th Ed. of Manual (20 July 1982)
(oo),gg,tt,pp,hh,ll,mm,uu Renewed 20 July 2000
709 - 2 1/2" (H) Approved 7th Ed. of Manual (12 June 1986)
(oo),gg,tt,pp,hh,ll,mm,uu Renewed 12 June 2001
709 - 3" (H) Approved 7th Ed. of Manual (12 June 1986)
(oo),gg,tt,pp,hh,ll,mm,uu,eee Renewed 12 June 2001
709 - 4" (H) Approved 6th Ed. of Manual (15 January 1982)
(oo),gg,tt,pp,hh,ll,mm,uu,eee Renewed 15 January 2003
709 - 4" (VU) Approved 8th Ed. of Manual (11 March 1996)
(oo),gg,tt,pp,hh,ll,mm,uu,eee Renewed 11 March 2002
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COMPANY MODEL-SIZE STATUS OF APPROVAL

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COMPANY MODEL-SIZE STATUS OF APPROVAL
Watts 709 - 6" (H) Approved 6th Ed. of Manual (18 May 1982)
(oo).gg.tt.pp.hh.ll.mm.uu.eee Renewed 18 May 2003
709 - 8" (H) Approved 6th Ed. of Manual (6 July 1981)
(oo),gg,tt,pp,hh,ll,mm,uu,eee Renewed 6 July 2002
709 - 10" (H) Approved 6th Ed. of Manual (16 March 1983)
(oo),gg,tt,pp,hh,ll,mm,uu,eee Renewed 16 March 2001
709 - 6", 8", 10" (VU) Approved 8th Ed. of Manual (5 December 1996)
(oo),gg,tt,pp,hh,ll,mm,uu,eee Renewed 5 December 2002
709QT-FDA- 2 1/2", 3",4",6",8",10" Approved 8th Ed. of Manual (30 September 1990)
(ww) (H) Renewed 30 September 2002
757a - 2 1/2", 3", 4" (H,VU) Approved 9th Ed. of Manual (7 October 2002)
(ppp),qqq,yyy
757Na - 2 1/2", 3", 4" (VUVD) Approved 9th Ed. of Manual (20 March 2003)
(ppp),qqq,yyy
767a - 2 1/2", 3" (H,VU) Approved 9th Ed. of Manual (7 October 2002)
(ppp),qqq,yyy
767Na - 2 1/2", 3" (VUVD) Approved 9th Ed. of Manual (20 March 2003)
(ppp),qqq,yyy
¬ 770 - 4" (H) Approved 8th Ed. of Manual (20 May 1992)
(oo),gg,tt,pp,hh,ll,mm,uu Renewed 20 May 2001
¬ 770 - 8" (H) Approved 8th Ed. of Manual (13 January 1993)
(oo),gg,tt,pp,hh,ll,mm,uu Renewed 13 January 2002
¬ 770 QT-FDA - 4" (H) Approved 8th Ed. of Manual (13 January 1993)
(ww) Renewed 13 January 2002
¬ 770 QT-FDA - 8" (H) Approved 8th Ed. of Manual (13 January 1993)
(ww) Renewed 13 January 2002
¬ 772 - 4" (H) Approved 8th Ed. of Manual (1 July 1992)
(oo) Renewed 1 July 2001
¬ 772 - 10" (H) Approved 8th Ed. of Manual (13 January 1993)
(oo) Renewed 13 January 2002
¬ 774 - 3/4",1" (H) Approved 8th Ed. of Manual (5 May 1995)
(ii) Renewed 5 May 2001
¬ 774 - 1 1/4" (H) Approved 8th Ed. of Manual (14 July 1995)
(ii) Renewed 14 July 2001
¬ 774 - 1 1/2", 2" (H) Approved 8th Ed. of Manual (13 October 1995)
(ii) Renewed 13 October 2001
774 - 2 1/2", 3" (H) Approved 8th Ed. of Manual (11 July 1991)
(tt),ee,ff,gg,hh,ccc,ddd,ll,mm,oo,pp,uu Renewed 11 July 2000
774 - 4" (H) Approved 8th Ed. of Manual (11 July 1991)
(tt).ee.ff.ag.hh.ccc.ddd.ll.mm.oo.pp.uu Renewed 11 July 2000
774 - 6" (H) Approved 8th Ed. of Manual (9 September 1992)
(tt),ee,ff,gg,hh,ccc,ddd,ll,mm,oo,pp,uu Renewed 9 September 2001
774 - 8" (H) Approved 8th Ed. of Manual (16 September 1996)
(mm),ee,ff,gg,hh,ccc,ddd,ll,tt,oo,pp,uu Renewed 16 September 2002
774 - 10" (H) Approved 8th Ed. of Manual (16 February 2001)
774X - 2 1/2" (H) Approved 8th Ed. of Manual (10 September 1996)
(mm),ee,ff,gg,hh,ccc,ddd,ll,tt,oo,pp,uu Renewed 10 September 2002
774X - 6" (H) Approved 8th Ed. of Manual (22 November 1993)
(tt),ee,ff,gg,hh,ccc,ddd,ll,mm,oo,pp,uu Renewed 22 November 2002
774X - 8" (H) Approved 8th Ed. of Manual (9 September 1992)
(tt),ee,ff,gg,hh,ccc,ddd,ll,mm,oo,pp,uu Renewed 9 September 2001
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775QT - 1" (H,VU) Approved 9th Ed. of Manual (12 August 1999)

(int) Renewed 12 August 2002

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COMPANY MODEL-SIZE STATUS OF APPROVAL

Watts 775QT - 1/2" (H,VU) Approved 9th Ed. of Manual (1 February 2000)

(int) Renewed 1 February 2003

775QT - 3/4" (H,VU) Approved 9th Ed. of Manual(1 February 2000)

(int) Renewed 1 February 2003

775QT - 1 1/4" (H,VU) Approved 9th Ed. of Manual (7 September 2000)

775QT - 1 1/2" (H,VU) Approved 9th Ed. of Manual (7 September 2000) (int)

775QT - 2" (H,VU) Approved 9th Ed. of Manual (28 March 2002) (int)

SS007M1QT - 1" (H,VU) Approved 9th Ed. of Manual (18 May 1998)

(hhh), Renewed 18 May 2001

SS007M3QT - 1/2" (H,VU) Approved 9th Ed. of Manual (11 September 2000) (hhh)

SS007M3QT - 3/4" (H,VU) Approved 9th Ed. of Manual (7 September 2000) (hhh)

U007QT - 1/2" (H,VU) Approved 9th Ed. of Manual (8 March 1999)

(vv),xx Renewed 8 March 2002

¬ U007QT - 3/4", 1" (H) Approved 7th Ed. of Manual (11 January 1988)

(vv),xx Renewed 11 January 2003

 $\neg$  U007QT - 1 1/2", 2" (H) Approved 7th Ed. of Manual (21 July 1988)

(vv),xx Renewed 21 July 2000

 $\neg$  U007PCQT - 3/4", 1" (H) Approved 8th Ed. of Manual (10 December 1993)

(vv),xx Renewed 10 December 2002

¬ U007PCQT - 1 1/2", 2" (H) Approved 8th Ed. of Manual (27 September 1994)

(vv),xx Renewed 27 September 2000

U007M1AQT - 3/4", 2" Approved 8th Ed. of Manual (24 February 1994)

(vv),xx (VUVD,VDVU,VUVU,VDVD) Renewed 24 February 2003

U007M1APCQT - 3/4" Approved 8th Ed. of Manual (10 December 1994)

(vv),xx (VUVD,VDVU,VUVU,VDVD) Renewed 27 September 2000

U007M1APCQT - 2" Approved 8th Ed. of Manual (27 September 1994)

(vv),xx (VUVD,VDVU,VUVU,VDVD) Renewed 27 September 2000

U007M1PCQT - 3/4", 1" (H) Approved 8th Ed. of Manual (10 December 1993)

(vv),xx Renewed 10 December 2002

U007M1PCQT - 1 1/2", 2" (H) Approved 8th Ed. of Manual (27 September 1994)

(vv),xx Renewed 27 September 2000

U007M1QT - 3/4", 1" (H) Approved 8th Ed. of Manual (30 August 1993)

(vv),xx Renewed 30 August 2002

 $\neg$  U007M1QT - 1 1/2" (H) Approved 8th Ed. of Manual (20 October 1993)

(vv),xx Renewed 20 October 2002

U007M1QT - 2" (H) Approved 8th Ed. of Manual (20 October 1993)

(vv).xx Renewed 20 October 2002

U007M2AQT - 1 1/2" Approved 8th Ed. of Manual (6 September 1994)

(vv),xx (VUVD,VDVU,VUVU,VDVD) Renewed 6 September 2000

U007M2QT - 1 1/4" (H) Approved 8th Ed. of Manual (1 October 1996)

(vv),xx Renewed 1 October 2002

U007M2QT - 1 1/2" (H) Approved 8th Ed. of Manual (6 September 1994)

(vv),xx Renewed 6 September 2000

- U007SSQT - 3/4", 1" (H) Approved 7th Ed. of Manual (11 January 1988)

(vv),xx Renewed 11 January 2003

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¬ U007SSQT - 1 1/2", 2" (H) Approved 7th Ed. of Manual (21 July 1988)
(vv),xx Renewed 21 July 2000
¬ U007SSPCQT - 3/4", 1" (H) Approved 8th Ed. of Manual (10 December 1993)
(vv),xx Renewed 10 December 2002
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Watts - U007SSPCQT - 1 1/2", 2" (H) Approved 8th Ed. of Manual (27 September 1994)
(vv),xx Renewed 27 September 2000
Wilkins 350 - 2 1/2", 3" (H) Approved 9th Ed. of Manual (5 September 2001)
(qq),ee,tt,yy,hh,ff,uu,zz
350 - 2 1/2", 3" (VU) Approved 9th Ed. of Manual (3 April 2002)
(qq),ee,tt,yy,hh,ff,uu,zz
350 - 4" (H) Approved 9th Ed. of Manual (15 September 1999)
(gg),ee,tt,yy,hh,ff,uu,zz Renewed 15 September 2002
350 - 4" (VU) Approved 9th Ed. of Manual (7 September 2000)
(qq),ee,tt,yy,hh,ff,uu,zz
350 - 6" (H) Approved 9th Ed. of Manual (18 October 1999)
(gg),ee,tt,yy,hh,ff,uu,zz Renewed 18 October 2002
350 - 6" (VU) Approved 9th Ed. of Manual (17 December 1999)
(gg),ee,tt,yy,hh,ff,uu,zz Renewed 17 December 2002
350 - 8" (H) Approved 9th Ed. of Manual (8 March 2002)
(gg),ee,tt,yy,hh,ff,uu,zz
350 - 8" (VU) Approved 9th Ed. of Manual (16 January 2003)
(gg),ee,tt,yy,hh,ff,uu,zz
350 - 10" (H) Approved 9th Ed. of Manual (28 August 2002)
(hh),gg,ee,tt,yy,ff,uu,zz
350 - 10"(VU) Approved 9th Ed. of Manual (14 March 2003)
(hh),gg,ee,tt,yy,ff,uu,zz
350G - 2 1/2". 3" (H.VU) Approved 9th Ed. of Manual (3 April 2002)
(ppp),qqq
350G - 4" (H) Approved 9th Ed. of Manual (10 April 2000)
(ppp),qqq Renewed 10 April 2003
350G - 4" (VU) Approved 9th Ed. of Manual (13 December 2000)
350G - 6" (H,VU) Approved 9th Ed. of Manual (10 April 2000)
(ppp),qqq Renewed 10 April 2003
350G - 8" (H) Approved 9th Ed. of Manual (8 March 2002)
(ppp),qqq
350GPI - 4",6" (H,VU) Approved 9th Ed. of Manual (31 July 2001)
(aga)-#1 SOV. (www)-#2 SOV
350PI - 4",6" (H,VU) Approved 9th Ed. of Manual (31 July 2001)
(hh)-#1 SOV, (vvv)-#2 SOV
450 - 2 1/2" (VUVD) Approved 9th Ed. of Manual (24 January 2002)
(gg), hh
450 - 3" (VUVD) Approved 9th Ed. of Manual (24 January 2002)
(gg), hh
450 - 4" (VUVD) Approved 9th Ed. of Manual (12 April 2000)
(ppp), ggg Renewed 12 April 2003
450 - 6" (VUVD) Approved 9th Ed. of Manual (24 May 2000)
(ppp),qqq Renewed 24 May 2003
450 - 8" (VUVD) Approved 9th Ed. of Manual (14 April 2003)
450G - 2 1/2" (VUVD) Approved 9th Ed. of Manual (24 January 2002)
(ppp), qqq
450G - 3" (VUVD) Approved 9th Ed. of Manual (24 January 2002)
(ppp), qqq
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450G - 4" (VUVD) Approved 9th Ed. of Manual (25 August 2000) (sss)

## Double Check Valve Assemblies

COMPANY MODEL-SIZE STATUS OF APPROVAL

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## Double Check Valve Assemblies

COMPANY MODEL-SIZE STATUS OF APPROVAL

Wilkins 450G - 6" (VUVD) Approved 9th Ed. of Manual (25 August 2000)

450G - 8" (VUVD) Approved 9th Ed. of Manual (14 April 2003)

¬ 550 - 3/4", 1" (H) Approved 5th Ed. of Manual (11 October 1976)

Renewed 5 October 2000

¬ 550A - 3/4", 1" (H) Approved 7th Ed. of Manual (17 April 1987)

(ii) Renewed 17 April 2002

 $-550 - 1 \frac{1}{4}$ , 1 1/2", 2" (H) Approved 5th Ed. of Manual (11 October 1976)

(ii) Renewed 5 October 2000

¬ 550 - 2 1/2" (H) Approved 7th Ed. of Manual (25 September 1986)

(gg),ee,tt, vy Renewed 25 September 2001

¬ 550 - 3" (H) Approved 5th Ed. of Manual (20 August 1979)

(gg), ee,tt,yy Renewed 20 August 2000

¬ 550 - 4" (H) Approved 5th Ed. of Manual (20 June 1980)

(gg),ee,tt,yy Renewed 20 June 2001

¬ 550 - 6" (H) Approved 6th Ed. of Manual (6 July 1981)

(gg),ee,tt,yy Renewed 6 July 2002

¬ 550 - M8" (4"x4"x8" Manifold) (H) Approved 8th Ed. of Manual (15 March 1989)

(gg),ee,tt,yy Renewed 15 March 2001

 $\overline{\phantom{a}}$  550 - M10" (6"x6"x10" Manifold) (H) Approved 6th Ed. of Manual (11 April 1983)

(formerly MBD) Renewed 11 April 2001 (gg).ee.tt.vv

950 - 3/4",1" (H) Approved 8th Ed. of Manual (18 July 1991)

(ii) Renewed 18 July 2000

950 - 1 1/4",1 1/2",2" (H) Approved 8th Ed. of Manual (5 April 1991)

(ii) Renewed 5 April 2003

950G - 4",6" (H,VU) Approved 8th Ed. of Manual (27 March 2000)

(ppp) Renewed 27 March 2003

950XL - 3/4",1",1 1/4",1 1/2",2" (H) Approved 8th Ed. of Manual (2 November 1992)

(ii) Renewed 2 November 2001

950XL - 3/4" (VU) Approved 8th Ed. of Manual (12 December 1996)

(ii) Renewed 12 December 2002

950XLD - 3/4" (H) Approved 9th Ed. of Manual (15 September 1999)

(ii) Renewed 15 September 2002

950XLD - 3/4" (VU) Approved 9th Ed. of Manual (5 January 2000)

(ii) Renewed 5 January 2003

950XLT - 3/4", 1" (H) Approved 9th Ed. of Manual (9 May 1997)

(ii) Renewed 9 May 2003

950XLT - 1 1/4" (H) Approved 9th Ed. of Manual (19 June 1998)

(ii) Renewed 19 June 2001

950XLT - 1 1/2", 2" (H) Approved 9th Ed. of Manual (9 April 1998)

(ii) Renewed 9 April 2001

950XLU - 3/4", 1", 1 1/2", 2" (H) Approved 8th Ed. of Manual (15 February 1994)

(ggg) Renewed 15 February 2003

950 - 2 1/2" (H) Approved 8th Ed. of Manual (26 November 1991)

(gg),ee,tt,yy,hh,ff,uu,zz Renewed 26 November 2000 950 - 3",4" (H) Approved 8th Ed. of Manual (8 November 1991) (gg),ee,tt,yy,hh,ff,uu,zz Renewed 8 November 2000 950 - 6" (H) Approved 8th Ed. of Manual (18 March 1992) (gg),ee,tt,yy,hh,ff,uu,zz Renewed 18 March 2001 950 - 8" (H) Approved 8th Ed. of Manual (18 March 1989) (gg),ee,tt,yy,hh,ff,uu,zz Renewed 18 March 2001 — - Only Spare Parts Available Page 18 of 52 2003 © University of Southern California

## Double Check Valve Assemblies

COMPANY MODEL-SIZE STATUS OF APPROVAL Wilkins 950 - 10" (H) Approved 8th Ed. of Manual (12 April 1994) (gg),ee,tt,yy,hh,ff,uu,zz Renewed 12 April 2003 950 - 4", 6", 8" (VU) Approved 8th Ed. of Manual (29 August 1995) (gg),ee,tt,yy,hh,ff,uu,zz Renewed 29 August 2001 950A - 3/4",1",1 1/4",1 1/2",2" (H) Approved 8th Ed. of Manual (18 July 1991) (ii) Renewed 18 July 2000 ¬ - Only Spare Parts Available Page 19 of 52 2003 © University of Southern California Ames – DCDC - 4", 6" (H) Approved 6th Ed. of Manual (14 June 1985) (K),A,B,C,D,E,F,G,H,I,J,L,M,N,O,P,Q Renewed 14 June 2000 ee.ff.aa.hh.ccc.ddd Watts 709QT - 3/4" (H) ¬ DCDC - 8" (H) Approved 7th Ed. of Manual (4 August 1987) (K),A,B,C,D,E,F,G,H,I,J,L,M,N,O,P,Q Renewed 4 August 2002 ee,ff,gg,hh,ccc,ddd Watts 709QT - 3/4" (H)

# **Detector Backflow Prevention Assemblies**WARNING

The Double Check Detector Assemblies (DCDA) and Reduced Pressure Principle Detector Assemblies (RPDA) shown below have been evaluated with a specific meter as the detector element of the assembly. That specific meter is coded by a parenthetic letter shown immediately after the size designation. This coding of meters is shown in this Section. Other meters having similar performance characteristics to permit the assembly to meet the Specifications are shown immediately after the original evaluation meter. The use of any other meter or modified bypass piping invalidates the Approval.

Most of the Approved Assemblies below utilize a line-size assembly which is not a standard or stock Approved Assembly. Increased loads are required in these linesize units to allow the assembly to accurately record low flow rates in the bypass meter. Therefore, various 'off the shelf' components can not be assembled and expected to perform satisfactorily. The bypass backflow preventer Approved with the detector assembly is listed after the meter designations in *italics*. This is only for verification purposes. Should replacement parts or a complete by-pass be needed the model number of the complete detector assembly should be used in ordering these components.

#### Identification of meters:

- (A) Hersey Model F-F 5/8"x3/4" (K) Precision 5/8"
- (B) Carlon 5/8" x 3/4" (L) Neptune Trident 8 5/8"
- (C) Dande' Model D-3 5/8"x3/4" (M)Neptune T-10 5/8"
- (D) Gamon-Calmet 5/8" (N) Badger Model 25 3/4"

- (E) Hays Acumeter 5/8"x3/4" (O) Badger 5/8" x 3/4" Model M25
- (F) Arad 5/8"x3/4" (Master Meter) (P) Hersey Model 430 Series II 5/8"
- (G) Schlumberger 5/8" x 3/4" Model MBRF (Q) Hersey Model MVR-30 3/4"
- (H) Rockwell (Sensus) SR-II 5/8" x 3/4" (R) Neptune T-10 1"
- (I) Hersey Model 430 5/8" (S) Neptune T-10 1 1/2"
- (J) ABB Model C700 5/8"x3/4"

formerly Kent

## **Double Check Detector Assemblies**

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Ames 3000 B- 2" (H,VU) Approved 9th Ed. of Manual (16 June 1997)

(H),A,B,C,D,E,F,G,I,J,K,L,M,N,O,P.Q Renewed 16 June 2000 (bbb)

Ames 1/2 2000B (H, VU), Watts 007QT - 1/2" (H, VU)

3000 CIV - 4", 6" (H) Approved 6th Ed. of Manual (27 July 1987)

(N),A,B,C, D,E,F,G,H,I,J,K,L,M,O,P,Q Renewed 27 July 2002

(pp),hh,uu,eee

Ames 2000B 1/2" (H), Watts 007QT - 1/2" (H)

3000 CIV - 4" (VU) Approved 8th Ed. of Manual (27 August 1996)

(N),A,B,C,D,E,F,G,H,I,J,K,L,M,O,P,Q Renewed 27 August 2002 (pp),hh,uu,eee

Ames 2000B 1/2" (VU), Watts 007QT - 1/2" (VU)

3000 CIV - 8" (H) Approved 6th Ed. of Manual (19 April 1987)

(N),A,B,C,D,E,F,G,H,I,J,K,L,M,O,P,Q Renewed 19 April 2002 (pp),hh,mm,uu,eee

Ames 2000B 1/2" (H), Watts 007QT - 1/2" (H)

3000 CIV - 10" (H) Approved 6th Ed. of Manual (27 July 1987)

(N),E,F,G, H,I,J,K,L,M,O,P,Q Renewed 27 July 2002

(pp),hh,mm,uu,eee

Ames 2000B 1/2" (H), Watts 007QT - 1/2" (H)

3000 CIV - 6", 8", 10" (VU) Approved 8th Ed. of Manual (5 December 1996)

(H),A,B,C,D,E,F,G,I,J,K,L,M,N,O,P,Q Renewed 5 December 2002 (pp),hh,mm,uu,eee

Ames 2000B 1/2" (VU), Watts 007QT- 1/2" (VU)

3000-DCDC - 10" (H) Approved 7th Ed. of Manual (4 August 1987)

(M),B,C,D,E,G,F,H,I,J,K,L,N,O,P,Q (Formerly DCDC) Renewed 4 August 2002 (uu),ee,ff,gg,hh,ccc,ddd

Watts 007M2QT - 3/4" (H) (- Watts 709QT - 3/4" (H)), Ames 2000B - 3/4" (H)

 $\neg$  3000-G-DCDC - 10" (H) Approved 7th Ed. of Manual (4 August 1987)

(M),B,C,D,E,FG,H,I,J,K,L,N,O,P,Q (Formerly DCDC) Renewed 4 August 2002 (uu),ee,ff,gg,hh,ccc,ddd

Watts 709QT - 3/4" (H)

- 3000 DCDA - 4" (H) Approved 7th Ed. of Manual (11 January 1988)

(M),B,C,D,E,FG,H,I,J,K,L,N,O,P,Q (Formerly DCDA) Renewed 11 January 2003 (uu),mm,ee,ff,qq,hh,ccc,ddd

Watts 007QT - 3/4" (H)

¬ 3000-G-DCDA - 4" (H) Approved 7th Ed. of Manual (11 January 1988)

(M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q (Formerly DCDA) Renewed 11 January 2003 (uu),mm,ee,ff,gg,hh,ccc,ddd

Watts 007QT - 3/4" (H)

¬ 3000 DCDA - 6" (H) Approved 7th Ed. of Manual (11 January 1988)

(M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q (Formerly DCDA-I) Renewed 11 January 2003 (uu),mm,ee,ff,gg,hh,ccc,ddd

Watts 709QT - 3/4" (H)

¬ 3000-G-DCDA - 6" (H) Approved 7th Ed. of Manual (11 January 1988)

(M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q (Formerly DCDA-I) Renewed 11 January 2003

(uu),mm,ee,ff,gg,hh,ccc,ddd

Watts 709QT - 3/4" (H)

¬ 3000 DCDA - 8" (H) Approved 7th Ed. of Manual (11 January 1988)

(M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q (Formerly DCDA) Renewed 11 January 2003

(uu),mm,ee,ff,gg,hh,ccc,ddd

Watts 007QT - 3/4" (H)

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Ames  $\neg$  3000-G-DCDA - 8" (H) Approved 7th Ed. of Manual (11 January 1988) (M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q (Formerly DCDA) Renewed 11 January 2003 (uu),mm,ee,ff,gg,hh,ccc,ddd

Watts 007QT - 3/4" (H)

3000SE - 2 1/2" (H) Approved 8th Ed. of Manual (10 September 1996)

(M),N,O,P,Q Renewed 10 September 2002

(mm),ee,ff,gg,hh,ccc,ddd,uu,ll,tt

Watts 007M2QT - 3/4" (H), Ames 2000B - 3/4" (H)

3000SE - 6" (H) Approved 8th Ed. of Manual (24 May 1995)

(M),A,B,C, D,E,F, G,H,I,J,K,L,N,O,P,Q Renewed 24 May 2001

(uu),ee,ff,gg,hh,ccc,ddd,ll,mm,tt

Watts 007M2QT - 3/4" (H), Ames 2000B - 3/4" (H)

3000SE - 8" (H) Approved 8th Ed. of Manual (9 September 1992)

(M),A,B,C,D,E,F G,H,I,J,K,L,N,O,P,Q Renewed 9 September 2001

(uu),ee,ff,gg,hh,ccc,ddd,ll,mm,tt

Watts 007M1QT - 3/4" (H)

¬ 3000SE-A - 8" (H) Approved 8th Ed. of Manual (5 May 1995)

(M),A,B,C, D,E,F, G,H,I,J,K,L,N,O,P,Q Renewed 5 May 2001

(uu),ee,ff,gg,hh,ccc,ddd,ll,mm,tt

Ames 2000SS - 3/4" (H)

3000SS - 2 1/2",3",4" (H) Approved 8th Ed. of Manual (24 May 1995)

(M),A,B,C, D,E,F, G,H,I,J,K,L,N,O,P,Q Renewed 24 May 2001

(uu),ee,ff,gg,hh,ccc,ddd,ll,mm,tt

Watts 007M2QT - 3/4" (H), Ames 2000B - 3/4" (H)

3000SS - 6" (H) Approved 8th Ed. of Manual (9 September 1992)

(M),A,B,C,D,E,F G,H,I,J,K,L,N,O,P,Q Renewed 9 September 2001

(uu),ee,ff,qq,hh,ccc,ddd,ll,mm,tt

Watts 007M1QT - 3/4" (H)

3000SS - 8" (H) Approved 8th Ed. of Manual (16 September 1996)

(M),A,B,C,D,E,F G,H,I,J,K,L,N,O,P,Q Renewed 16 September 2002

(mm),ee,ff,gg,hh,ccc,ddd,ll,tt,uu

Watts 007M2QT - 3/4" (H), Ames 2000B - 3/4" (H)

3000SS - 10" (H) Approved 8th Ed. of Manual (16 February 2001)

(J), C, D, E, F, G, H, I, K, L, M, N, O, P, Q

(II),mm

Ames 2000B - 3/4" (H)

- 3000SS-A - 6" (H) Approved 8th Ed. of Manual (5 May 1995)

(M),A,B,C, D,E,F, G,H,I,J,K,L,N,O,P,Q Renewed 5 May 2001

(uu),ee,ff,gg,hh,ccc,ddd,ll,mm,tt

Ames 2000SS - 3/4" (H)

¬ 3000SS-M - 4" (H) Approved 8th Ed. of Manual (5 May 1995)

(R) Renewed 5 May 2001

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(uu),ee,ff,gg,hh,ccc,ddd,ll,mm,tt

Ames 2000SS - 1" (H)
3000SS-M - 6" (H) Approved 8th Ed. of Manual (5 May 1995)
(S) Renewed 5 May 2001
(uu),ee,ff,gg,hh,ccc,ddd,ll,mm,tt

Watts 007M2QT - 1 1/2" (H)
3000SS-WM1 - 2 1/2",3" (H) Approved 8th Ed. of Manual (11 July 1991)
(M),A,B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 11 July 2000
(uu),ee,ff,gg,hh,ccc,ddd,
ll,mm,tt (Formerly 3000SS-prior to Serial Number 2EK0320)
Watts 007M1QT - 3/4" (H)
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Ames 3000SS-WM1 - 4" (H) Approved 8th Ed. of Manual (11 July 1991)

(M),A,B,C,D,E,F G,H,I,J,K,L,N,O,P,Q Renewed 11 July 2000

(uu),ee,ff,gg,hh,ccc,ddd,

II,mm,tt (Formerly 3000SS-prior to Serial Number 2EK0320)

Watts 007M1QT - 3/4" (H)

3000SE-WM1 - 6" (H) Approved 8th Ed. of Manual (22 November 1993)

(M),A,B,C,D,E,F G,H,I,J,K,L,N,O,P,Q Renewed 22 November 2002

(uu),ee,ff,gg,hh,ccc,ddd,

II,mm,tt (Formerly 3000SS-prior to Serial Number 2EK0320)

Watts 007M1QT - 3/4" (H)

Conbraco 2 1/2DCDA - 2 1/2" (H.VU) Approved 9th Ed. of Manual (16 October 2000)

(M),E,F,G,H,I,J,K,LN,O,P,Q

(II) mm

Conbraco Model 1/2DC 1/2" (H,VU)

2 1/2DCDA-6 - 2 1/2" (H,VU) Approved 9th Ed. of Manual (10 April 2001)

(M),E,F,G,H,I,J,K,L,N,O,P,Q

(mm)[#1SOV],(ooo)[#2SOV]

Conbraco Model 1/2DC 1/2" (H,VU)

2 1/2DCDAU - 2 1/2" (VUVD) Approved 9th Ed. of Manual (10 April 2001)

(M),E,F,G,HI,J,K,L,M,N,O,P,Q

(II),mm

Conbraco Model 1/2 DC 1/2" (H)

3DCDA - 3" (H,VU) Approved 9th Ed. of Manual (16 October 2000)

(M),E,F,G,H, I,J,K,LN,O,P,Q

(II) mm

Conbraco Model 1/2DC 1/2" (H,VU)

3DCDA-6 - 3" (H,VU) Approved 9th Ed. of Manual (10 April 2001)

(M), E, F, G, H, I, J, K, L, N, O, P, Q

(mm)[#1SOV],(ooo)[#2SOV]

Conbraco Model 1/2DC 1/2" (H,VU)

3DCDAU - 3" (VUVD) Approved 9th Ed. of Manual (10 April 2001)

(M), E, F, G, HI, J, K, L, M, N, O, P, Q

(II),mm

Conbraco Model 1/2DC 1/2" (H)

4DCDA - 4" (H,VU) Approved 9th Ed. of Manual (16 October 2000)

(M),E,F,G,H,I,J,K,LN,O,P,Q

(II) mm

Conbraco Model 1/2DC 1/2" (H,VU)

4DCDA-6 - 4" (H,VU) Approved 9th Ed. of Manual (10 April 2001)

(M),E,F,G,H,I,J,K,L,N,O,P,Q

(mm)[#1SOV],(ooo)[#2SOV]

Conbraco Model 1/2DC 1/2" (H,VU)

4DCDAU - 4" (VUVD) Approved 9th Ed. of Manual (10 April 2001)

(M),E,F,G,HI,J,K,L,M,N,O,P,Q

(II),mm

Conbraco Model 1/2 DC 1/2" (H)

6DCDA - 6" (H,VU) Approved 9th Ed. of Manual (16 October 2000)

(M),E,F,G,H,I,J,K,LN,O,P,Q

(II) mm

Conbraco Model 1/2DC 1/2" (H,VU)

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Conbraco 6DCDA-6 - 6" (H,VU) Approved 9th Ed. of Manual (10 April 2001)

(M),E,F,G,H,I,J,K,L,N,O,P,Q

(mm)[#1SOV],(ooo)[#2SOV]

Conbraco Model 1/2DC 1/2" (H,VU)

6DCDAU - 6" (VUVD) Approved 9th Ed. of Manual (10 April 2001)

(M),E,F,G,H,I,J,K,L,M,N,O,P,Q

(II),mm

Conbraco Model 1/2 DC 1/2" (H)

8DCDA - 8" (H,VU) Approved 9th Ed. of Manual (16 January 2003)

(M),F,G,H,I,J,K,L,N,O,P,Q

(mm),II

Conbraco Model 1/2DC 1/2" (H,VU)

10DCDA - 10" (H,VU) Approved 9th Ed. of Manual (16 January 2003)

(M)F,G,H,I,J,K,L,N,O,P,Q

(mm),ll

Conbraco Model 1/2DC 1/2" (H,VU)

40-600-C3 - 3" (H) Approved 8th Ed. of Manual (20 August 1996)

(M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 20 August 2002

(uu),cc,mm (Formerly 40-600-03)

Conbraco 40-104-02 - 3/4" (H)

40-600-E3 - 3" (H) Approved 8th Ed. of Manual (20 August 1996)

(M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 20 August 2002

(uu),cc,mm (Formerly 40-600-03)

Conbraco 40-104-02 - 3/4" (H)

40-60A-C3 - 4" (H) Approved 8th Ed. of Manual (13 April 1993)

(M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 13 April 2002

(uu),cc,mm (Formerly 40-60A-03)

Conbraco 40-104-02 - 3/4" (H)

40-60A-C6 - 4" (H) Approved 8th Ed. of Manual (1 February 2000)

(M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 1 February 2003

(mm)[#1SOV],(ooo)[#2SOV]

Conbraco 40-104-02 - 3/4" (H)

40-60A-E3 - 4" (H) Approved 8th Ed. of Manual (13 April 1993)

(M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 13 April 2002

(uu),cc,mm (Formerly 40-60A-03)

Conbraco 40-104-02 - 3/4" (H)

40-60A-E6 - 4" (H) Approved 8th Ed. of Manual (1 February 2000)

(M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 1 February 2003

(mm)[#1SOV],(ooo)[#2SOV]

Conbraco 40-104-02 - 3/4" (H)

40-60C-C3 - 6" (H) Approved 8th Ed. of Manual (2 June 1993)

(M),A,B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 2 June 2002 (uu),cc,mm (Formerly 40-60C-03) Conbraco 40-104-02 - 3/4" (H) 40-60C-C6 - 6" (H) Approved 8th Ed. of Manual (1 February 2000) (M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 1 February 2003 (mm)[#1SOV],(ooo)[#2SOV] Conbraco 40-104-02 - 3/4" (H) 40-60C-E3 - 6" (H) Approved 8th Ed. of Manual (2 June 1993) (M),A,B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 2 June 2002 (uu),cc,mm (Formerly 40-60C-03) Conbraco 40-104-02 - 3/4" (H)

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Conbraco 40-60C-E6 - 6" (H) Approved 8th Ed. of Manual (1 February 2000)

(M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 1 February 2003

(mm)[#1SOV],(ooo)[#2SOV]

Conbraco 40-104-02 - 3/4" (H)

40-60E-C3 - 8" (H) Approved 8th Ed. of Manual (13 April 1993)

(M),A,B,C,D,E,F,G,H,IJ,K,L,M,N,O,P,Q Renewed 13 April 2002

(uu),cc,mm (Formerly 40-60E-03)

Conbraco 40-104-02 - 3/4" (H)

40-60E-C6 - 8" (H) Approved 8th Ed. of Manual (1 February 2000)

(M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 1 February 2003

(mm)[#1SOV],(ooo)[#2SOV]

Conbraco 40-104-02 - 3/4" (H)

40-60E-E3 - 8" (H) Approved 8th Ed. of Manual (13 April 1993)

(M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 13 April 2002

(uu),cc,mm (Formerly 40-60E-03)

Conbraco 40-104-02 - 3/4" (H)

40-60E-E6 - 8" (H) Approved 8th Ed. of Manual (1 February 2000)

(M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 1 February 2003

(mm)[#1SOV],(ooo)[#2SOV]

Conbraco 40-104-02 - 3/4" (H)

40-60G-C3 - 10" (H) Approved 8th Ed. of Manual (13 April 1993)

(M),A,B,C,D,E,F,G,H,I,,J,K,L,M,N,O,P,Q Renewed 13 April 2002

(uu),cc,mm (Formerly 40-60G-03)

Conbraco 40-104-02 - 3/4" (H)

40-60G-C6 - 10" (H) Approved 8th Ed. of Manual (1 February 2000)

(M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 1 February 2003

(mm)[#1SOV],(ooo)[#2SOV]

Conbraco 40-104-02 - 3/4" (H)

40-60G-E3 - 10" (H) Approved 8th Ed. of Manual (13 April 1993)

(M),A,B,C,D,E,F,G,H,I,,J,K,L,M,N,O,P,Q Renewed 13 April 2002

(uu),cc,mm (Formerly 40-60G-03)

Conbraco 40-104-02 - 3/4" (H)

40-60G-E6 - 10" (H) Approved 8th Ed. of Manual (1 February 2000)

(M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 1 February 2003 (mm)[#1SOV],(ooo)[#2SOV]

Conbraco 40-104-02 - 3/4" (H)

Febco – 806 - 4" (H) Approved 6th Ed. of Manual (4 August 1983)

(F),A,B,C,D,E,G,H,I,J,K,L,M,N,O,P,Q Renewed 4 August 2001

Febco 805Y - 3/4" (H)

- 806 - 6",8",10" (H) Approved 6th Ed. of Manual (13 May 1982)

(F),A,B,C,D,E,G,H,I,J,K,L,M,N,O,P,Q Renewed 13 May 2003 Febco 805Y - 3/4" (H) 806YD - 3" (H) Approved 8th Ed. of Manual (26 September 1988) (M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 26 September 2000 (ff),mm,uu (Formerly 806 Type YD) Febco 805Y - 3/4" (H) 806YD - 4",6",8",10" (H) Approved 7th Ed. of Manual (10 July 1987) (F),A,B,C,D,E,G,H,I,J,K,L,M,N,O,P,Q Renewed 10 July 2002 (ff),mm,uu (Formerly 806 Type YD) Febco 805Y - 3/4" (H)

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Febco 856 - 2 1/2",3" (H) Approved 8th Ed. of Manual (19 March 1997)

(M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 19 March 2003

(ff),mm,uu

Febco 805YB - 3/4" (H)

856 - 2 1/2",3" (VU) Approved 8th Ed. of Manual (5 January 2000)

(M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 5 January 2003

(ff),mm,uu

Febco 805YB - 3/4" (VU)

856 - 4",6" (H) Approved 8th Ed. of Manual (4 May 1994)

(M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 4 May 2003

(ff),mm,uu,nnn

Febco 805YB - 3/4" (H)

856 - 4",6" (VU) Approved 8th Ed. of Manual (16 April 1996)

(M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 16 April 2002

(ff),mm,uu,nnn

Febco 805YB - 3/4" (VU)

856 - 8" (H) Approved 8th Ed. of Manual (4 October 1995)

(M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 4 October 2001

(ff),mm,uu,nnn

Febco 805YB - 3/4" (H)

856 - 8" (VU) Approved 8th Ed. of Manual (5 January 2000)

(M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 5 January 2003

(ff),mm,uu,nnn

Febco 805YB - 3/4" (VU)

876 - 2 1/2", 3" (VUVD) Approved 8th Ed. of Manual (10 March 1995)

(M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 10 March 2001

(ff),mm,uu

Febco 805YB - 3/4" (H)

876 - 4",6" (VUVD) Approved 8th Ed. of Manual (4 May 1994)

(M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 4 May 2003

(ff),mm,uu

Febco 805YB - 3/4" (H)

876 - 8" (VUVD) Approved 8th Ed. of Manual (24 May 1995)

(M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 24 May 2001

(ff),mm,uu

Febco 805YB - 3/4" (H)

876 - 10" (VUVD) Approved 8th Ed. of Manual (4 October 1996)

(M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 4 October 2002

(ff),mm,uu

Febco 805YB - 3/4" (H)

876V - 2 1/2",3",4",6" (VUVD,VUVU) Approved 8th Ed. of Manual (8 March 1996)

(M),B,C,D, E,F,G,H,I,J,K,L,N,O,P,Q Renewed 8 March 2002 (ff),ee,ll,mm,tt,uu Febco 805YB - 3/4" (H) 876V - 8" (VUVD, VUVU) Approved 8th Ed. of Manual (6 January 1997) (M),B,C,D, E,F,G,H,I,J,K,L,N,O,P,Q Renewed 6 January 2003 (ff),mm,uu Febco 805YB - 3/4" (H) 876V - 10" (VUVD, VUVU) Approved 8th Ed. of Manual (11 July 1997) (M),B,C,D, E,F,G,H,I,J,K,L,N,O,P,Q Renewed 11 July 2000 (ee), II,tt,ff,mm,uu Febco 805YB - 3/4" (H)

### Double Check Detector Assemblies

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COMPANY MODEL-SIZE STATUS OF APPROVAL

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Hersey/Grinnell DDC-II - 3" (H) Approved 6th Ed. of Manual (31 January 1985) (Q),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P Renewed 31 January 2003 (uu),cc,rr,iii,lll Hersey FDC - 3/4" (H)

DDC-II - 4",6" (H) Approved 6th Ed. of Manual (10 April 1980) (I).J.K.L.M.N.O.P.Q Renewed 18 March 2001

(uu),cc,rr,iii,lll

Hersey FDC - 3/4" (H)

DDC-II - 8" (H) Approved 6th Ed. of Manual (6 July 1981)

(I),J,K,L,M,N,O,P,Q Renewed 6 July 2002

(uu),cc,rr,iii,lll

Hersey FDC - 3/4" (H)

DDC-II - 10" (H) Approved 7th Ed. of Manual (14 March 1986)

(Q),B,C,D,E,F,G,H,I,J,K,L,M,N,O,P Renewed 14 March 2001 (uu),cc,rr,iii,lll

Hersey FDC - 3/4" (H)

Watts 007 DCDA - 2" (H) Approved 9th Ed. of Manual (16 June 1997)

(H),A,B,C,D,E,F,G,I,J,K,L,M,N,O,P,Q Renewed 16 June 2000

(bbb) Previously Approved 8th Ed. (19 April 1996)

Watts 007QT - 1/2" (H)

007 DCDA - 2" (VU) Approved 9th Ed. of Manual (16 June 1997)

(H),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 16 June 2000

(bbb) Previously Approved 8th Ed. (10 September 1996)

Watts 007QT - 1/2" (VU)

007 DCDA - 2 1/2" (H) Approved 8th Ed. of Manual (11 October 1993)

(H),D,E,F,G,I,J,K,L,M,N,O,P,Q Renewed 11 October 2002

(pp),gg,hh,ll,mm,oo,tt,uu

Watts 007M2QT - 3/4" (H) (Watts 007M1QT - 3/4" [H])

007 DCDA - 2 1/2" (VU) Approved 8th Ed. of Manual (27 August 1996)

(H),D,E,F,G,I,J,K,L,M,N,O,P,Q Renewed 27 August 2002

(pp),gg,hh,ll,mm,oo,tt,uu

Watts 007M2QT - 3/4" (VU)

007 DCDA - 3" (H) Approved 8th Ed. of Manual (19 September 1992)

(H),D,E,F,G,I,J,K,L,M,N,O,P,Q Renewed 19 September 2001

(pp),hh,mm,uu

Watts 007M2QT - 3/4" (H) (Watts 007M1QT - 3/4" [H])

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¬ 007 DCDA - 4",6" (H) Approved 8th Ed. of Manual (1 February 1995)
(H),D,E,F,G,I,J,K,L,M,N,O,P,Q Renewed 1 February 2001
(oo),gg,tt,pp,hh,uu
Watts 007M1QT - 3/4" (H)
709 DCDA - 3" (H) Approved 6th Ed. of Manual (19 April 1987)
(N),B,C,D,E,F,G,H,I,J,K,L,M,O,P,Q Renewed 19 April 2002
(pp),hh,uu,eee (Formerly 709DDC)
Watts 007QT - 1/2" (H) (Watts 007M1QT - 3/4" [H], — Watts 709QT - 3/4" [H])
709 DCDA - 4", 6" (H) Approved 6th Ed. of Manual (27 July 1987)
(N),A,B,C,D,E,F,G,H,I,J,K,L,M,O,P,Q Renewed 27 July 2002
(pp),hh,uu,eee (Formerly 709DDC)
Watts 007QT - 1/2" (H) (Watts 007M1QT - 3/4" [H]; - Watts 709QT - 3/4" [H])
709 DCDA - 4" (VU) Approved 8th Ed. of Manual (27 August 1996)
(N),A,B,C,D,E,F,G,H,I,J,K,L,M,O,P,Q Renewed 27 August 2002
(pp),hh,uu,eee
Watts 007QT - 1/2" (VU) {Watts 007M2QT [VU] - 3/4"}
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Watts 709 DCDA - 8" (H) Approved 6th Ed. of Manual (19 April 1987)
(N),A,B,C,D,E,F,G,H,I,J,K,L,M,O,P,Q Renewed 19 April 2002
(pp),hh,mm,uu,eee (Formerly 709DDC)
Watts 007QT - 1/2" (H) (Watts 007M1QT - 3/4"[H]; — Watts 709QT - 3/4"[H])
709 DCDA - 10" (H) Approved 6th Ed. of Manual (27 July 1987)
(N), E, F, G, H, I, J, K, L, M, O, P, Q Renewed 27 July 2002
(pp),hh,mm,uu,eee (Formerly 709DDC)
Watts 007QT - 1/2" (H) (Watts 007M1QT - 3/4" [H]: - Watts 709QT - 3/4" [H])
709 DCDA - 6", 8", 10" (VU) Approved 8th Ed. of Manual (5 December 1996)
(H),A,B,C,D,E,F,G,I,J,K,L,M,N,O,P,Q Renewed 5 December 2002
(pp),hh,mm,uu,eee
Watts 007QT - 1/2" (VU)

¬ 770 DCDA - 4" (H) Approved 8th Ed. of Manual (20 May 1992).

(H),A,B,C,D,E,F,G,I,J,K,L,M,N,O,P,Q Renewed 20 May 2001
(pp),hh,mm,uu
Watts 007M1QT - 3/4" (H)

¬ 770 DCDA - 8" (H) Approved 8th Ed. of Manual (13 January 1993).

(N),D,E,F,G,I,J,K,L,M,N,O,P,Q Renewed 13 January 2002
(oo),gg,hh,ll,mm,pp,tt,hh,uu
Watts 007M1QT - 3/4" (H)
¬ 772 DCDA - 4" (H) Approved 8th Ed. of Manual (1 August 1992)
(H),A,B,C,D,E,F,G,I,J,K,L,M,N,O,P,Q Renewed 1 August 2001
(00)
Watts 007M1QT 3/4" (H)
¬ 772 DCDA - 10" (H) Approved 8th Ed. of Manual (13 January 1993)
(H),A,B,C,D,E,F,G,I,J,K,L,M,N,O,P,Q Renewed 13 January 2002
(00)
Watts 007M1QT 3/4" (H)
774DCDA - 2 1/2",3",4" (H) Approved 8th Ed. of Manual (24 May 1995)
(M),A,B,C, D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 24 May 2001
(uu),ee,ff,gg,hh,ll,mm,oo,pp,tt,ccc,ddd
Watts 007M2QT - 3/4" (H), Ames 2000B - 3/4" (H)
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774DCDA- 6" (H) Approved 8th Ed. of Manual (9 September 1992) (M),A,B,C,D,E,F G,H,I,J,K,L,N,O,P,Q Renewed 9 September 2001

(uu),ee,ff,qq,hh,ll,mm,oo,pp,tt,ccc,ddd

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Watts 007M1QT - 3/4" (H)
774DCDA - 8" (H) Approved 8th Ed. of Manual (16 September 1996)
(M),A,B,C,D,E,F G,H,I,J,K,L,N,O,P,Q Renewed 16 September 2002
(mm),ee,ff,gg,hh,ll,mm,oo,pp,tt,uu,ccc,ddd
Watts 007M2QT - 3/4" (H), Ames 2000B - 3/4" (H)
774DCDA - 10" (H) Approved 8th Ed. of Manual (16 February 2001)
(J),C,D,E,F,G,H,I,K,L,M,N,O,P,Q
(II),mm
Watts 007M2QT - 3/4" (H), Ames 2000B - 3/4" (H)
774XDCDA - 2 1/2" (H) Approved 8th Ed. of Manual (10 September 1996)
(M)N,O,P,Q Renewed 10 September 2002
(mm).ee.ff.aa.hh.ll.mm.oo.pp.tt.uu.ccc.ddd
Watts 007M2QT - 3/4" (H), Ames 2000B - 3/4" (H)
774XDCDA - 6"(H) Approved 8th Ed. of Manual (24 May 1995)
(M), A, B, C, D, E, F, G, H, I, J, K, L, N, O, P, Q Renewed 24 May 2001
(uu),ee,ff,gg,hh,ll,mm,oo,pp,tt,ccc,ddd
Watts 007M2QT - 3/4" (H), Ames 2000B - 3/4" (H)
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Watts 774XDCDA - 8"(H) Approved 8th Ed. of Manual (9 September 1992)
(M), A, B, C, D, E, F, G, H, I, J, K, L, N, O, P, Q, Renewed 9 September 2001
(uu),ee,ff,gg,hh,ll,mm,oo,pp,tt,ccc,ddd
Watts 007M1QT - 3/4" (H)
Wilkins 350DA - 2 1/2", 3" (H) Approved 9th Ed. of Manual (3 April 2002)
(M),A,B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q
(hh),ff,mm,uu,zz
Wilkins 950XLD - 3/4" (H)
350DA - 2 1/2", 3" (VU) Approved 9th Ed. of Manual (8 October 2002)
(M),A,B,C,D,E,F G,H,I,J,K,L,N,O,P,Q
(hh),ff,mm,uu,zz
Wilkins 950XLD - 3/4" (VU)
350DA - 4" (H) Approved 9th Ed. of Manual (15 September 1999)
(M),A,B,C,D,EF,G,H,I,J,K,L,N,O,P,Q Renewed 15 September 2002
(hh),ff,mm,uu,zz
Wilkins 950XLD - 3/4" (H)
350DA - 4" (VU) Approved 9th Ed. of Manual (9 September 2000)
(M),A,B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q
(hh),ff,mm,uu,zz
Wilkins 950XLD - 3/4" (VU)
350DA - 6" (H) Approved 9th Ed. of Manual (18 October 1999)
(M),A,B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 18 October 2002
(hh),ff,mm,uu,zz
Wilkins 950XLD - 3/4" (H)
350DA - 6" (VU) Approved 9th Ed. of Manual (5 January 2000)
(M), A, B, C, D, E, F, G, H, I, J, K, L, N, O, P, Q Renewed 5 January 2003
(hh),ff,mm,uu,zz
Wilkins 950XLD - 3/4" (VU)
350DA - 8" (H) Approved 9th Ed. of Manual (3 July 2002)
(N),F,G,H,I,J,K,L,M,O,P,Q
(hh),ff,gg,uu,zz
Wilkins 950XLD - 3/4" (H)
350DA - 8" (VU) Approved 9th Ed. of Manual (16 January 2003)
(N),F,G,H,I,J,K,L,M,O,P,Q
(hh),ff,qq,uu,zz
Wilkins 950XLD - 3/4" (VU)
350DA - 10" (H) Approved 9th Ed. of Manual (28 August 2002)
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(N),F,G,H,I,J,K,L,M,O,P,Q
(hh),ff,gg,uu,zz
Wilkins 950XLD - 3/4" (H)
350DA - 10" (VU) Approved 9th Ed. of Manual (14 March 2003)
(N),F,G,H,I,J,K,L,M,O,P,Q
(hh),ff,gg,uu,zz
Wilkins 950XLD - 3/4" (VU)
350 DAG - 4" (H) Approved 9th Ed. of Manual (10 April 2000)
(M),A,B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 10 April 2003
(qqq)
Wilkins 950XLD - 3/4" (H)
350 DAG - 4" (VU) Approved 9th Ed. of Manual (13 December 2000)
(M),A,B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q
(qqq)
Wilkins 950XLD - 3/4" (VU)
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## **Double Check Detector Assemblies**

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## **Double Check Detector Assemblies**

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Wilkins 350 DAG - 6" (H,VU) Approved 9th Ed. of Manual (10 April 2000)
(M), A, B, C, D, E, F, G, H, I, J, K, L, N, O, P, Q Renewed 10 April 2003
(qqq)
Wilkins 950XLD - 3/4" (H, VU)
350 DAGPI - 4",6" (H, VU) Approved 9th Ed. of Manual (31 July 2001)
(M),A,B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q
(qqq)- #1SOV, (www)-# 2SOV
Wilkins 950XLD - 3/4" (H, VU)
350 DAPI - 4",6" (H,VU), Approved 9th Ed. of Manual (31 July 2001)
(M), A, B, C, D, E, F, G, H, I, J, K, L, N, O, P, Q
(hh)- #1SOV, (vvv)-# 2SOV
Wilkins 950XLD - 3/4" (H, VU)
450DA - 4" (VUVD) Approved 9th Ed. of Manual (12 April 2000)
(M), A, B, C, D, E, F, G, H, I, J, K, L, N, O, P, Q Renewed 12 April 2003
Wilkins 950XLD - 3/4" (H)
450DA - 6" (VUVD) Approved 9th Ed. of Manual (24 May 2000)
(M),C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 24 May 2003
(qqq)
Wilkins 950XLD - 3/4" (H)
450DAG - 4" (VUVD) Approved 9th Ed. of Manual (25 August 2000)
(M), A, B, C, D, E, F, G, H, I, J, K, L, N, O, P, Q
(ttt)
Wilkins 950XLD - 3/4" (H)
450DAG - 6" (VUVD) Approved 9th Ed. of Manual (25 August 2000)
(M),C,D,E,F,G,H,I,J,K,L,N,O,P,Q
(ttt)
Wilkins 950XLD - 3/4" (H)
950DA -2 1/2", 3" (H) Approved 8th Ed. of Manual (2 January 1994)
(M),A,B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 2 January 2003
(hh),ff,mm,uu,zz
Wilkins 950XL - 3/4" (H) (Wilkins 950 - 3/4" [H])
950DA - 4", 8" (H) Approved 8th Ed. of Manual (9 June 1993)
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(M), E, F, G, H, I, J, K, L, N, O, P, Q Renewed 9 June 2002
(hh),ff,mm,uu,zz
Wilkins 950XL - 3/4" (H) (Wilkins 950 - 3/4" [H])
950DA - 4", 8" (VU) Approved 8th Ed. of Manual (12 December 1996)
(M),A,B,C,D,E,F,GH,I,J,K,L,N,O,P,Q Renewed 12 December 2002
(hh),ff,mm,uu,zz
Wilkins 950XL - 3/4" (VU)
950DA - 6" (H) Approved 8th Ed. of Manual (9 June 1993)
(M),A,B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 9 June 2002
(hh),ff,mm,uu,zz
Wilkins 950XL - 3/4" (H) (Wilkins 950 - 3/4" [H])
950DA - 2 1/2",3",6" (VÚ) Approved 8th Ed. of Manual (12 December 1996)
(M),D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 12 December 2002
(hh),ff,mm,uu,zz
Wilkins 950XL - 3/4" (VU)
950DA - 10" (H) Approved 8th Ed. of Manual (23 June 1994)
(M),A,B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 23 June 2000
(hh).ff.mm.uu.zz
Wilkins 950XL - 3/4" (H) (Wilkins 950 - 3/4"[H])
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COMPANY MODEL-SIZE STATUS OF APPROVAL
Wilkins 950DAG -4" (H), Approved 8th Ed. of Manual (27 March 2000)
(M),E,F,G,H,I,J,K,L,N,O,P,Q Renewed 27 March 2003
Wilkins 950 XL 3/4" (H)
950DAG - 4" (VU) Approved 8th Ed. of Manual (27 March 2000)
(M),A,B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 27 March 2003
(ppp)
Wilkins 950 XL 3/4" (VU)
950DAG -6" (H) Approved 8th Ed. of Manual (27 March 2000)
(M),A,B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 27 March 2003
(qqq)
Wilkins 950 XL 3/4" (H)
950DAG -6" (VU) Approved 8th Ed. of Manual (27 March 2000)
(M),D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 27 March 2003
(qqq)
Wilkins 950 XL 3/4" (VU)
¬ DCDA - 2 1/2", 3" (H) Approved 7th Ed. of Manual (5 March 1987)
(M) B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 5 March 2002
(hh),ff,mm,uu,zz
Wilkins 550A - 3/4" (H)

    DCDA - 4" (H) Approved 7th Ed. of Manual (18 May 1988)

(M),A,B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 18 May 2003
(hh),ff,mm,uu,zz
Wilkins 550A - 3/4" (H)
¬ DCDA - 6" (H) Approved 7th Ed. of Manual (2 June 1988)
(M),A,B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 2 June 2003
(hh).ff.mm.uu.zz
Wilkins 550A - 3/4" (H)
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2003 © University of Southern California
Ames 5000 - 4", (H) Approved 8th Ed. of Manual (28 December 1989)
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(M),A,B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 28 December 2001

(uu),ee,ff,gg,hh,ccc,ddd,ll,mm,tt Conbraco 40-204-02 - 3/4" (H) 5000 - 6", (H) Approved 8th Ed. of Manual (28 December 1989) (K),A,B,C,D,E,F,G,H,I,J,L,M,N,O,P,Q Renewed 28 December 2001 (uu),ee,ff,gg,hh,ccc,ddd,ll,mm,tt Conbraco 40-204-02 - 3/4" (H) 5000 - 8", (H) Approved 8th Ed. of Manual (1 July 1989) (K),A,B,C,D,E,F,G,H,I,J,L,M,N,O,P,Q Renewed 1 July 2001 (uu),ee,ff,gg,hh,ccc,ddd,ll,mm,tt Conbraco 40-204-02 - 3/4" (H) 5000 - 10", (H) Approved 8th Ed. of Manual (19 March 1990) (M),A,B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 19 March 2002 (uu),ee,ff,gg,hh,ccc,ddd,ll,mm,tt Conbraco 40-204-02 - 3/4" (H) 5000CIV - 2 1/2" (H) Approved 8th Ed. of Manual (7 July 2000) (H),C,D,E,F,G,I,J,K,L,M,N,O,P,Q(pp),hh,mm,uu Watts Model 909QT 3/4" (H) 5000CIV - 3",4",6",8",10" (H) Approved 8th Ed. of Manual (7 July 2000) (N),B,C,D,E,F,G,H,I,J,K,L,M,O,P,Q(pp),hh,mm,uu,eee Watts Model 909QT 3/4" (H) Cla-Val – 18-4 - 10" (H) Approved 8th Ed. of Manual (23 August 1990) (H),A,B,C,D,E,F,G,I,J,K,L,M,N,O,P,Q Renewed 23 August 2002 (hh),gg,qq,rr Cla-Val RP2 - 3/4" (H) Conbraco 40-700-C3 - 3" (H) Approved 8th Ed. of Manual (27 July 1993) (M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 27 July 2002 (uu),cc,mm (Formerly 40-700-03) Conbraco 40-204-02 - 3/4" (H) 40-700-E3 - 3" (H) Approved 8th Ed. of Manual (27 July 1993) (M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 27 July 2002 (uu),cc,mm (Formerly 40-700-03) Conbraco 40-204-02 - 3/4" (H) 40-70A-C3 - 4" (H) Approved 8th Ed. of Manual (27 July 1993) (M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 27 July 2002 (uu),cc,mm (Formerly 40-70A-03) Conbraco 40-204-02 - 3/4" (H) 40-70A-E3 - 4" (H) Approved 8th Ed. of Manual (27 July 1993) (M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 27 July 2002 (uu),cc,mm (Formerly 40-70A-03) Conbraco 40-204-02 - 3/4" (H) 40-70C-C3 - 6" (H) Approved 8th Ed. of Manual (20 October 1993) (M),D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 20 October 2002 (uu).cc.mm (Formerly 40-70C-03) Conbraco 40-204-02 - 3/4" (H)

# Reduced Pressure Principle Detector Assemblies

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Conbraco 40-70C-E3 - 6" (H) Approved 8th Ed. of Manual (20 October 1993)

(M),D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 20 October 2002

(uu),cc,mm (Formerly 40-70C-03)

Conbraco 40-204-02 - 3/4" (H)

40-70E-C3 - 8" (H) Approved 8th Ed. of Manual (24 May 1993)

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(M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 24 May 2002
(uu),cc,mm (Formerly 40-70E-03)
Conbraco 40-204-02 - 3/4" (H)
40-70E-E3 - 8" (H) Approved 8th Ed. of Manual (24 May 1993)
(M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 24 May 2002
(uu),cc,mm (Formerly 40-70E-03)
Conbraco 40-204-02 - 3/4"(H)
40-70G-C3 - 10"(H) Approved 8th Ed. of Manual (13 April 1993)
(M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 13 April 2002
(uu),cc,mm (Formerly 40-70G-03)
Conbraco 40-204-02 - 3/4" (H)
40-70G-E3 - 10"(H) Approved 8th Ed. of Manual (13 April 1993)
(M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 13 April 2002
(uu),cc,mm (Formerly 40-70G-03)
Conbraco 40-204-02 - 3/4" (H)
Febco 826YD - 2 1/2", 3" (H) Approved 8th Ed. of Manual (11 November 1988)
(M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 11 November 2000
(ff),mm,uu (Formerly 826 Type YD)
Febco 825Y - 3/4" (H)
826YD - 4" (H) Approved 8th Ed. of Manual (14 October 1988)
(M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 14 October 2000
(ff),mm,uu (Formerly 826 Type YD)
Febco 825Y - 3/4" (H)
826YD - 6" (H) Approved 8th Ed. of Manual (1 March 1990)
(M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 1 March 2002
(ff),mm,uu (Formerly 826 Type YD)
Febco 825Y - 3/4" (H)
826YD - 8", 10" (H) Approved 8th Ed. of Manual (22 June 1990)
(M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 22 June 2002
(ff),mm,uu (Formerly 826 Type YD)
Febco 825Y - 3/4" (H)
Hersey/Grinnell
6CMDA - 4",6",8",10" (H) Approved 8th Ed. of Manual (28 December 1989)
(M),B,C,D,E,F,G,H,I,J,K,L,N,O,P,Q Renewed 28 December 2001
(uu),cc,rr,iii,lll
Hersey FRP-II - 1 1/2" (H)
Watts - 009NRS RPDA - 4",6" (H) Approved 8th Ed. of Manual (1 February 1995)
(H),D,E,F,G,I,J,K,L,M,N,O,P,Q Renewed 1 February 2001
(oo),gg,ll,tt
Watts 009M2QT - 3/4" (H)
- 009OSY RPDA - 4".6" (H) Approved 8th Ed. of Manual (1 February 1995)
(H),D,E,F,G,I,J,K,L,M,N,O,P,Q Renewed 1 February 2001
(pp),hh,mm,uu
Watts 009M2QT - 3/4" (H)
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Watts 909 RPDA - 2 1/2" (H) Approved 8th Ed. of Manual (16 June 1999)
(H),C,D,E,F,G,H,I,J,K,L,M,O,P,Q Renewed 16 June 2002
(pp),hh,mm,uu
Watts 909QT - 3/4" (H)
909 RPDA - 3" (H) Approved 8th Ed. of Manual (5 October 1988)
(N),B,C,D,E,F,G,H,I,J,K,L,M,O,P,Q Renewed 5 October 2000
(pp),hh,mm,uu,eee (Formerly Model 909 DDC-M2)
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Watts 909QT - 3/4" (H)
909 RPDA - 4" (H) Approved 8th Ed. of Manual (9 February 1988)
(N),B,C,D,E,F,G,H,I,J,K,L,M,O,P,Q Renewed 9 February 2003
(pp),hh,mm,uu,eee
Watts 909QT - 3/4" (H)
909 RPDA - 6" (H) Approved 8th Ed. of Manual (5 October 1988)
(N),B,C,D,E,F,G,H,I,J,K,L,M,O,P,Q Renewed 5 October 2000
(pp),hh,mm,uu,eee (Formerly Model 909 DDC)
Watts 909QT - 3/4" (H)
909 RPDA - 8" (H) Approved 8th Ed. of Manual (14 February 1988)
(N),B,C,D,E,F,G,H,I,J,K,L,M,O,P,Q Renewed 14 February 2003
(pp).hh.mm.uu.eee
Watts 909QT - 3/4" (H)
909 RPDA - 10" (H) Approved 8th Ed. of Manual (15 February 1988)
(N),B,C,D,E,F,G,H,I,J,K,L,M,O,P,Q Renewed 15 February 2003
(pp),hh,mm,uu,eee
Watts 909QT - 3/4" (H)
¬ 990 RPDA - 4" (H) Approved 8th Ed. of Manual (1 November 1992)
(H),A,B,C,D,E,F,G,I,J,K,L,M,N,O,P,Q Renewed 11 November 2001
(pp),hh,mm,uu
Watts 009QT 3/4" (H)
¬ 990 RPDA - 8" (H) Approved 8th Ed. of Manual (13 January 1993)
(H),D,E,F,G,I,J,K,L,M,N,O,P,Q Renewed 13 January 2002
(oo),gg,hh,ll,mm,pp,tt,uu
Watts 009QT 3/4" (H)
¬ 992 RPDA - 4" (H) Approved 8th Ed. of Manual (1 November 1992)
(H), A.B.C.D.E.F.G.I.J.K.L.M.N.O.P.Q Renewed 1 November 2001
(00)
Watts 009QT 3/4" (H)
\neg 992 RPDA - 10" (H) Approved 8th Ed. of Manual (13 January 1993)
(H),D,E,F,G,I,J,K,L,M,N,O,P,Q Renewed 13 January 2002
(00)
Watts 009QT 3/4" (H)
Wilkins 375DA - 2 1/2", 3" (H) Approved 9th Ed. of Manual (8 October 2002)
(M),C,D,E,F,G,H,I,J,K,L,N,O,P,Q
(hh),ff,mm,uu,zz
Wilkins 975XLD 3/4" (H)
375DA - 4" (H) Approved 9th Ed. of Manual (13 December 2000)
(M),C,D,E,F,G,H,I,J,K,L,N,O,P,Q
(hh),ff,mm,uu,zz
Wilkins 975XLD 3/4" (H)
375 DA - 6" (H) Approved 9th Ed. of Manual (31 May 2001)
(N),C,D,E,F,G,H,I,J,K,L,M,O,P,Q
(hh),ff,mm,uu,zz
Wilkins 975XLD - 3/4" (H)
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# Reduced Pressure Principle Detector Assemblies

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# Reduced Pressure Principle Detector Assemblies

COMPANY MODEL - SIZE STATUS OF APPROVAL Wilkins 375DAG - 4" (H) Approved 9th Ed. of Manual (31 July 2001) (M),C,D,E,F,G,H,I,J,K,L,N,O,P,Q (qqq)

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Wilkins 975XLD 3/4" (H)
375DAG - 6" (H) Approved 9th Ed. of Manual (6 August 2001)
(N),C,D,E,F,G,H,I,J,K,L,M,O,P,Q
(qqq)
Wilkins 975XLD 3/4" (H)
375DAGPI - 4" (H) Approved 9th Ed. of Manual (31 July 2001)
(M),C,D,E,F,G,H,I,J,K,L,N,O,P,Q
(qqq)- #1 SOV, (www)- #2 SOV
Wilkins 975XLD 3/4" (H)
375DAGPI - 6" (H) Approved 9th Ed. of Manual (28 March 2002)
(N), C, D, E, F, G, H, I, J, K, L, M, O, P, Q
(qqq)- #1 SOV, (www)- #2 SOV
Wilkins 975XLD 3/4" (H)
375DAPI - 4" (H) Approved 9th Ed. of Manual (31 July 2001)
(M),C,D,E,F,G,H,I,J,K,L,N,O,P,Q
(hh)- #1 SOV, (vvv)- #2 SOV
Wilkins 975XLD 3/4" (H)
375DAPI - 6" (H) Approved 9th Ed. of Manual (28 March 2002)
(N),C,D,E,F,G,H,I,J,K,L,M,O,P,Q
(hh)- #1 SOV, (vvv)- #2 SOV
Wilkins 975XLD 3/4" (H)
475 DA - 4" (VUVD) Approved 9th Ed. of Manual (20 March 2001)
(N),F,G,H,I,J,K,L,M,O,P,Q
(ppp),qqq
Wilkins 975XLD - 3/4" (H)
475 DA - 6" (VUVD) Approved 9th Ed. of Manual (31 May 2001)
(N),F,G,H,I,J,K,L,M,O,P,Q
(ppp),qqq
Wilkins 975XLD - 3/4" (H)
475 DAG -4", 6"(VUVD) Approved 9th Ed. of Manual (6 August 2001)
(N),F,G,H,I,J,K,L,M,O,P,Q
(qqq),ttt
Wilkins 975XLD - 3/4" (H)
475 DAV - 4" (VUVD) Approved 9th Ed. of Manual (20 March 2001)
(N),F,G,H,I,J,K,L,M,O,P,Q
ppp,(qqq)
Wilkins 975XLD - 3/4" (H)
475 DAVG - 4" (VUVD) Approved 9th Ed. of Manual (6 August 2001)
(N),F,G,H,I,J,K,L,M,O,P,Q
(qqq),ttt
Wilkins 975XLD - 3/4" (H)
975 DA - 2 1/2", 3" (H) Approved 8th Ed. of Manual (1 February 1994)
(M),A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 1 February 2003
(hh),ff,uu,zz
Wilkins 975 3/4" (H)
975 DA - 4" (H) Approved 8th Ed. of Manual (1 November 1993)
(M), A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,Q Renewed 1 November 2002
(hh),ff,uu,zz
Wilkins 975 3/4" (H)
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# Reduced Pressure Principle Detector Assemblies

COMPANY MODEL - SIZE STATUS OF APPROVAL Wilkins 975 DA - 6" (H) Approved 8th Ed. of Manual (14 March 1994) (M), A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 14 March 2003

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(hh),ff,uu,zz
Wilkins 975 3/4" (H)
975 DA - 8", 10" (H) Approved 8th Ed. of Manual (5 December 1996)
(M), A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 5 December 2002
(hh),ff,uu,zz
Wilkins 975 3/4" (H)
975 DAG - 4", 6" Approved 8th Ed. of Manual (27 March 2000)
(M), A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q Renewed 27 March 2003
Wilkins 975 3/4" (H)
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2003 © University of Southern California
Ames 4000B - 1/2" (H) Approved 9th Ed. of Manual (10 September 1996)
(vv),xx Previously Approved 8th Ed. (26 May 1993)
Renewed 10 September 2002
4000B - 3/4" (H) Approved 8th Ed. of Manual (31 October 1992)
(vv),xx Renewed 31 October 2001
4000B - 1" (H) Approved 7th Ed. of Manual (11 January 1988)
(vv),xx Renewed 11 January 2003
4000B - 11/4", 1 1/2" (H) Approved 8th Ed. of Manual (24 August 1993)
(vv),xx Renewed 24 August 2002
4000B - 2" (H) Approved 9th Ed. of Manual (10 September 1996)
(vv).xx Renewed 10 September 2002
4000BM2 - 1" (H) Approved 9th Ed. of Manual (18 May 1998)
(vv),xx Renewed 18 May 2001
4000BM3 - 3/4"(H) Approved 9th Ed. of Manual (27 March 2000)
(vv),xx Renewed 27 March 2003
4000CIV - 2 1/2",3" (H) Approved 7th Ed. of Manual (7 July 2000)
(oo),gg,hh,ll,mm,pp,tt,uu
4000CIV - 4",6"(H) Approved 6th Ed. of Manual (19 June 2000)
(oo),qq,hh,ll,mm.pp,tt,uu,eee
4000CIV - 8",10" (H) Approved 8th Ed. of Manual (19 June 2000)
(oo),qq,hh,ll,mm,pp,tt,uu
4000SS - 2 1/2",3",4" (H) Approved 8th Ed. of Manual (15 April 1994)
(tt),ee,ff,gg,hh,ccc,ddd,ll,mm,uu Renewed 15 April 2003
4000SS - 6" (H) Approved 8th Ed. of Manual (22 September 1997)
(tt),ee,ff,gg,hh,ccc,ddd,ll,mm,uu Renewed 22 September 2000
4000-RP - 4", 6", 8" (H) Approved 7th Ed. of Manual (13 October 1987)
(formerly Model RP) Renewed 13 October 2002
(tt),ee,ff,qq,hh,ccc,ddd,ll,mm,uu
4000-RP - 10" (H) Approved 7th Ed. of Manual (13 October 1987)
(formerly Model RP) Renewed 13 October 2002
(tt),ee,ff,qq,hh,ccc,ddd,ll,mm,uu
Colt 400 - 2 1/2", 3", 4" (H) Approved 9th Ed. of Manual (7 October 2002)
Colt 400N - 2 1/2",3",4" (VUVD) Approved 9th Ed. of Manual (14 April 2003)
(ppp),qqq,yyy
Colt 400Z - 2 1/2",3",4" (VUVU) Approved 9th Ed. of Manual (14 April 2003)
(ppp),qqq,yyy
Maxim 400 - 2 1/2", 3" (H) Approved 9th Ed. of Manual (7 October 2002)
(ppp),qqq
Maxim 400N - 2 1/2", 3" (VUVD) Approved 9th Ed. of Manual (14 April 2003)
(ppp),qqq,yyy
Maxim 400Z - 2 1/2",3" (VUVU) Approved 9th Ed. of Manual (14 April 2003)
yyy,ppp,(qqq)
Beeco - See Hersey/Grinnell
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Buckner – 24000 - 3/4" (H) Approved 8th Ed. of Manual (14 March 1994)
(ii) Renewed 14 March 2003

¬ 24001 - 1" (H) Approved 8th Ed. of Manual (14 March 1994)

(ii) Renewed 14 March 2003
- 24002 - 1 1/4" (H) Approved 8th Ed. of Manual (18 July 1991)
(ii) Renewed 18 July 2000

¬ 24003 - 1 1/2" (H) Approved 8th Ed. of Manual (18 July 1991)
(ii) Renewed 18 July 2000
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COMPANY MODEL - SIZE STATUS OF APPROVAL
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Buckner - 24004 - 2" (H) Approved 8th Ed. of Manual (18 July 1991)
(ii) Renewed 18 July 2000 – 24000/25 - 3/4" (H) Approved 8th Ed. of Manual (14 March 1994)
(ii) Renewed 14 March 2003

¬ 24001/25 - 1" (H) Approved 8th Ed. of Manual (14 March 1994).

(ii) Renewed 14 March 2003

¬ 24002/25 - 1 1/4" (H) Approved 8th Ed. of Manual (18 July 1991)
(ii) Renewed 18 July 2000
- 24003/25 - 1 1/2" (H) Approved 8th Ed. of Manual (18 July 1991)
(ii) Renewed 18 July 2000

¬ 24004/25 - 2" (H) Approved 8th Ed. of Manual (18 July 1991).

(ii) Renewed 18 July 2000
Cla-Val - RP-2 - 3/4", 1" (H) Approved 4th Ed. of Manual (6 February 1974)
(nn),dd Renewed 18 March 2001
¬ RP-2 - 1 1/4", 1 1/2" (H) Approved 5th Ed. of Manual (13 August 1976)
(nn),dd Renewed 5 October 2000
RP-4 - 6" (H) Approved 7th Ed. of Manual (7 August 1987)
(gg),hh,qq,rr Renewed 7 August 2002
¬ RP-4 - 2" (H) Approved 8th Ed. of Manual (22 June 1989)
(nn) Renewed 22 June 2001
RP-4 - 2 1/2", 3", 4", 8", 10" (H) Approved 8th Ed. of Manual (22 June 1989)
(gg),hh,gg,rr Renewed 22 June 2001
RP4V - 4" (VUVU) Approved 8th Ed. of Manual (15 March 1990)
(gg),hh,gg,rr Renewed 15 March 2002
Conbraco 40-200-02 - 3" (H) Approved 8th Ed. of Manual (8 April 1991)
(tt),bb,ee,ll Renewed 8 April 2003
40-200-03 - 3" (H) Approved 8th Ed. of Manual (8 April 1991)
(uu),cc,mm Renewed 8 April 2003
40-200-05 - 3" (H) Approved 8th Ed. of Manual (8 December 1998)
(mmm) Renewed 8 December 2001
40-201-02 - 1/4" (H) Approved 8th Ed. of Manual (3 May 1991)
(dd) Renewed 3 May 2003
40-201-A2 - 1/4" (H) Approved 8th Ed. of Manual (19 April 1996)
(dd) Renewed 19 April 2002
40-201-A2S - 1/4" (H) Approved 8th Ed. of Manual (19 April 1996)
(uuu) Renewed 19 April 2002
40-201-T2 - 1/4" (H) Approved 8th Ed. of Manual (16 September 1998)
(dd) [formerly 40-201-99T] Renewed 16 September 2001
40-202-02 - 3/8" (H) Approved 8th Ed. of Manual (3 May 1991)
(dd) Renewed 3 May 2003
40-202-A2 - 3/8" (H) Approved 8th Ed. of Manual (19 April 1996)
(dd) Renewed 19 April 2002
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40-202-A2S - 3/8" (H) Approved 8th Ed. of Manual (19 April 1996)

(uuu) Renewed 19 April 2002 40-202-T2 - 3/8" (H) Approved 8th Ed. of Manual (16 September 1998) (dd) [formerly 40-202-99T] Renewed 16 September 2001 40-203-02 - 1/2" (H) Approved 8th Ed. of Manual (3 May 1991) (dd) Renewed 3 May 2003 40-203-A2 - 1/2" (H) Approved 8th Ed. of Manual (19 April 1996) (dd) Renewed 19 April 2002 40-203-A2S - 1/2" (H) Approved 8th Ed. of Manual (19 April 1996) (uuu) Renewed 19 April 2002

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Conbraco 40-203-T2 - 1/2" (H) Approved 8th Ed. of Manual (16 September 1998)

(dd) [formerly 40-203-99T] Renewed 16 September 2001

40-204-02 - 3/4" (H) Approved 8th Ed. of Manual (8 May 1989)

(dd) Renewed 8 May 2001

40-204-T2 - 3/4" (H) Approved 8th Ed. of Manual (16 September 1998)

(dd) [formerly 40-204-99T] Renewed 16 September 2001

40-204-A2 - 3/4" (H) Approved 8th Ed. of Manual (27 November 1991)

(dd) Renewed 27 November 2000

40-204-A2S - 3/4" (H) Approved 8th Ed. of Manual (16 August 1994)

(uuu) Renewed 16 August 2000

40-204-A2U - 3/4" (VUVD) Approved 8th Ed. of Manual (6 November 1992)

(dd) Renewed 6 November 2001

40-204-A2Z - 3/4" (VUVU) Approved 8th Ed. of Manual (6 November 1992)

(dd) Renewed 6 November 2001

40-204-TC2 - 3/4" (H) Approved 8th Ed. of Manual (30 November 1998)

(dd) Renewed 30 Novmber 2001

40-204-TCU - 3/4" (VUVD) Approved 8th Ed. of Manual (30 November 1998)

(dd) Renewed 30 November 2001

40-205-02 - 1" (H) Approved 8th Ed. of Manual (8 May 1989)

(dd) Renewed 8 May 2001

40-205-T2 - 1" (H) Approved 8th Ed. of Manual (16 September 1998)

(dd) [formerly 40-205-99T] Renewed 16 September 2001

40-205-A2 - 1" (H) Approved 8th Ed. of Manual (27 November 1991)

(dd) Renewed 27 November 2000

40-205-A2S - 1" (H) Approved 8th Ed. of Manual (16 August 1994)

(uuu) Renewed 16 August 2000

40-205-A2U - 1" (VUVD) Approved 8th Ed. of Manual (15 September 1993)

(dd) Renewed 15 September 2002

40-205-A2Z - 1" (VUVU) Approved 8th Ed. of Manual (15 September 1993)

(dd) Renewed 15 September 2002

40-205-TC2 - 1" (H) Approved 8th Ed. of Manual (30 November 1998)

(dd) Renewed 30 November 2001

40-205-TCU - 1" (VUVD) Approved 8th Ed. of Manual (30 November 1998)

(dd) Renewed 30 November 2001

40-206-02 - 1 1/4" (H) Approved 8th Ed. of Manual (6 April 1992)

(dd) Renewed 6 April 2001

40-206-A2 - 1 1/4" (H) Approved 8th Ed. of Manual (21 June 1993)

(dd) Renewed 21 June 2002

40-206-A2U - 1 1/4" (VUVD) Approved 8th Ed. of Manual (2 February 1995)

(dd) Renewed 2 February 2001

40-206-A2Z - 1 1/4" (VUVU) Approved 8th Ed. of Manual (2 February 1995)

(dd) Renewed 2 February 2001

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40-206-T2 - 1 1/4" (H) Approved 8th Ed. of Manual (16 September 1998) (dd) [formerly 40-206-99T] Renewed 16 September 2001 40-207-02 - 1 1/2" (H) Approved 8th Ed. of Manual (17 March 1989) (dd) Renewed 17 March 2001 40-207-A2 - 1 1/2" (H) Approved 8th Ed. of Manual (16 September 1992) (dd) Renewed 16 September 2001 40-207-A2U - 1 1/2" (VUVD) Approved 8th Ed. of Manual (2 February 1995) (dd) Renewed 2 February 2001 40-207-A2Z - 1 1/2" (VUVU) Approved 8th Ed. of Manual (2 February 1995) (dd) Renewed 2 February 2001 40-207-T2 - 1 1/2" (H) Approved 8th Ed. of Manual (16 September 1998) (dd) [formerly 40-207-99T] Renewed 16 September 2001
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 Conbraco 40-208-02 - 2" (H) Approved 8th Ed. of Manual (17 March 1989)
 (dd) Renewed 17 March 2001

40-208-A2 - 2" (H) Approved 8th Ed. of Manual (16 September 1992)

(dd) Renewed 16 September 2001

40-208-A4 - 2" (H) Approved 8th Ed. of Manual (24 May 2000)

(rrr) Renewed 24 May 2003

40-208-A2U - 2" (VUVD) Approved 8th Ed. of Manual (2 February 1995)

(dd) Renewed 2 February 2001

40-208-A2Z - 2" (VUVU) Approved 8th Ed. of Manual (2 February 1995)

(dd) Renewed 2 February 2001

40-208-T2 - 2" (H) Approved 8th Ed. of Manual (16 September 1998)

(dd) [formerly 40-208-99T] Renewed 16 September 2001

40-209-02 - 2 1/2" (H) Approved 8th Ed. of Manual (8 April 1991)

(tt),bb,ee,II Renewed 8 April 2003

40-209-03 - 2 1/2" (H) Approved 8th Ed. of Manual (8 April 1991)

(uu),cc,mm Renewed 8 April 2003

40-209-05 - 2 1/2" (H) Approved 8th Ed. of Manual (8 December 1998)

(mmm) Renewed 8 December 2001

40-20A-02 - 4" (H) Approved 8th Ed. of Manual (8 April 1991)

(tt),bb,ee,ll Renewed 8 April 2003

40-20A-03 - 4" (H) Approved 8th Ed. of Manual (8 April 1991)

(uu),cc,mm Renewed 8 April 2003

40-20A-05 - 4" (H) Approved 8th Ed. of Manual (8 December 1998)

(mmm) Renewed 8 December 2001

40-20C-02 - 6" (H) Approved 8th Ed. of Manual (8 April 1991)

(tt),bb,ee,Il Renewed 8 April 2003

40-20C-03 - 6" (H) Approved 8th Ed. of Manual (8 April 1991)

(uu).cc.mm Renewed 8 April 2003

40-20C-05 - 6" (H) Approved 8th Ed. of Manual (8 December 1998)

(mmm) Renewed 8 December 2001

40-20E-02 - 8" (H) Approved 8th Ed. of Manual (22 October 1991)

(tt),bb,ee,ll Renewed 22 October 2000

40-20E-03 - 8" (H) Approved 8th Ed. of Manual (22 October 1992)

(uu),cc,mm Renewed 22 October 2001

40-20G-02 - 10" (H) Approved 8th Ed. of Manual (13 April 1993)

(tt),bb,ee,ll Renwed 13 April 2002

40-20G-03 - 10" (H) Approved 8th Ed. of Manual (13 April 1993)

(uu),cc,mm Renewed 13 April 2002

Febco  $\neg$  825 - 2 1/2" (H) Approved 5th Ed. of Manual (17 March 1975)

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Renewed 17 March 2002
¬ 825 - 3" (H) Approved 5th Ed. of Manual (16 June 1975)
Renewed 16 June 2002
\neg 825 - 4" (H) Approved 5th Ed. of Manual (12 June 1975)
Renewed 12 June 2002
¬ 825 - 6" (H) Approved 5th Ed. of Manual (6 June 1975)
Renewed 6 June 2002
¬ 825 - 8" (H) Approved 5th Ed. of Manual (11 November 1975)
Renewed 11 November 2002
¬ 825 - 10" (H) Approved 5th Ed. of Manual (23 March 1979)
Renewed 23 March 2003
¬ 835B- 3/4", 1", 1 1/2", 2" (H) Approved 5th Ed. of Manual (6 March 1979)
Renewed 6 March 2003
Reduced Pressure Principle Assemblies
COMPANY MODEL - SIZE STATUS OF APPROVAL
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2003 © University of Southern California
Febco – 825D - 2 1/2",3",4",6",8",10" (H) Approved 7th Ed. of Manual (13 September 1987)
(Formerly 825 Type D) Renewed 13 September 2002
825Y - 3/4", 1" (H) Approved 6th Ed. of Manual (19 March 1982)
(ii),fff,jjj,ooo Renewed 19 March 2003
825Y - 1 1/4" (H) Approved 6th Ed. of Manual (3 June 1982)
(ii),fff,jjj,ooo Renewed 3 June 2003
825Y - 1 1/2" (H) Approved 6th Ed. of Manual (6 August 1982)
(ii),fff,jj,ooo Renewed 6 August 2000
825Y - 2" (H) Approved 6th Ed. of Manual (6 August 1982)
(ii),fff,ooo Renewed 6 August 2000
825YA - 3/4", 1" (H,VUVD,VUH,HVD) Approved 8th Ed. of Manual (5 March 1990)
(ii),fff,jjj,ooo Renewed 5 March 2002
825YA - 1 1/2" (H,VUVD,VUH,HVD) Approved 8th Ed. of Manual (8 May 1989)
(ii),fff,jjj,ooo Renewed 8 May 2001
825YA - 2" (H,VUVD,VUH,HVD) Approved 8th Ed. of Manual (8 May 1989)
(ii),fff,ooo Renewed 8 May 2001
825 YAR - 3/4"(H, VUVD, VUH, HVD) Approved 8th Ed. of Manual (22 January 1993)
(ii).fff.iii.ooo Renewed 22 January 2002
825 YAR - 1"(H,VUVD,VUH,HVD) Approved 8th Ed. of Manual (21 January 1993)
(ii),fff,ijj,ooo Renewed 21 January 2002
825 YAR - 1 1/2"(H,VUVD,VUH,HVD) Approved 8th Ed. of Manual (19 August 1993)
(ii),fff,jjj,ooo Renewed 19 August 2002
825 YAR - 2" (H,VUVD,VUH,HVD) Approved 8th Ed. of Manual (19 August 1993)
(ii),fff,ooo Renewed 19 August 2002
825YD - 2 1/2",3",4",6",8",10" (H) Approved 7th Ed. of Manual (24 February 1989)
(ee),ff,ll,mm,tt,uu (Formerly 825 Type YD) Renewed 24 February 2001
825YR - 3/4",1"(H) Approved 8th Ed. of Manual (22 January 1993)
(ii),fff,jjj Renewed 22 January 2002
825YR - 1 1/2" (H) Approved 8th Ed. of Manual (23 July 1993)
(ii),fff,jjj Renewed 23 July 2002
825YR - 2"(H) Approved 8th Ed. of Manual (23 July 1993)
(ii),fff Renewed 23 July 2002
860 - 1/2" (H) Approved 9th Ed. of Manual (9 April 1998)
(fff),ooo Renewed 9 April 2001
860 - 3/4", 1" (H) Approved 9th Ed. of Manual (21 November 1997)
(fff),jjj,ooo Renewed 21 November 2000
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860 - 1 1/4" (H) Approved 9th Ed. of Manual (4 June 1998)

(fff),jjj,ooo Renewed 4 June 2001

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860 - 1 1/2" (H) Approved 9th Ed. of Manual (9 April 1998)
(fff),jjj,ooo Renewed 9 April 2001
860 - 2" (H) Approved 9th Ed. of Manual (9 April 1998)
(fff),ooo Renewed 9 April 2001
860 - 2 1/2", 3" (H) Approved 8th Ed. of Manual (19 April 1996)
(ee),II,tt,ff,mm,uu Renewed 19 April 2002
860 - 4" (H) Approved 8th Ed. of Manual (31 May 1995)
(ee),II,tt,ff,mm,uu,nnn Renewed 31 May 2001
860 - 6" (H) Approved 8th Ed. of Manual (7 August 1995)
(ee),II,tt,ff,mm,uu,nnn Renewed 7 August 2001
860 - 8" (H) Approved 8th Ed. of Manual (4 October 1995)
(ee).II.tt.ff.mm.uu.nnn Renewed 4 October 2001
860U - 1/2",3/4",1",1 1/4",1 1/2",2" (H)Approved 9th Ed. of Manual (12 October 1998)
(kkk) Renewed 12 October 2001
880 - 2 1/2",3" (VUVD) Approved 8th Ed. of Manual (24 May 1995)
(ee),II,tt,ff,mm,uu Renewed 24 May 2001
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2003 © University of Southern California
Febco 880 - 4" (VUVD) Approved 8th Ed. of Manual (10 March 1995)
(ee),II,tt,ff,mm,uu Renewed 10 March 2001
880 - 6",8" (VUVD) Approved 8th Ed. of Manual (19 May 1995)
(ee),II,tt,ff,mm,uu Renewed 19 May 2001
880 - 10" (VUVD) Approved 8th Ed. of Manual (4 October 1996)
(ee),II,tt,ff,mm,uu Renewed 4 October 2002
880V - 2 1/2", 3" (VUVD, VUVU) Approved 8th Ed. of Manual (30 June 1995)
(ee),II,tt,ff,mm,uu Renewed 30 June 2001
880V - 4" (VUVD, VUVU) Approved 8th Ed. of Manual (8 August 1995)
(ee),II,tt,ff,mm,uu Renewed 8 August 2001
880V - 6" (VUVD, VUVU) Approved 8th Ed. of Manual (5 July 1995)
(ee).II.tt.ff.mm.uu Renewed 5 July 2001
880V - 8" (VUVD, VUVU) Approved 8th Ed. of Manual (18 December 1996)
(ee),II,tt,ff,mm,uu Renewed 18 December 2002
880V - 10" (VUVD, VUVU) Approved 8th Ed. of Manual (17 June 1997)
(ee),II,tt,ff,mm,uu Renewed 17 June 2000
Flomatic RPZ - 3/4", 1" (H) Approved 8th Ed. of Manual (7 June 1994)
(ii) Renewed 7 June 2000
RPZ - 1 1/2", 2" (H) Approved 8th Ed. of Manual (10 May 1995)
(ii) Renewed 10 May 2001
RPZ - 2 1/2", 3" (H) Approved 8th Ed. of Manual (14 February 1997)
(gg), hh Renewed 14 February 2003
RPZ - 4" (H) Approved 9th Ed. of Manual (28 January 1999)
(gg), hh Renewed 28 January 2001
RPZ - 6" (H) Approved 9th Ed. of Manual (31 January 2002)
(gg),hh
RPZE - 3/4",1",1 1/2",2" (H) Approved 8th Ed. of Manual (7 June 2001)
RPZ-II - 1/2", 3/4" (H) Approved 8th Ed. of Manual (15 August 1997)
(ii) Renewed 15 August 2000
RPZ-IIE - 1/2",3/4" (H) Approved 8th Ed. of Manual (7 June 2001)
(ii)
Hersey/Grinnell
6CM - 2 1/2" (H) Approved 6th Ed. of Manual (12 August 1983)
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(tt),bb,qq,iii,lll Renewed 12 August 2001

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6CM - 3" (H) Approved 5th Ed. of Manual (1 December 1978)
(tt),bb,qq,iii,lll Renewed 1 December 2002
6CM - 4" (H) Approved 5th Ed. of Manual (21 December 1978)
(tt),bb,qq,iii,lll Renewed 21 December 2002
6CM - 6" (H) Approved 5th Ed. of Manual (27 December 1978)
(tt),bb,qq,iii,lll Renewed 27 December 2002
6CM - 8" (H) Approved 5th Ed. of Manual (10 February 1981)
(tt),bb,qq,iii,lll Renewed 10 February 2002
6CM - 10" (H) Approved 6th Ed. of Manual (19 February 1982)
(tt),bb,gg,iii,lll Renewed 19 February 2003
FRP-II - 3/4", 1" (H) Approved 5th Ed. of Manual (15 December 1978)
(ii) Renewed 15 December 2002
FRP-II - 1 1/2" (H) Approved 5th Ed. of Manual (10 April 1980)
(ii) Renewed 18 March 2001
FRP-II - 2" (H) Approved 5th Ed. of Manual (5 May 1980)
(ii) Renewed 5 May 2001
FRP-II - 1 1/4" (H) Approved 6th Ed. of Manual (21 January 1981)
(ii) Renewed 21 January 2002
Reduced Pressure Principle Assemblies
COMPANY MODEL - SIZE STATUS OF APPROVAL
¬ - Only Spare Parts Available Page 42 of 52
2003 © University of Southern California
Hersey/Grinnell
6CM-Bronze - 2 1/2" (H) Approved 5th Ed. of Manual (30 November 1978)
(tt),bb,gg Renewed 30 November 2002
6CM-Bronze - 3", 4" (H) Approved 6th Ed. of Manual (6 August 1980)
(tt),bb,qq Renewed 6 August 2001
6CM-Bronze - 6" (H) Approved 6th Ed. of Manual (23 December 1980)
(tt),bb,gg Renewed 23 December 2001
Neptune - See Wilkins
Richwell - see Wilkins
Watts 009 - 2 1/2" (H) Approved 8th Ed. of Manual (31 August 1990)
(oo),gg,hh,ll,mm,pp,tt,uu Renewed 31 August 2002
009 - 3" (H) Approved 8th Ed. of Manual (31 August 1990)
(oo),gg,hh,ll,mm,pp,tt,uu,eee Renewed 31 August 2002
¬ 009 - 4",6" (H) Approved 8th Ed. of Manual (17 February 1995)
(oo),gg,hh,ll,mm,pp,tt,uu Renewed 17 February 2001
¬ 009M1QT - 1 1/4", 1 1/2" (H) Approved 8th Ed. of Manual (30 June 1992)
(vv),xx Renewed 30 June 2001
¬ 009M1QT - 2" (H) Approved 8th Ed. of Manual (19 December 1991)
(vv),xx Renewed 19 December 2000
¬ 009M1PCQT - 1 1/4", 1 1/2", 2" (H) Approved 8th Ed.of Manual (27 September 1994)
(vv),xx Renewed 27 September 2000
009M2QT - 3/4" (H) Approved 8th Ed. of Manual (31 October 1992)
(vv),xx Renewed 31 October 2001
009M2QT - 1" (H) Approved 9th Ed. of Manual (18 May 1998)
(vv),xx Renewed 18 May 2001
009M2QT - 11/4", 1 1/2" (H) Approved 8th Ed. of Manual (24 August 1993)
(vv),xx Renewed 24 August 2002
009M2QT - 2" (H) Approved 9th Ed. of Manual (10 September 1996)
(vv).xx Renewed 10 September 2002
009M2PCQT - 3/4" (H) Approved 8th Ed. of Manual (7 October 2002)
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009M2PCQT - 1" (H) Approved 9th Ed. of Manual (15 January 1999)

(vv), xx Renewed 15 January 2002

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009M2PCQT - 1 1/4", 1 1/2" (H) Approved 8th Ed. of Manual (12 September 1994)
(vv),xx Renewed 12 September 2000
009M2PCQT - 2" (H) Approved 9th Ed. of Manual (26 August 1997)
(vv), xx Renewed 26 August 2000
009M3QT - 3/4" (H) Approved 9th Ed. of Manual (18 October 1999)
(vv),xx Renewed 18 October 2002
009PCQT - 3/4" (H) Approved 8th Ed. of Manual (10 December 1993)
(vv),xx Renewed 10 December 2002
- 009PCQT - 1" (H) Approved 8th Ed. of Manual (10 December 1993)
(vv),xx Renewed 10 December 2002
009PCQT - 1/2" (H) Approved 8th Ed. of Manual (17 February 1995)
(vv),xx Renewed 17 February 2001
¬ 009PCQT - 1 1/4", 1 1/2", 2" (H) Approved 8th Ed. of Manual (27 September 1994)
(vv),xx Renewed 27 September 2000
009QT - 1/4", 3/8" (H) Approved 8th Ed. of Manual (7 August 1995)
(vv),xx Renewed 7 August 2001
009QT - 1/2" (H) Approved 9th Ed. of Manual (10 September 1996)
(vv),xx Previously Approved 8th Ed. (26 May 1993)
Renewed 10 September 2002
Reduced Pressure Principle Assemblies
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## COMPANY MODEL - SIZE STATUS OF APPROVAL ¬ - Only Spare Parts Available Page 43 of 52 2003 © University of Southern California Watts 009QT - 3/4" (H) Approved 7th Ed. of Manual (11 January 1988) (vv),xx Renewed 11 January 2003 ¬ 009QT - 1" (H) Approved 7th Ed. of Manual (11 January 1988) (vv),xx Renewed 11 January 2003 ¬ 009QT - 1 1/4", 1 1/2", 2" (H) Approved 7th Ed. of Manual (9 August 1988) (vv),xx Renewed 9 August 2000 - 009SSM1QT - 2" (H) Approved 8th Ed. of Manual (19 December 1991) (vv),xx Renewed 19 December 2000 - 009SSM1PCQT - 2" (H) Approved 8th Ed.of Manual (27 September 1994) (vv),xx Renewed 27 September 2000 ¬ 009SSPCQT - 3/4", 1" (H) Approved 8th Ed. of Manual (10 December 1993) (xx).vv Renewed 10 December 2002 ¬ 009SSPCQT - 1 1/4", 1 1/2", 2" (H) Approved 8th Ed.of Manual (27 September 1994) (vv),xx Renewed 27 September 2000 ¬ 009SSQT - 3/4", 1" (H) Approved 7th Ed. of Manual (11 January 1988) (vv),xx Renewed 11 January 2003 ¬ 009SSQT - 1 1/4", 1 1/2", 2" (H) Approved 7th Ed. of Manual (9 August 1988) (vv).xx Renewed 9 August 2000 909 - 2 1/2" (H) Approved 7th Ed. of Manual (12 June 1986) (oo),gg,hh,ll,mm,pp,tt,uu Renewed 12 June 2001 909 - 3" (H) Approved 7th Ed. of Manual (12 June 1986) (oo),gg,hh,ll,mm,pp,tt,uu,eee Renewed 12 June 2001 909 - 4" (H) Approved 6th Ed. of Manual (15 January 1982) (oo),gg,hh,ll,mm,pp,tt,uu,eee Renewed 15 January 2003 909 - 6" (H) Approved 6th Ed. of Manual (6 July 1981) (oo),gg,hh,ll,mm,pp,tt,uu,eee Renewed 6 July 2002 ¬ 909 - 8", 10" (H) Approved 6th Ed. of Manual (6 July 1981) Renewed 6 July 2002 909BB - 2 1/2", 3" (H) Approved 6th Ed. of Manual (4 February 1983) (oo),gg,hh,ll,mm,pp,tt,uu Renewed 4 February 2001

909HWQT- 3/4", 1" (H) Approved 5th Ed. of Manual (29 September 1979)

(vv),xx Renewed 29 September 2000

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909HWM1QT- 1 1/4", 1 1/2", 2" (H) Approved 5th Ed.of Manual (7 February 1980)
(vv),xx (Formerly 909HWQT) Renewed 7 February 2001
909M1 - 8", 10" (H) Approved 8th Ed. of Manual (1 May 1989)
(oo),gg,hh,ll,mm,pp,tt,uu Renewed 1 May 2001
909M1QT- 1 1/4", 1 1/2", 2" (H) Approved 6th Ed. of Manual (15 January 1982)
(vv),xx (Formerly 909QT) Renewed 15 January 2003
909M1QTFDA - 8",10" (H) Approved 8th Ed. of Manual (15 October 1990)
(ww) Renewed 15 October 2002
909PCHWM1QT - 1 1/4",1 1/2",2" (H) Approved 8th Ed. of Manual (2 February 1995)
(vv),xx Renewed 2 February 2001
909PCHWQT - 3/4",1" (H) Approved 8th Ed. of Manual (2 February 1995)
(vv),xx Renewed 2 February 2001
909PCM1QT - 1 1/4",1 1/2",2" (H) Approved 8th Ed. of Manual (2 February 1995)
(vv),xx Renewed 2 February 2001
909PCQT - 3/4",1" (H) Approved 9th Ed. of Manual (9 October 1998)
(vv),xx Previously Approved 8th Ed (2 February 1995)
(Ninth Ed. Approval for Serial numbers 464100
and higher) Renewed 9 October 2001
909PCQT - 3/4",1" (VU) Approved 9th Ed. of Manual (9 October 1998)
(vv),xx (Serial Numbers 464100 and higher)
Renewed 9 October 2001
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COMPANY MODEL - SIZE STATUS OF APPROVAL

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2003 © University of Southern California
Watts 909QT- 3/4", 1" (H) Approved 9th Ed. of Manual (18 June 1998)
(vv), xx Renewed 18 June 2001
Previously Approved 6th Ed. (15 January 1982)
(Ninth Ed. Approval for Serial Numbers 461650
and higher) Renewed18 June 2001
909QT- 3/4", 1" (VU) Approved 9th Ed. of Manual (18 June 1998)
(vv), xx Renewed 18 June 2001
(Serial Numbers 461650 and higher)
909QTFDA - 2 1/2",3",4",6" (H) Approved 8th Ed. of Manual (15 October 1990)
(ww) Renewed 15 October 2002
957 - 2 1/2", 3", 4" (H) Approved 9th Ed. of Manual (7 October 2002)
957N - 2 1/2",3",4" (VUVD) Approved 9th Ed. of Manual (14 April 2003)
(ppp),qqq,yyy
957Z - 2 1/2",3",4" (VUVU) Approved 9th Ed. of Manual (14 April 2003)
(ppp),qqq,yyy
967 - 2 1/2", 3" (H) Approved 9th Ed. of Manual (7 October 2002)
(ppp),qqq
967N - 2 1/2",3" (VUVD) Approved 9th Ed. of Manual (14 April 2003)
(ppp),qqq,yyy
967Z - 2 1/2",3" (VUVU) Approved 9th Ed. of Manual (14 April 2003)
(ppp),qqq,yyy
\neg 990 - 4" (H) Approved 8th Ed. of Manual (1 November 1992)
(oo),gg,hh,pp,tt,uu Renewed 1 November 2001
¬ 990 - 8" (H) Approved 8th Ed. of Manual (13 January 1993)
(oo),gg,hh,pp,tt,uu Renewed 13 January 2002
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¬ 990QT-FDA - 4" (H) Approved 8th Ed. of Manual (13 January 1993)

¬ 990QT-FDA - 8" (H) Approved 8th Ed. of Manual (13 January 1993)

(ww) Renewed 13 January 2002

(ww) Renewed 13 January 2002

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¬ 992 - 4" (H) Approved 8th Ed. of Manual (1 November 1992)
(oo) Renewed 1 November 2001
¬ 992 - 10" (H) Approved 8th Ed. of Manual (13 January 1993)
(oo) Renewed 13 January 2002
994 - 2 1/2",3",4" (H) Approved 8th Ed. of Manual (15 April 1994)
(tt),ee,ff,gg,hh,ll,mm,oo,pp,uu,ccc,ddd Renewed 15 April 2003
994 - 6" (H) Approved 8th Ed. of Manual (22 September 1997)
(tt),ee,ff,gg,hh,ll,mm,oo,pp,uu,ccc,ddd Renewed 22 September 2000
995QT - 1/2" (H) Approved 9th Ed. of Manual (13 April 2000)
(int) Renewed 13 April 2003
995QT - 3/4" (H) Approved 9th Ed. of Manual (13 April 2000)
(int) Renewed 13 April 2003
995QT - 1" (H) Approved 9th Ed. of Manual (14 January 1999)
(int) Renewed 14 January 2002
995QT - 1 1/4" (H) Approved 9th Ed. of Manual (28 March 2002)
995QT - 1 1/2" (H) Approved 9th Ed. of Manual (28 March 2002)
FAE909QT - 1 1/4", 1 1/2", 2" (H) Approved 6th Ed. of Manual (15 January 1982)
(vv),xx Renewed 15 January 2003
FAE909HWQT 1 1/4", 1 1/2", 2" (H) Approved 5th Ed.of Manual (7 February 1980)
(vv),xx Renewed 7 February 2001
Reduced Pressure Principle Assemblies
COMPANY MODEL - SIZE STATUS OF APPROVAL
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2003 © University of Southern California
Watts SS009M3QT - 1/4" (H) Approved 9th Ed. of Manual (19 December 2001)
SS009M3QT - 3/8" (H) Approved 9th Ed. of Manual (19 December 2001)
SS009M3QT - 1/2" (H) Approved 9th Ed. of Manual (19 December 2001)
SS009M3QT - 3/4" (H) Approved 9th Ed. of Manual (31 July 2001)
SS009QT - 1" (H) Approved 9th Ed. of Manual (18 May 1998)
(hhh) Renewed 18 May 2001
U009APCQT - 3/4" Approved 8th Ed. of Manual (10 December 1993)
(vv),xx (VUVD,VDVU,VUVU,VDVD) Renewed 10 December 2002
- U009APCQT - 1" Approved 8th Ed. of Manual (10 December 1993)
(vv),xx (VUVD,VDVU,VUVU,VDVD) Renewed 10 December 2002
U009AQT - 3/4" Approved 8th Ed. of Manual (12 June 1992)
(vv),xx (VUVD,VDVU,VUVU,VDVD) Renewed 12 June 2001
- U009AQT - 1" Approved 8th Ed. of Manual (12 June 1992)
(vv),xx (VUVD,VDVU,VUVU,VDVD) Renewed 12 June 2001
¬ U009M1APCQT - 1 1/2", 2" Approved 8th Ed. of Manual (27 September 1994)
(vv),xx (VUVD,VDVU,VUVU,VDVD) Renewed 27 September 2000
¬ U009M1AQT - 1 1/2" (H) Approved 8th Ed. of Manual (16 December 1992)
(vv),xx (VUVD,VDVU,VUVU,VDVD) Renewed 16 December 2001
- U009M1AQT - 2" (H) Approved 8th Ed. of Manual (9 November 1992)
(vv),xx (VUVD,VDVU,VUVU,VDVD) Renewed 9 November 2001
U009M1PCQT - 1 1/4", 1 1/2", 2" (H) Approved 8th Ed. of Manual (27 September 1994)
(vv),xx Renewed 27 September 2000
U009M1QT - 1 1/4" (H) Approved 8th Ed. of Manual (30 June 1992)
(vv),xx Renewed 30 June 2001
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- U009M1QT - 1 1/2", 2" (H) Approved 8th Ed. of Manual (30 June 1992)

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(vv),xx Renewed 30 June 2001
U009M2APCQT - 1" (H) Approved 9th Ed. of Manual (15 January 1999)
(vv),xx (VUVD,VDVU,VUVU,VDVD) Renewed 15 January 2002
U009M2APCQT - 1 1/2" (H) Approved 8th Ed. of Manual (12 September 1994)
(vv),xx (VUVD,VDVU,VUVU,VDVD) Renewed 12 September 2000
U009M2APCQT - 2" (H) Approved 9th Ed. of Manual (26 August 1997)
(vv), xx (VUVD, VDVU, VUVU, VDVD) Renewed 26 August 2000
U009M2AQT - 1" (H) Approved 9th Ed. of Manual (15 January 1999)
(vv),xx (VUVD,VDVU,VUVU,VDVD) Renewed 15 January 2002
U009M2AQT - 1 1/2" (H) Approved 8th Ed. of Manual (24 August 1993)
(vv), xx (VUVD, VDVU, VUVU, VDVD) Renewed 24 August 2002
U009M2AQT - 2" (H) Approved 9th Ed. of Manual (26 August 1997)
(vv), xx (VUVD,VDVU,VUVU,VDVD) Renewed 26 August 2000
U009M2PCQT - 1" (H) Approved 9th Ed. of Manual (15 January 1999)
(vv),xx Renewed 15 January 2002
U009M2PCQT - 1 1/2" (H) Approved 8th Ed. of Manual (12 September 1994)
(vv),xx Renewed 27 September 2000
U009M2PCQT - 2" (H) Approved 9th Ed. of Manual (26 August 1997)
(vv), xx Renewed 26 August 2000
U009M2QT - 3/4" (H) Approved 8th Ed. of Manual (16 November 1992)
(vv).xx Renewed 16 November 2001
U009M2QT - 1" (H) Approved 9th Ed. of Manual (15 January 1999)
(vv),xx Renewed 15 January 2002
U009M2QT - 1 1/2" (H) Approved 8th Ed. of Manual (24 August 1993)
(vv),xx Renewed 24 August 2002
COMPANY MODEL - SIZE STATUS OF APPROVAL
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2003 © University of Southern California
Watts U009M2QT - 2" (H) Approved 9th Ed. of Manual (26 August 1997)
(vv), xx Renewed 26 August 2000
U009PCQT - 1/2" (H) Approved 8th Ed. of Manual (2 February 1995)
(vv),xx Renewed 2 February 2001
U009PCQT - 3/4" (H) Approved 8th Ed.of Manual (10 December 1993)
(vv),xx Renewed 10 December 2002
- U009PCQT - 1" (H) Approved 8th Ed.of Manual (10 December 1993)
(vv),xx Renewed 10 December 2002
¬ U009PCQT - 1 1/4", 1 1/2",2" (H) Approved 8th Ed. of Manual (27 September 1994)
(vv),xx Renewed 27 September 2000
U009QT - 1/2" (H) Approved 8th Ed. of Manual (2 February 1995)
(vv),xx Renewed 2 February 2001
¬ U009QT - 3/4", 1" (H) Approved 7th Ed. of Manual (11 January 1988)
(vv),xx Renewed 11 January 2003
¬ U009QT - 1 1/4", 1 1/2", 2" (H) Approved 7th Ed. of Manual (9 August 1988)
(vv),xx Renewed 9 August 2000
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¬ U009SSPCQT - 3/4", 1" (H) Approved 8th Ed. of Manual (10 December 1993)

¬ U009SSPCQT - 1 1/4", 1 1/2", 2" (H) Approved 8th Ed. of Manual (27 September 1994)

(vv),xx Previously Approved under 6th Ed. (15 Jan. 1982)

(vv).xx Renewed 10 December 2002

(vv),xx Renewed 27 September 2000

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Ninth Ed. Approval for Serial Numbers 464100
and higher) Renewed 9 October 2001
U909QT - 3/4", 1" (VU) Approved 9th Ed. of Manual (9 October 1998)
(vv),xx (Serial Numbers 464100 and higher)
Renewed 9 October 2001
U909HWQT - 3/4", 1" (H) Approved 5th Ed. of Manual (29 September 1979)
(vv),xx Renewed 29 September 2000
Wilkins 375 - 2 1/2", 3" (H) Approved 9th Ed. of Manual (28 September 2001)
(gg),ee,tt,yy,hh,ff,uu,zz
375 - 4" (H) Approved 9th Ed. of Manual (27 March 2000)
(gg),ee,tt,yy,hh,ff,uu,zz Renewed 27 March 2003
375G - 2 1/2", 3" (H) Approved 9th Ed. of Manual (3 April 2002)
(ppp),qqq
375G - 4" (H) Approved 9th Ed. of Manual (10 April 2000)
(ppp),qqq Renewed 10 April 2003
375 - 6" (H) Approved 9th Ed. of Manual (27 July 2000)
(gg),ee,tt,yy,hh,ff,uu,zz
375 - 8" (H) Approved 9th Ed. of Manual (11 November 2002)
(gg),ee,tt,yy,hh,ff,uu,zz
375G - 6" (H) Approved 9th Ed. of Manual (27 July 2000)
(ppp),qqq
375GPI - 4",6" (H) Approved 9th Ed. of Manual (31 July 2001)
(ggg)- #1 SOV, (www)- #2 SOV
375PI - 4", 6" (H) Approved 9th Ed. of Manual (31 July 2001)
(hh)- #1 SOV, (vvv)- #2 SOV
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2003 © University of Southern California
Wilkins 475 - 2 1/2" (VUVD) Approved 9th Ed. of Manual (24 January 2002)
(gg), hh,ee,tt,yy,ff,uu,zz
475 - 3" (VUVD) Approved 9th Ed. of Manual (24 January 2002)
(gg), hh,ee,tt,yy,ff,uu,zz
475 - 4".6" (VUVD) Approved 9th Ed. of Manual (27 July 2000)
(ppp),qqq
475G - 2 1/2" (VUVD) Approved 9th Ed. of Manual (24 January 2002)
(ppp), qqq
475G - 3" (VUVD) Approved 9th Ed. of Manual (24 January 2002)
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(ppp), qqq

475G - 4",6" (VUVD) Approved 9th Ed. of Manual (25 August 2000) (sss),ttt

475V - 2 1/2" (VUVU) Approved 9th Ed. of Manual (24 January 2002) (qq),hh,ee,tt,yy,ff,uu,zz

475V - 3" (VUVU) Approved 9th Ed. of Manual (24 January 2002)

(gg),hh,ee,tt,yy,ff,uu,zz 475V - 4" (VUVU) Approved 9th Ed. of Manual (9 September 2000)

ppp,(qqq)

475V - 6" (VUVU) Approved 9th Ed. of Manual (31 May 2001) (ppp),qqq

475VG - 2 1/2" (VUVU) Approved 9th Ed. of Manual (24 January 2002) (ppp), qqq

475VG - 3" (VUVU) Approved 9th Ed. of Manual (24 January 2002)

475VG - 4"(VUVU) Approved 9th Ed. of Manual (13 December 2000) (sss),ttt

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475VG - 6" (VUVU) Approved 9th Ed. of Manual (6 August 2001)
(ppp),sss,ttt
¬ 575 - 3/4", 1" (H) Approved 5th Ed. of Manual (28 April 1976)
Renewed 30 April 2003
- 575A - 3/4", 1" (H) Approved 7th Ed. of Manual (17 April 1987)
(ii) Renewed 17 April 2002
¬ 575 - 1 1/4", 1 1/2", 2" (MOD-III) (H) Approved 5th Ed. of Manual (11 October 1976)
(ii) Renewed 5 October 2000
¬ 575 - 2 1/2" (H) Approved 7th Ed. of Manual (25 September 1986)
(gg),ee,tt,yy Renewed 25 September 2001
¬ 575 - 3" (H) Approved 5th Ed. of Manual (20 August 1979)
(gg),ee,tt,yy Renewed 20 August 2000
¬ 575 - 4" (H) Approved 5th Ed. of Manual (8 June 1980)
(gg),ee,tt,yy Renewed 8 June 2001
¬ 575 - 6" (H) Approved 6th Ed. of Manual (6 July 1981)
(gg),ee,tt,yy Renewed 6 July 2002
¬ 575 -M8" (4"x4"x8" Manifold) (H) Approved 6th Ed.of Manual (11 April 1983)
(formerly MBC - 8") Renewed 11 April 2001
(qq),ee,tt,vv
- 575 - M10" (6"x6"x10" Manifold) (H) Approved 6th Ed. of Manual (1 June 1983)
(formerly MBC -10") Renewed 1 June 2001
(qq),ee,tt,vv
975 - 3/4",1",1 1/4",1 1/2",2" (H) Approved 8th Ed. of Manual (18 July 1991)
(ii) Renewed 18 July 2000
975 - 2 1/2" (H) Approved 8th Ed. of Manual (26 November 1991)
(gg),ee,tt,yy,hh,ff,uu,zz Renewed 26 November 2000
Reduced Pressure Principle Assemblies
COMPANY MODEL - SIZE STATUS OF APPROVAL
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2003 © University of Southern California
Wilkins 975 - 3",4",6" (H) Approved 8th Ed. of Manual (8 November 1991)
(gg),ee,tt,yy,hh,ff,uu,zz Renewed 8 November 2000
975 - 8",10" (H) Approved 8th Ed. of Manual (6 February 1995)
(gg),ee,tt,yy,hh,ff,uu,zz Renewed 6 February 2001
975A - 3/4",1",1 1/4",1 1/2",2" (H) Approved 8th Ed. of Manual (18 July 1991)
(ii) Renewed 18 July 2000
975 BMS - 2 1/2", 3", 4", 6", 8", 10" (H)Approved 8th Ed. of Manual (17 June 1997)
(gg),ee,tt,yy,hh,ff,uu,zz Renewed 17 June 2000
975G - 4",6" (H) Approved 8th Ed. of Manual (27 March 2000)
(ppp) Renewed 27 March 2003
975MS - 2 1/2".3".4"6" (H) Approved 8th Ed. of Manual (5 May 1995)
(gg),ee,tt,yy,hh,ff,uu,zz Renewed 5 May 2001
975MS - 8",10" (H) Approved 8th Ed. of Manual (5 December 1996)
(gg),ee,tt,yy,hh,ff,uu,zz Renewed 5 December 2002
975XL - 1/4", 3/8", 1/2" (H) Approved 8th Ed. of Manual (12 July 1994)
(ii) Renewed 12 July 2000
975XL - 3/4",1",1 1/4",1 1/2",2" (H) Approved 8th Ed. of Manual (2 November 1992)
(ii) Renewed 2 November 2001
975XLBMS - 3/4", 1", 1 1/4", 1 1/2", 2"Approved 8th Ed. of Manual (9 May 1997)
(ii) (H) Renewed 9 May 2003
975XLD - 3/4" (H) Approved 9th Ed. of Manual (8 October 2002)
975XLMS - 3/4",1",1 1/4",1 1/2",2" (H) Approved 8th Ed. of Manual (30 August 1994)
(ii) Renewed 30 August 2000
975XLSE - 3/4", 1" (VUVD, VUVU) Approved 9th Ed. of Manual (16 October 2000)
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(ii)
975XLSE - 1 1/4",1 1/2",2" Approved 9th Ed. of Manual (4 November 1999)
(ii) (VUVD,VUVU) Renewed 4 November 2002
975XLST - 3/8", 1/2" (H) Approved 9th Ed. of Manual (19 November 2002)
(ii)
975XLSEU - 3/4", 1" (VUVD,VUVU) Approved 9th Ed. of Manual (16 October 2000)
(ggg)
975XLSEU - 1 1/4",1 1/2",2" Approved 9th Ed. of Manual (27 March 2000)
(ggg) (VUVD,VUVU) Renewed 27 March 2003
975XLU - 3/4", 1", 1 1/2", 2" (H) Approved 8th Ed. of Manual (2 September 1993)
(ggg) Renewed 2 September 2002
975XLV - 3/4", 1" (VUVD,VUVU) Approved 9th Ed. of Manual (7 January 2001)
(iii)
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COMPANY MODEL - SIZE STATUS OF APPROVAL

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## Atmospheric Vacuum Breakers

COMPANY MODEL - SIZE STATUS OF APPROVAL

Arrowhead 58 - 1/2" Approved 6th Ed. of Manual (18 March 1983)

Brass Renewed 18 March 2001

Ames A100 - 3/4", 1" (VUH) Approved 8th Ed. of Manual (1 November 1991)

Renewed 1 November 2000

A100 - 1 1/2" (VUH) Approved 8th Ed. of Manual (27 September 1991)

Renewed 27 September 2000

A100 - 2" (VUH) Approved 8th Ed. of Manual (21 August 1991)

Renewed 21 August 2000

Champion 162 3/4", 1",1 1/4", 1 1/2", 2" (H) Approved 7th Ed. of Manual (13 January 1986)

Brass Renewed 13 January 2001

262 (angle) - 3/4", 1",1 1/4", 1 1/2", 2"Approved 7th Ed. of Manual (13 January 1986)

(VUH) Renewed 13 January 2001

¬ 362 3/4". 1" (VUH) Approved 7th Ed. of Manual (13 January 1986)

Renewed 13 January 2001

466P 3/4", 1" (VUVD) Approved 7th Ed. of Manual (13 January 1986)

Renewed 13 January 2001

Rain Bird APAS - 075 - 3/4" (VUVD) Approved 6th Ed. of Manual (22 April 1982)

Renewed 22 April 2003

DAS - 075 - 3/4" (VUVD) Approved 6th Ed. of Manual (22 April 1982)

Renewed 22 April 2003

Strahman HS - Vertical - 3/4" (VD) Approved 6th Ed. of Manual (5 June 1981)

Renewed 5 June 2002

HS - Horizontal - 3/4" (H) Approved 6th Ed. of Manual (15 September 1981)

Renewed 5 September 2002

Watts 288A-M3 - 1 1/4" (VUH) Approved 8th Ed. of Manual (12 August 1991)

Renewed 12 August 2000

288A-M3 - 1 1/2" (VUH) Approved 8th Ed. of Manual (27 September 1991)

Renewed 27 September 2000

288A-M3 - 2" (VUH) Approved 8th Ed. of Manual (21 August 1991)

Renewed 21 August 2000

288A-M3 - 2 1/2" (VUH) Approved 8th Ed. of Manual (10 September 1991)

Renewed 10 September 2000

288A-M3 - 3" (VUH) Approved 8th Ed. of Manual (16 September 1991)

Renewed 16 September 2000

288A-M5 - 3/4", 1" (VUH) Approved 8th Ed. of Manual (1 November 1991)

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Renewed 1 November 2000
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2003 © University of Southern California
Ames A200 - 3/4" (VUH) Approved 8th Ed. of Manual (6 April 1993)
(vv),xx Renewed 6 April 2002
A200 - 1" (VUH) Approved 8th Ed. of Manual (25 May 1993)
(vv),xx Renewed 25 May 2002
A200 - 1 /2", 2" (VUH) Approved 8th Ed. of Manual (21 June 1993)
(vv),xx Renewed 21 June 2002
Buckner - 24199 - 1/2" (VUH) Approved 8th Ed. of Manual (10 December 1991)
(ii) Renewed 10 December 2000

¬ 24200 - 3/4" (VUH) Approved 8th Ed. of Manual (10 December 1991)

(ii) Renewed 10 December 2000

¬ 24201 - 1" (VUH) Approved 8th Ed. of Manual (10 December 1991)

(ii) Renewed 10 December 2000

¬ 24202 - 1 1/4" (VUH) Approved 8th Ed. of Manual (9 September 1992).

(ii) Renewed 9 September 2001
\neg 24203 - 1 1/2" (VUH) Approved 8th Ed. of Manual (9 September 1992)
(ii) Renewed 9 September 2001

¬ 24204 - 2" (VUH) Approved 8th Ed. of Manual (9 September 1992)

(ii) Renewed 9 September 2001
- 24199/25 - 1/2" (VUH) Approved 8th Ed. of Manual (10 December 1991)
(ii) Renewed 10 December 2000
- 24200/25 - 3/4" (VUH) Approved 8th Ed. of Manual (10 December 1991)
(ii) Renewed 10 December 2000

¬ 24201/25 - 1" (VUH) Approved 8th Ed. of Manual (10 December 1991)

(ii) Renewed 10 December 2000

¬ 24202/25 - 1 1/4" (VUH) Approved 8th Ed. of Manual (9 September 1992).

(ii) Renewed 9 September 2001

¬ 24203/25 - 1 1/2" (VUH) Approved 8th Ed. of Manual (9 September 1992).

(ii) Renewed 9 September 2001

¬ 24204/25 - 2" (VUH) Approved 8th Ed. of Manual (9 September 1992)

(ii) Renewed 9 September 2001
Conbraco 40-503-02 - 1/2" (VUH) Approved 8th Ed. of Manual (6 September 1991)
(dd) Renewed 6 September 2000
40-504-02 - 3/4" (VUH) Approved 8th Ed. of Manual (6 September 1991)
(dd) Renewed 6 September 2000
40-505-02 - 1" (VUH) Approved 8th Ed. of Manual (6 September 1991)
(dd) Renewed 6 September 2000
40-506-02 - 1 1/4" (VUH) Approved 8th Ed. of Manual (1 December 1993)
(dd) Renewed 1 December 2002
40-507-02 - 1 1/2" (VUH) Approved 8th Ed. of Manual (1 December 1993)
(dd) Renewed 1 December 2002
40-508-02 - 2" (VUH) Approved 8th Ed. of Manual (1 December 1993)
(dd) Renewed 1 December 2002
PVB -1/2", 3/4", 1" (VUH) Approved 9th Ed. of Manual (23 September 1999)
PVB - 1 1/4", 1 1/2" (VUH) Approved 9th Ed. of Manual (7 October 2002)
Febco 745 - 3/4". 1" (VUH) Approved 6th Ed. of Manual (10 May 1983)
(ii),fff,jjj,ooo Renewed 10 May 2001
765 - 1/2" (VUH) Approved 5th Ed. of Manual (26 March 1974)
(ii),fff,ooo,xxx Renewed 1 July 2001
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## Pressure Vacuum Breakers

COMPANY MODEL-SIZE STATUS OF APPROVAL

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## Pressure Vacuum Breakers

COMPANY MODEL-SIZE STATUS OF APPROVAL

Febco 765 - 3/4", 1" (VUH) Approved 5th Ed. of Manual (26 March 1974)

(ii),fff,jjj,ooo,xxx Renewed 1 July 2001

765 - 1 1/4" (VUH) Approved 5th Ed. of Manual (26 March 1974)

(ii),fff,jjj,ooo Renewed 1 July 2001

765 - 1 1/2" (VUH) Approved 5th Ed. of Manual (26 March 1974)

(ii),fff,jjj,ooo,xxx Renewed 1 July 2001

765 - 2" (VUH) Approved 5th Ed. of Manual (26 March 1974)

(ii),fff,ooo,xxx Renewed 1 July 2001

766 - 1" (VUH) Approved 9th Ed. of Manual (31 August 1999)

(fff),ii,jjj,ooo Renewed 31 August 2002

Flomatic PVB - 3/4", 1" (VUH) Approved 9th Ed. of Manual (21 November 1997)

(ii) Renewed 21 November 2000

Neptune, SMR - See Wilkins

Watts - 800 QT- 3/4", 1" (VUH) Approved 5th Ed. of Manual (14 February 1978)

(vv),xx Renewed 14 February 2002

 $\neg$  800 QT- 1 1/4",1 1/2", 2" (VUH) Approved 5th Ed. of Manual (14 August 1978)

(vv),xx Renewed 14 August 2002

800M QT - 1/2",3/4" (VUH) Approved 8th Ed. of Manual (18 July 1989)

(vv),xx Renewed 18 July 2001

800CM QT - 1/2",3/4" (VUH) Approved 8th Ed. of Manual (18 July 1989)

(vv),xx Renewed 18 July 2001

¬ 800M2QT - 1/2",3/4",1" (VUH) Approved 8th Ed. of Manual (9 July 1991)

(vv),xx Renewed 9 July 2000

- 800M2QT - 1 1/4",1 1/2",2" (VUH) Approved 8th Ed. of Manual (25 March 1993)

(vv),xx Renewed 25 March 2002

 $\neg$  800 M3QT - 1/2", 3/4" (VUH) Approved 8th Ed. of Manual (24 February 1992)

(vv),xx Renewed 24 February 2001

800 M4FR - 1/2", 3/4" (VUH) Approved 9th Ed. of Manual (12 May 1998)

(vv),xx Renewed 12 May 2001

800 M4FR - 1" (VUH) Approved 9th Ed. of Manual (1 September 1995)

(vv),xx Renewed 1 September 2001

800 M4FR - 1 1/4", 1 1/2", 2" (VUH) Approved 9th Ed. of Manual (13 May 1997)

(vv),xx Renewed 13 May 2003

800M4QT - 1/2" (VUH) Approved 8th Ed. of Manual (6 September 1993)

(vv),xx Renewed 6 September 2002

800M4QT - 3/4" (VUH) Approved 8th Ed. of Manual (6 April 1993)

(vv),xx Renewed 6 April 2002

800M4QT - 1" (VUH) Approved 8th Ed. of Manual (25 May 1993)

(vv),xx Renewed 25 May 2002

800M4QT - 1 1/4" (VUH) Approved 8th Ed. of Manual (24 May 1994)

(vv),xx Renewed 24 May 2003

800M4QT - 1 1/2", 2" (VUH) Approved 8th Ed. of Manual (21 June 1993)

(vv),xx Renewed 21 June 2002

Wilkins 420 - 1/2", 3/4" (VUH) Approved 9th Ed. of Manual (17 July 1999)

(ii) Renewed 17 July 2002

420 - 1" (VUH) Approved 9th Ed. of Manual (29 September 2000)

720A - 1/2",3/4",1" (VUH) Approved 5th Ed. of Manual (28 August 1978) (ii) Renewed 28 August 2002

720A - 1 1/4", 1 1/2", 2" (VUH) Approved 5th Ed. of Manual (28 August 1978)

(ii) Renewed 28 August 2002

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Fifty-two (52) Pages

Paul H. Schwartz, P.E., Chief Engineer

NOTE: All assemblies are listed in alphabetical order;

there is no implication of preference of assemblies.

## Spill Resistant Pressure Vacuum Breakers

COMPANY MODEL-SIZE STATUS OF APPROVAL

Conbraco SVB - 1/4", 3/8", 1/2" (H) Approved 9th Ed. of Manual (30 November 2000) (int)

Watts 008PCQT - 3/8" (VUH) Approved 9th Ed. of Manual (18 November 1998)

(vv),xx Renewed 18 November 2001

008PCQT - 1/2" (VUH) Approved 9th Ed. of Manual (18 November 1998)

(vv),xx Renewed 18 November 2001

008PCQT - 3/4" (VUH) Approved 9th Ed. of Manual (19 June 2000)

(vv),xx

008PCQT - 1" (VUH) Approved 9th Ed. of Manual (19 June 2000)

(vv),xx

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## Hersey/Grinnell

## http://www.grinnell.com/

**Grinnell Corporation** 

Research and Development Center

1467 Elmwood Ave.

Cranston, RI 02910

(401) 781-8220

#### **Rain Bird**

### http://www.rainbird.com

19233 E. Foothill Blvd.

Glendora, CA 91340

(626) 963-9311

Strahman Valves. Inc.

http://www.strahmanvalves.com/

3 Vreeland Road

Florham Park, NJ 07932

(973) 377-4900

### **Watts Regulator Company**

#### http://www.wattsreg.com/

815 Chestnut Street

North Andover, MA 01845

(978) 688-1811

#### **Wilkins Regulator Company**

## http://www.zurn.com/wilkins/wilkins.htm

1747 Commerce Way

Paso Robles, CA 93446

(800) 817-8177

### **Ames Company**

### http://www.ames-co.com/

1485 Tanforan Ave.

Woodland, CA 95695

(530) 666-2493

## **Arrowhead Brass**

http://www.arrowheadbrass.com/

5147 Alhambra Ave. Los Angeles, CA 90032 (323) 343-9790

Buckner, Inc.

http://www.bucknerirrigation.com

4381 N. Brawley Ave. Fresno, CA 93722 (559) 275-0500

**Champion Brass Manufacturing Co.** 

http://www.championirrigation.com/

1460 N. Nuad Street Los Angeles, CA 90012 (213) 221-2108

Cla-Val Company

http://www.cla-val.com/

P. O. Box 1325 Newport Beach, CA 92659-0325 (949) 722-4800

**Conbraco Industries** 

http://www.conbraco.com/

P. O. Box 247 Matthews, NC 28105 (704) 847-9191

Febco - SPX Valves & Controls

http://www.cmb-ind.com/

P. O. Box 8070 Fresno, CA 93747 (559) 252-0791

**Flomatic** 

http://www.flomatic.com/ 15 Pruyn's Island Dr.

Glen Falls, NY 12801-4424

(800) 833-2040

# Manufacturers of Approved Assemblies

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## Special Notices

From time to time the Foundation issues Special Notices when specific information needs to be brought before the Members of the Foundation. A copy of the notices are sent to Foundation Members as they are published. Notices may also be found on the Internet at the World Wide Web address of http://www.usc.edu/fccchr/notice.html Notices are summarized as follows.

#### Notice 96-001

This notice lists Ames assemblies which have been reported with low check valve readings. Corrections to the problem are discussed.

### Notice 97-001

This Notice discusses changes in the Wilkins 975 8" and 10" reduced pressure principle assemblies. A change in the retaining cup in the relief valve stem.

#### Notice 97-002

Ames 2000SS, 3000SS, and 4000SS series assemblies were discovered to have unapproved components.

#### Notice 97-003

This notice lists assemblies which were NOT Approved by the Foundation, although advertisements may have implied otherwise.

#### Notice 98-001

This notice advises members of certain action in the Federal Register regarding cross-connection control programs.

#### Notice 98-002

This notice advises members of Wilkins 950 series and 975 series modifications.

#### Notice 99-001

This notice lists assemblies which were NOT Approved by the Foundation, although advertisements may have implied otherwise.

#### Notice 99-002

This notice lists assemblies which were NOT Approved by the Foundation, although advertisements may have implied otherwise.

#### Notice 99-003

This notice lists assemblies which were NOT Approved by the Foundation, although advertisements may have implied otherwise.

#### Notice 01-001

Discuss silicon parts in certain Febco relief valves

### Notice 01-002/Revised Notice 01-002-R1

This notice discusses some check valves not approved in certain Ames and Watts asemblies

#### Notice 01-003

This notice lists assemblies which were NOT Approved by the Foundation, although advertisements may have implied otherwise.

#### Notice 02-001

This notice explains there are some specific Febco assemblies with unapproved check valve retainers.

#### Notice 03-001

This notice explains there are some improper markings of model designations on some Wilkins assemblies

#### Notice 03-002

This notice explains there is the possibility of the interference of the check valves on some Ames and Watts assemblies. 2003 © University of Southern California

Foundation for Cross-Connection Control

and Hydraulic Research

University of Southern California Kaprielian Hall 200

Los Angeles, California 90089-2531

(213) 740-2032

FAX: (213) 740-8399

E-Mail: fccchr@usc.edu

World Wide Web Homepage:

http://www.usc.edu/fccchr/

# **Recommended Protection At Fixtures and Equipment**

Description of fixture, equipment or use of water	Assessed Health Hazard	Minimum Protection at Fixture	Additional Premises or Internal Isolation*
Air Compressor	low	DCVA	
• Air conditioning systems	high	RPBA	
• Air washers	high	RPBA	
Aquarium make-up water	high	AG/RPBA	
• Aspirators, medical/lab	high	AVB RPBA	
• Aspirators, medical/lab	high	RPBA	
• Aspirator, weedicide, herbicide, and pesticide	high	RPBA	
• Aspirator, vault drain	high	RPBA	
• Autoclave	high	RPBA	
Autopsy tables	high	RPBA	
Baptismal fountain	high/low	RPBA/AG/AVB	
• Bathtub, below rim filler	high	RPBA	
Bedpan washer	high	RPBA	
• Post-mix beverage dispenser using CO <sub>2</sub>	high	RPBA	
• Bidets	low	AVB	
• Boiler feed lines	high	RPBA	
Bottle washing equipment	high	RPBA	
Bottle washing equipment	high	PVBA/AVB RPBA	
• Box hydrant (irrigation)	high	PVBA/DCVA	
• Brine tank	low	AG/DCVA	
• Can washing equipment	high	RPBA	
Can washing equipment	high	PVBA/AVB	RPBA
Chemical feed tank or industrial process	high	AG/RPBA	RPBA
• Chemical feeder for commercial cleaners	high	AG/PVBA	
• Chemical feeder for commercial cleaners	high	AVB/PVBA	RPBA/DCVA
• Chlorinators	high	RPBA	
Commercial coffee urns	low	AG/AVB	
Computer cooling lines	high	RPBA	
Condensate tanks	high	RPBA	
Commercial cooking kettles	low	AG/AVB	

<sup>(\*)</sup> Where a high health hazard is assessed, the use of an atmospheric vacuum breaker or other backflow device for protection at a fixture should only be allowed when area or premise isolation is provided by an approved assembly.

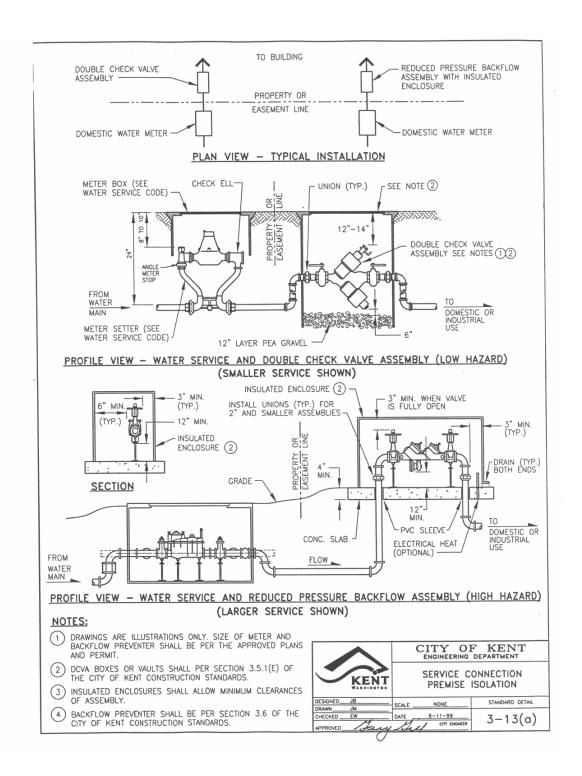
# **Recommended Protection At Fixtures and Equipment**

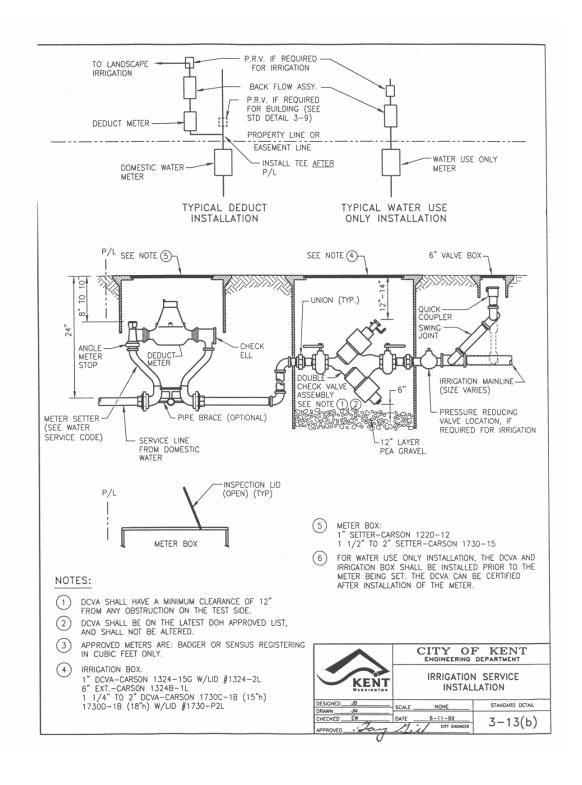
Description of fixture, equipment or use of water	Assessed Health Hazard	Minimum Protection at Fixture	Additional Premises or Internal Isolation*
Cooling towers	high	AG/RPBA	
Decorative ponds	high	AG/RPBA	
Degreasing equipment	high	RPBA	
Dental equipment/cuspidors	high	RPBA	RPBA
Dialysis equipment	high	RPBA	
Dishwashers	low	AVB	
Drinking fountains	low	AG	
Dye vats and tanks	high	AG/RPBA	
Etching tanks	high	AG/RPBA	RPBA
Fermenting tanks	high	AG/RPBA	RPBA
Fertilizer injection	high	RPBA	
Film processors	high	RPBA	
Fire department connection	low	DCVA	
Fire sprinkler system w/o chemical addition	low	DCVA/DCDA	
Fire sprinkler system with chemical addition	high	RPBA/RPDA	
Floor drains	high	AG	
Flushing floor drains	high	AVB	DCVA
• Fume hoods (lab)	high	AVB	RPBA
Garbage can washers	high	RPBA	
Heat exchangers other than double wall with leak path	high	RPBA	
Heat pumps	high	RPBA	
High pressure washers w/o chemical injection	low	DCVA	
Hose bibbs (residential)	low	AVB/HBVB	
Hose bibbs (industrial)	varies	AVB/HBVB	RPBA/DCVA
Hoses, kitchen rinse	low	AVB	
Hot tubs	high	AG/RPBA	
Commercial hot water heating boilers	high	RPBA	
Hydrotheraphy baths	high	RPBA	
Ice makers	high	AG/RPBA	
Industrial fluid systems	high	RPBA	

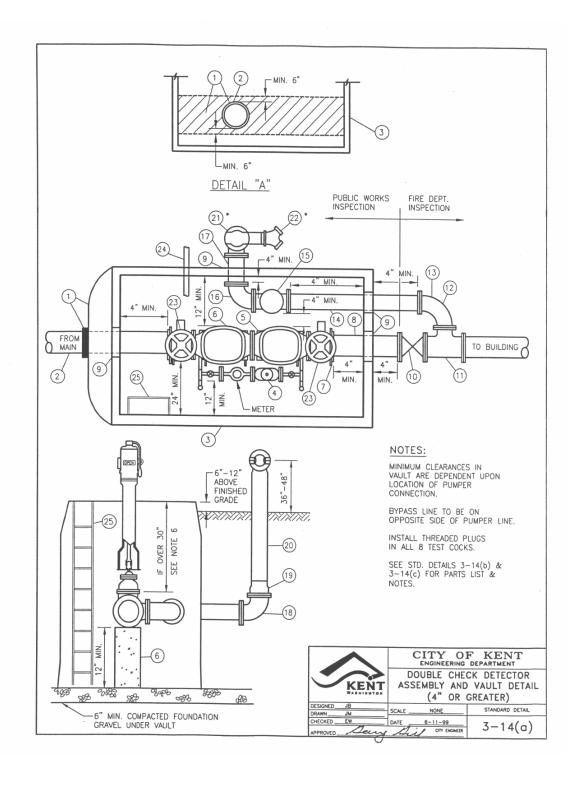
# **Recommended Protection At Fixtures and Equipment**

Description of fixture, equipment or use of water	Assessed Health Hazard	Minimum Protection at Fixture	Additional Premises or Internal Isolation*
Intertied (looped) service	low	DCVA	
Irrigation system (lawn) with chemical addition	high	RPBA	
Irrigation system (lawn) w/o chemical addition	low	PVBA/DCVA	
Janitor sinks	low	AVB/HBVB	
Kitchen equipment	low	AVB	
Laboratory equipment	high	AVB/LFVB RPBA	
Laundry machines, commercial	high	RPBA	
Livestock drinking tanks	high	AG/AVB	DCVA
Make-up tanks	high	AG/RPBA	
Mobile carpet cleaners	high	RPBA	
Pesticide applicator trucks	high	AG/RPBA	
Photo developing sinks/tanks	high	RPBA	
Private fire hydrants	low	DCVA	
Pump prime lines	high	RPBA	
Radiator flushing equipment	high	RPBA	
Recreational vehicle dump station	severe	AG	RPBA
Sewer connected equipment	severe	AG	
Sewer flushing	severe	AG	
• Spas	high	AG/RPBA	
Steam generating equipment	high	RPBA	
• Sterilizes	high	RPBA	
• Stills	high	RPBA	
• Sumps	high	AG	
Swimming pools	high	AG/RPBA	
Trap primers	high	AG	
Used or gray water systems	high	RPBA	
X-ray equipment	high	RPBA	

The information in this table may differ from the backflow prevention requirements for individual plumbing fixtures found in plumbing codes. For public health protection within a customer's premise, the plumbing code having jurisdiction governs. This table is provided to illustrate only some of the health hazards found in plumbing systems. This table should be used by water purveyors in assessing the degree of hazard a customer's plumbing system places upon the purveyor's water distribution system. Deficiencies in backflow prevention within the customer's premise, should be compensated for through the selection of an appropriate assembly for premise isolation.







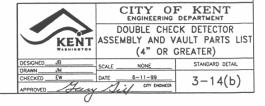
SEE CITY FIRELINE CODE AND STD. DETAIL 3-14(c) FOR NOTES.

SEE STD. DETAIL 3-14(a) FOR PLAN, ELEVATION & SECTION.

- 1) CONC. BLOCKING AS REQ'D W/ LOCKING FOLLOWER RING AS SHOWN. SEE DETAIL "A".
- (2) 4" MIN. D.I. CLASS 52.
- 3 PRECAST CONC. VAULT. SEE CITY OF KENT FIRELINE CODE.
- 4 APPROVED DCVA IN BYPASS LINE (LATEST HEALTH DEPARTMENT APPROVED LIST) SHALL BE ON OPPOSITE SIDE OF PUMPER LINE. (PART OF DCDA)
- DCDA IN MAIN LINE (LATEST DSHS APPROVED LIST).
- (6) CONC. SUPPORT PADS UNDER CHECK VALVE.
- (7) 10", 8", 6" OR 4" FL COUPLING ADAPTER
- 8) 10", 8", 6" OR 4" PExFL PIPE.
- GROUT INTERIOR & EXTERIOR ALL AROUND PIPE.
- 10", 8", 6" OR 4" RESILIENT WEDGE GATE VALVE, FL W/ POST INDICATOR W/ TAMPER SWITCH.
- 11) 10", 8", 6" OR 4" TEE, FL.
- 10", 8", 6" OR 4" REDUCING 90" BEND, FL, AS REQ'D.
- (13) 6" OR 4" LONG RADIUS 90° BEND, FL
- (14) 6" OR 4" SPOOL, FL.
- 6" SWING TYPE GRAVITY OPERATED CHECK VALVE, FL W/ BALL DRIP.
- (16) 4" OR 6" 90" BEND, FL
- (17) 4" OR 6" SPOOL, FLxFL.
- (18) 6" OR 4" BEND, FLxFL.
- (19) FLxIP ADAPTER.
- 6" OR 4" GALV. PIPE, THREADED, LENGTH AS REQ'D (SEE STD. DET. 3-14C).
- (21) \* 4"x4"x6" BULL HEAD THREADED TEE.
- (22)\* UL LISTED FD CONNECTION & UL LISTED BREAK AWAY CAPS, LOCATE WITHIN 50' MAX. OF A PUBLIC FIRE HYDRANT.
- O.S & Y VALVES TO BE RESILIENT SEATED W/ TAMPER SWITCHES. ADD WIRING IN ACCORDANCE W/ L & I (SEE NOTE 11 ON STD. DETAIL 3-14C).
- GALV. CONDUIT SLEEVE, SEALED BOTH ENDS, FOR ELECTRONIC MONITORING WIRES.
- (25) LADDER AS REQ'D PER OSHA.

\* (21) & (22)

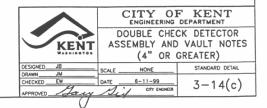
ARE GENERALLY 6" WITH THE BULL, ELBOW AS INDICATED. IN CASES WHERE A 4" DCVA IS APPROVED THE BULL, ELBOW IS ELIMINATED AND THE FD CONNECTION IS ATTACHED DIRECTLY TO THE GALV. PIPE.

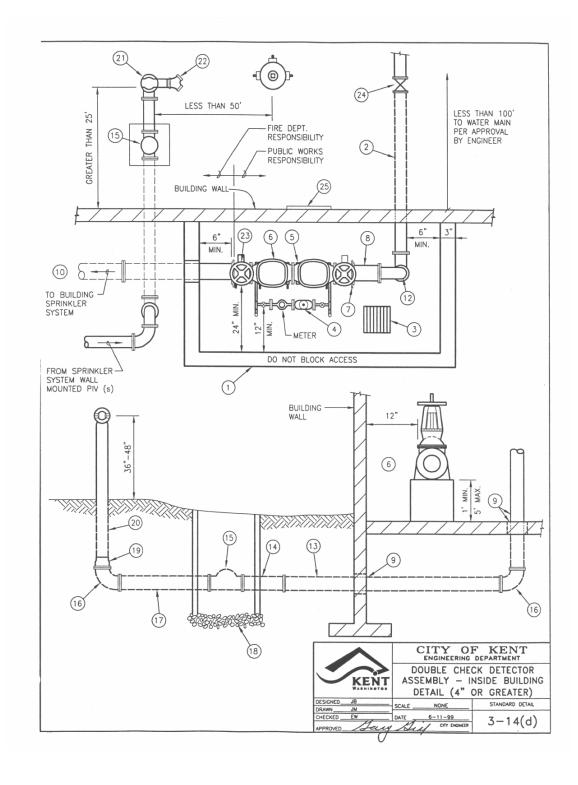


#### 4 INCH OR GREATER DOUBLE CHECK DETECTOR ASSEMBLY AND VAULT NOTES:

- 1) VAULT DIMENSIONS BASED ON SIZE OF APPARATUS AND MEETING MINIMUM CLEARANCES.
- 2) ALL VAULT LIDS SHALL HAVE DOUBLE DOORS WITH LID DRAINS TO EXTERIOR OF VAULT.
- 3) MINIMUM APPARATUS SIZE SHALL BE 4 INCHES.
- 4) VAULT SHALL BE SEALED TO PREVENT WATER LEAKAGE.
- 5) LADDERS SHALL BE REQUIRED WHEN DEPTH FROM TOP OF LID TO TOP OF APPARATUS EXCEEDS 30", AND/OR THE APPARATUS IS MORE THAN 12" ABOVE THE FLOOR. INSTALLATION OF ALL LADDERS SHALL BE IN COMPLIANCE TO OSHA.
- 6) ALL BACK FLOW PREVENTORS SHALL BE ON THE LATEST APPROVED LIST APPROVED BY THE CITY OF KENT.
- 7) MAKE ALL ATTEMPTS TO LOCATE VAULT IN PLANTING AREA NOT IN PAVING AREA.
- 8) ALL BENDS AND ELBOWS TO BE CAST IRON, CLASS 250, CEMENT LINED. (SEE APWA AND AWWA).
- 9) TEMPORARY SUPPORT SHALL BE PROVIDED UNDER VALVES AT THE TIME OF INSTALLATION. AFTER COMPLETE INSTALLATION REMOVE THE TEMPORARY SUPPORT AND INSTALL CONCRETE SUPPORT PAD WITH 6"BRICK SHIMS AS REQUIRED.
- 10) GROUT INTERIOR AND EXTERIOR ALL AROUND PIPE.
- 11) ALL PIPE TO BE DUCTILE IRON CEMENT LINED CLASS 52 PIPE EXCEPT WHERE INDICATED. INSTALLATION MUST ALLOW CLEARANCE FOR PROPER OPERATION OF ALL O.S AND Y's.
- 12) GALVANIZED STEEL PIPE SHALL BE WRAPPED WITH POLYETHYLENE WRAPPING 10mm THICKNESS.

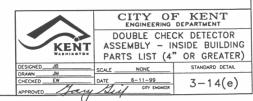
SEE STD. DETAIL 3-14(o) FOR PLAN, ELEVATION & SECTION. SEE STD. DETAIL 3-14(b) FOR PARTS LIST.





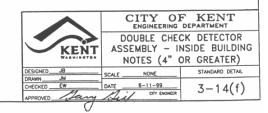
### INSIDE BUILDING ASSEMBLY LIST (4" OR GREATER):

- PERIMETERS OF MINIMUM CLEARANCES TO BE PAINTED ON FLOOR IN WHITE ENAMEL PAINT WITH 2" STENCILED BLACK LETTERS "DO NOT BLOCK ACCESS".
- 4" MINIMUM D.I. CLASS 52.
- 3) FLOOR DRAIN IN BUILDING TO STORM SYSTEM.
- 4) DCVA IN BYPASS LINE (LATEST HEALTH DEPT. APPROVED LIST) SHALL BE ON OPPOSITE SIDE OF PUMPER LINE.
- 5) DCDA IN MAIN LINE (LATEST HEALTH DEPT. APPROVED LIST).
- 6) CONCRETE SUPPORT PADS UNDER CHECK VALVE.
- 7) 10", 8", 6" OR 4" FL COUPLING ADAPTER.
- 8) 10", 8", 6" OR 4" PE x FL PIPE.
- 9) 2" CLEARANCE INTERIOR AND EXTERIOR ALL AROUND PIPE.
- 10) 10", 8", 6" OR 4" RESILIENT WEDGE GATE VALVE, FL WITH WALL MOUNTED POST INDICATOR WITH TAMPER SWITCH.
- 11) 10", 8", 6" OR 4" DIP, CL 50.
- 12) 10", 8", 6" OR 4" 90 DEGREE BEND, FL WITH BALL DRIP IN VAULT.
- 13) 6" OR 4" DIP, CL 50.
- 14) 6" OR 4" SPOOL, FL.
- 15) . 6" SWING TYPE GRAVITY OPERATED CHECK VALVE, FL WITH BALL DRIP IN VAULT.
- 16) 4" OR 6" SPOOL, 90 DEGREE BEND.
- 17) 4" OR 6" SPOOL, FL x FL.
- 18) DRAIN ROCK, 1/2 C.Y.
- 19) FL x IP ADAPTER
- 20) 6" OR 4" CALV. PIPE, THREADED, LENGTH AS REQUIRED (SEE STD. DETAIL 3-14c).
- 21) 4"x4"x6" BULL, ELBOW, THREADED.
- 22) UL LISTED FD CONNECTION AND UL LISTED BREAK AWAY CAPS, LOCATE WITHIN 50' MAX. OF A PUBLIC FIRE HYDRANT.
- 0.S. AND Y VALVES TO BE RESILIENT WEDGE WITH TAMPER SWITCHES. ADD WIRING IN ACCORDANCE WITH L & I (SEE NOTE 11 ON STD. DETAIL 3-14c)
- 24) 10", 8", 6", OR 4" RESILIENT WEDGE GATE VALVE, FL W/POST INDICATOR W/TAMPER SWITCH.
- 25) SIGN ON OUTSIDE OF BUILDING......FIRELINE DOUBLE CHECK INSIDE BLDG



#### INSIDE BUILDING: 4" OR GREATER DOUBLE CHECK DETECTOR ASSEMBLY NOTES

- 1) ROOM IN WHICH DCDA IS PROPOSED TO BE LOCATED SHALL:
  - A. HAVE FLOOR DRAINS CONNECTED TO STORM OR SANITARY SEWER.
  - B. HAVE A HEATING SYSTEM (40° F MIN. TEMP.) NO HEAT TAPE.
  - C. NOT BE USED FOR STORAGE AROUND THE DCDA.
  - D. HAVE CLEARLY DELINEATED ACCESS WAYS TO DCDA AND WALL MOUNTED PIVS.
- 2) MINIMUM APPARATUS SIZE SHALL BE 4 INCHES.
- 3) ALL BACKFLOW PREVENTERS SHALL BE ON THE LATEST LIST APPROVED BY THE DEPARTMENT OF HEALTH AND THE CITY OF KENT.
- 4) MAKE ALL ATTEMPTS TO LOCATE SWING CHECK VAULT IN PLANTING AREA & NOT IN PAVING AREA.
- 5) ALL BENDS AND ELBOWS TO BE CAST IRON, CLASS 250, CEMENT LINED. (SEE APWA AND AWWA).
- 6) TEMPORARY SUPPORT SHALL BE PROVIDED UNDER VALVES AT THE TIME OF INSTALLATION. AFTER COMPLETE INSTALLATION REMOVE THE TEMPORARY SUPPORT AND INSTALL CONCRETE SUPPORT PAD WITH 6" BRICK SHIMS AS REQUIRED.
- 7) GROUT ALL AROUND PIPE WHERE IT ENTERS THE BUILDING.
- 8) ALL PIPE TO BE DUCTILE IRON CEMENT LINED CLASS 52 PIPE EXCEPT WHERE INDICATED. INSTALLATION MUST ALLOW CLEARANCE FOR PROPER OPERATION OF ALL O.S. AND Y'S.
- 9) GALVANIZED STEEL PIPE SHALL BE WRAPPED WITH POLYETHYLENE WRAPPING (10mm THICKNESS).
- 10) IF A NEW CITY HYDRANT IS NOT REQUIRED ON FIRELINE UPSTREAM OF BUILDING, (THERE IS AN EXISTING CITY HYDRANT WITHIN 50' OF FDC) THEN INSTALL A 2" B.O. PER KENT STANDARD DETAIL 3-2 60' FROM CITY MAIN.
- 11) IF PRIVATE HYDRANTS ARE REQUIRED FOR THE PROJECT, ENTIRE SYSTEM (HYDRANTS AND FIRELINE) SHALL BE ISOLATED FROM CITY SYSTEM BY A DCDA LOCATED IN A VAULT AT THE PROPERTY LINE PER STANDARD DETAILS 3-14(a), 3-14(b) AND 3-14(c).
- 12) INSTALLATION OF DCDA IS APPROVED BY HORIZONTAL ALIGNMENT ONLY.
- 13) A HEATED, R-19 INSULATED WOOD FRAMED ENCLOSURE IS AN ACCEPTABLE ALTERNATIVE TO A ROOM IF DCDA IS TO BE LOCATED IN AN UNHEATED BUILDING. THE ENCLOSURE MUST MEET ALL REQUIREMENTS OF THE DEVELOPMENT SERVICES DIVISION.



## PUBLIC WORKS OPERATIONS

## STANDARD OPERATING PROCEDURES

### 9.0 WATER

## 9.3 New Water Main Connection Procedures

PURPOSE: To avoid connections between the City potable water system and unsafe or newly constructed water systems that have the potential to contaminate the City water system, and to provide optimal cleaning, disinfection and connection procedures for new water mains to ensure safe, potable drinking water for human consumption.

Note: These procedures shall be done in the following sequence or as directed by the City Inspector.

## 9.3.1 Connection to an Existing Water Main

A physical separation between all untested and potentially contaminated water mains (or main extensions) and the city's existing water system shall be maintained at all times unless the connection is protected by an approved Department of Health backflow device (See diagram on page 5). A hydrant meter and an approved backflow prevention device shall be used whenever drawing water from the city system (see Page 5 for schematic details). Hydrant meters and backflow devices may be obtained from the Public Works Operations Division/Water Section at 5821 S. 240<sup>th</sup> Street by completing the billing forms for a hydrant meter permit and making the required damage deposit. There will be a charge for all water used in accordance with Kent City Ordinance section 7.02.180 "Temporary Water Meters".

Prior to the new water main being installed, the contractor has the option of cutting in the connection tee on the existing water main, or providing potable water from another source to provide a temporary water supply. If the Contractor chooses the option of installing the new connection tee, the Contractor shall install new resilient wedge gate valves on all sides of the tee, or as required by the City. A mechanical joint plug with a 2" minimum tap and proper blocking shall be installed on the new incoming mainline valve at the new tee, with piping accessible to accommodate filling the new water main.

The City Inspector shall notify the Water section of Public Works Operations a minimum of five full working days before the valve and tee installation is scheduled. This will allow water section employees time to schedule the water main shutdown and notify the customers affected.

## 9.3.2 **Cubing**

Foam cubes (pigs) shall be inserted into and pushed through the new water main to remove any residue, dirt, debris, obstruction or possible foreign material in the new water main.

- A. The Water Section shall be responsible for supplying the foam cubes to the contractor based on the water system design as shown on the approved construction plans.
- B. The Contractor shall be responsible for picking up the cubes at the Public Works Operations located at 5821 S 240<sup>th</sup> St Kent, Washington, and shall install two foam cubes at the initial connection and two foam cubes at each lateral connection six inches in diameter and larger (downstream of each connecting valve), as the new main is installed. This would include all six-inch diameter lateral runs to hydrants that are longer than two full pipe lengths, or have more than a single joint in them.
- C. A mechanical joint cap with a 2"minimum tap shall be installed with proper blocking at the initial connection point on the new main with piping accessible to accommodate both flushing and chlorine injection.
- D. The Water Section shall retrieve the foam cubes when the contractor performs the cubing process. All cubing and flushing shall be under the supervision of the Water Section or a City Inspector.
- E. To accommodate the launch and the retrieval of the cubes, the minimum blow-off size shall be four-inch diameter for six-inch and eight-inch mains. A six-inch diameter blow-off shall be installed for 10-inch and 12-inch mains per City of Kent Standards.
- F. It shall be the contractor's responsibility to properly dispose of all flush water per City of Kent Standards as well as locating and retrieving any "lost" or missing cubes or partial cubes from the water main.
- G. In the event that the initial cubing does not adequately clean the new water mains, the contractor shall be required to provide additional point(s) for launching and retrieval of additional cubes, and re-cube those sections of main that have debris in them until clean, as determined by the Water Section.

## 9.3.3 Pressure and Leakage Test

All new water mains, extensions of existing mains, water system appurtenances and water services shall then be pressure tested for leakage in accordance with Section 7-11.3(11) of the WSDOT Standard Specifications. Water services and appurtenances 2" and smaller installed prior to water main testing shall also be pressure tested with the water main. At **no time** will the temporary water system connection or backflow device remain connected or in place during the pressure test procedures.

## 9.3.4 Chlorine Injection

After the Contractor has cleaned the water main by cubing and flushing, the Contractor shall inject a liquid chlorine solution evenly throughout the new main and appurtenances for optimal disinfection. The chlorine dosage shall be in accordance with WSDOT 7-11.3(12)B at a minimum of 50 mg/L (see the table on page 4 of this document) and a maximum of 100 mg/l. AWWA C651-99 Standards include detailed procedures for the adequate disinfection, flushing and microbiological testing of all water mains. If the contractor wishes the Water Section to do the injection, the City Inspector shall give the Water Section three working days notification to perform the chlorine injection. The Contractor must sign a waiver holding the City harmless for any failure of purity samples due to the work performed by the Water Section, as well as agreeing to reimburse the city for all city costs associated with the disinfection process. Work may be scheduled after hours due to manpower or workload constraints, in which case the Contractor will reimburse the Water Section for city employee overtime associated with the work performed.

The Chlorine shall remain in the main for the time specified according to the procedure used from AWWA Standards C651-99. After the 24-hour disinfection period, the remaining residual throughout the water main and appurtenances shall not be lower than 25 mg/L. The Contractor shall be responsible for disposing of all chlorinated water. Chlorinated water shall be disposed of in an **approved sanitary sewer**. If a sanitary sewer is not available, or the capacity of the sanitary sewer will be at risk, the Contractor shall be responsible for disposing of the water per City of Kent Construction Standards.

Amount of Chlorine needed to produce 50 mg/L in 18ft of pipe (one pipe length) for 5.25% household bleach (with no additives), 12.5% Sodium Hypochlorite solutions and 65% available dry Calcium Hypochlorite.

<u>Diameter</u>	5.25%(gal)	12.5%(gal)	65%(lb)
4"	0.009	0.005	0.007
6"	0.022	0.011	0.017
8"	0.039	0.019	0.029
10"	0.061	0.031	0.052
12"	0.087	0.044	0.047
16"	0.156	0.078	0.119
18"	0.197	0.098	0.152
24"	0.352	0.176	0.271
30"	0.548	0.275	0.422

**Example**: How many gallons of <u>fresh</u> 5.25% Sodium Hypochlorite will be required to disinfect 5,000 ft of 8" main?

5,000 ft  $\div$  18 ft = 278 lengths of 8" pipe  $278 \times 0.039 = 11$  gallons required

## 9.3.5 <u>Bacteriological Purity Samples</u>

Two consecutive sets of acceptable purity samples, taken at least 24 hours apart, shall be collected from representative points of the new main and appurtenances.

Water section personnel shall take the first bacteriological purity sample(s) after the chlorine is removed, flushing is completed and the chlorine level is no greater than nor less than the level present in the adjacent distribution system. Water services and other appurtenances two inches and smaller installed prior to water main testing shall also be purity tested with the water main. The second set of purity samples shall be taken no less than 24 hours after the first set of samples. A representative background sample of the City water system may be taken from the distribution source at the same time purity samples are taken from the new main.

In the event that the Water Section or the City Inspector determines that trench water, dirt or debris has entered the new main during construction, the first purity samples shall be not be taken until the water has stood in the new main for at least 16 hours after final flushing. As above, the second set of purity samples shall not be taken until the water in the new main has stood for an additional 24 hours.

Note: No water shall be flushed during the 16- or 24-hour incubation periods described above, or prior to the purity samples being taken.

It shall be the contractor's responsibility to make arrangements to transport the sample(s) to a state-certified laboratory approved by the Water Section. The contractor shall be responsible for paying all costs for the purity samples excluding the representative background sample at the distribution source.

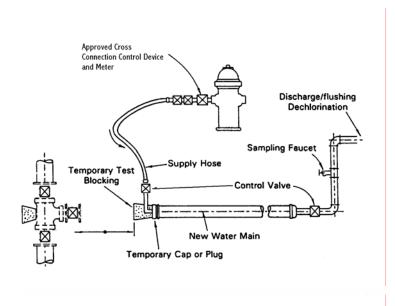
Note: Two consecutive samples, 24 hours apart, must show no coliform presence before performing final connections to the existing water system.

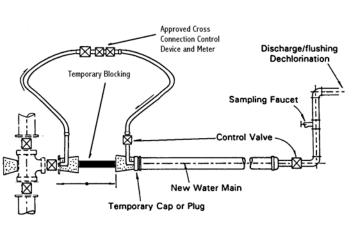
The Water Section may be available during normal working hours, depending upon workload, (7:30 am to 4:00 pm) excluding holidays and weekends, to take purity samples, assist with cubing and chlorine injections. The Contractor shall reimburse the city for all associated costs, including labor, vehicles, materials and overhead charges. Outside of normal working hours, the contractor shall reimburse the City at the most current hourly overtime rate for labor, vehicles, materials and other associated costs.

## 9.3.6 Final Connection(s) to the Existing Water Main

When both sets of purity sample results are satisfactory and received in writing from the state-certified laboratory, and all other City of Kent water system standards have been met, the contractor shall be allowed to connect the new mains to the existing distribution system following City of Kent and AWWA standards. It shall be the Contractors responsibility to prevent, <u>at all times</u>, the contamination of the new and existing water mains with trench water, dirt, debris, or other foreign material.

A City of Kent inspector and/or Water Section representative must be present to witness the final connection(s) to the existing water system, to turn on and flush the new water system, and to place the new water system and appurtenances into service.





## **Reference Guide**

## Ordinance 2394

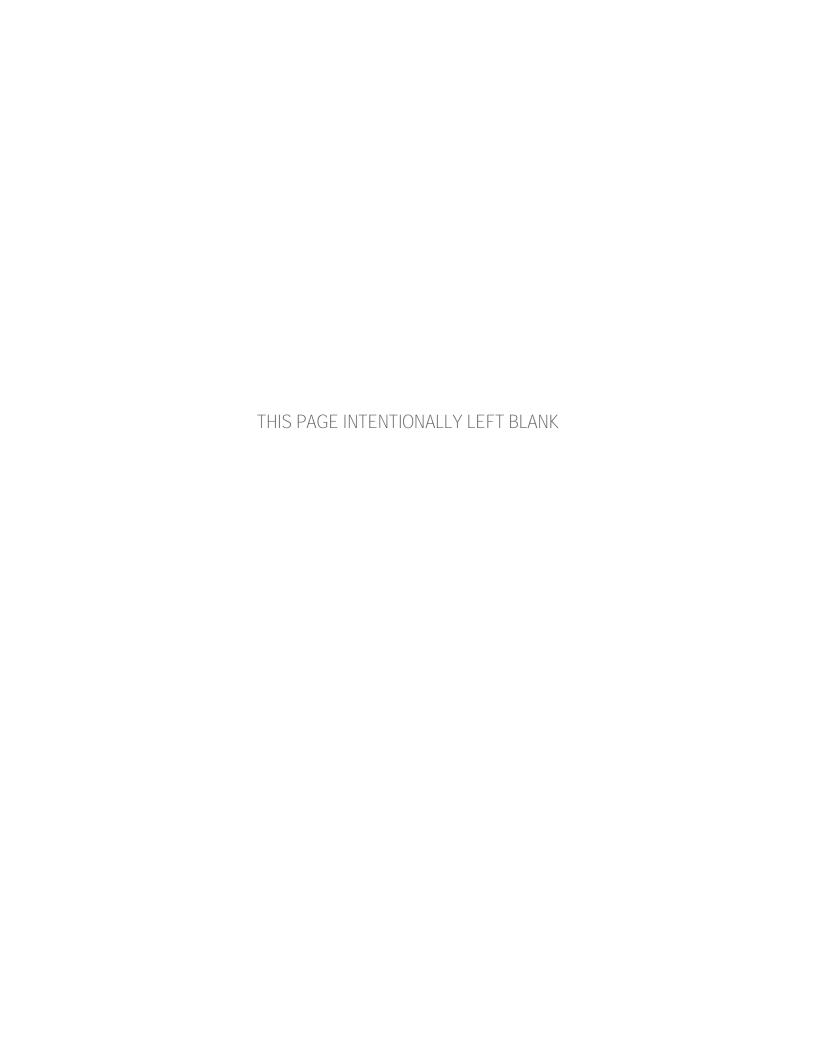
water rainegor radionity on rabbe respectly
Local Administrative Authority (LAA)
Authority on Private Property
Enforcement:
Access to Premises
Shut Off Water
Requiring a Backflow Assembly 7.06.182A
Cross-Connection Program
Authority to Operate the Program Section 9.16
Customers Responsibility
CCS Responsibilities
Installation Time Frames
Schedule for Evaluation and Reevaluation
New Connections
Existing Connections Survey Premises
Existing Commercial Connections
With No Backflow Assembly
With A DCVA or DCDA
All Connections
Premises Isolation
In-Premises Isolation
Fire Connections
Procedures for Field Evaluation
Reinspection
Enforcement
Backflow Preventers, Eliminate Cross-Connection
High and Low Hazards
Approval of Backflow Preventers
Installation of Backflow Preventers

Time Frames	9.16.10B
By-pass Piping	. 9.16.10B
CCS for Inspection of Assemblies	9.16.10B
Inspection and/or testing of Backflow Preventers	9.16.10C
Backflow Assembly Testing Quality Control	9.16.11
Backflow Incident Response Procedure	9.16.12
Cross-Connection Education	9.16.13
Records and Reports	. 9.16.14
Reclaimed Water	9.16.15
Recommended Protection at Fixtures and Equipment	.Appedix K

## APPENDIX G

# Water System Construction Standards

Please find *Appendix G – Water System Construction Standards* on the flash drive that accompanies this Water System Plan.



## **SECTION 3:**

# **Standards for Water System Improvements**



#### 3.0 STANDARDS FOR WATER SYSTEM IMPROVEMENTS

These Standards contain the design criteria and improvement standards for the extension or connections to the City of Kent Water System. The conditions as stated herein apply to all improvements made by public agencies and private Developers. These improvements may include the following:

- Watermain extensions, modifications and replacements
- Fire line and/or yard hydrant or fire hydrant connections to City mains
- Water service and water use only meter installations
- Cross connection control devices

#### 3.1 EASEMENTS AND RIGHTS-OF-WAY

Permanent on-site easements for access, maintenance, and construction are required for all watermain extensions located outside of public right-of-way. Easements shall be provided by the Developer for all public water system infrastructure including the pipe, valves, backflow preventers, etc. Whenever an easement or right-of-way is fenced, a gate shall be installed matching the width of the easement and a City lock must be placed in "series" to facilitate access by the City. When easements are required, legal descriptions shall be prepared by a Professional Land Surveyor licensed by the State of Washington. A title report, dated within thirty (30) days, covering the properties to be encumbered by the easements shall accompany the description.

When off-site and/or on-site easements for the extension of approved comprehensive water plans are required, these easements shall be approved and recorded by the City before any civil construction permit is issued unless the easements are being dedicated to the City as a part of the recorded final subdivision.

Private improvements such as buildings, fences, garages, carports, retaining walls, utilities, signs, light standards, etc., are not allowed in public easements and rights-of-way. Watermain easements and rights-of-way are not allowed within the setbacks between two residential structures. Where an encroachment occurs, the Developer shall remove and relocate the conflicting private improvement immediately upon direction from the Engineer.

#### 3.1.A Easement Requirements

Easements shall be accessible for construction equipment normally used for the operation and maintenance of the facility. Cross slopes exceeding 5 percent will require approval from the Engineer. The minimum easement widths, centered on the utility system, are as follows:

- 1. Watermain under 5' deep 15' wide minimum
- 2. Watermain 5' 9' deep 25' wide minimum
- 3. Watermain over 9' deep The formula for half of the width of the easement shall be the sum of the total depth from the top of pipe to

the surface, plus the pipe diameter, plus 3', rounded to the nearest even foot up to a maximum of 50' total width.

- 4. Special conditions or installation requirements may require greater easement widths as determined by the Engineer.
- 5. In easements with multiple utility systems, the easement width shall be increased by the minimum separation distance between the lines.

#### 3.1.B Right-of-way

Where feasible, the utility system extensions shall be located within the City's right-of-way. Work inside adjacent City, County and/or State right-of-way requires special permits from the respective agencies. Adjacent City, County and State permits and others must be obtained by the Developer or the City if required by franchise prior to Engineering Plans approval by the City.

#### 3.2 STANDARD SPECIFICATIONS

The installation of all watermains and appurtenances shall be in accordance with the applicable provisions of the latest edition of the Washington State Department of Health (WSDOH) Water System Design Manual, AWWA or WSDOT Standard Specifications. The manufacturer's recommended installation procedures should be adhered to and not conflict with AWWA or WSDOT Standard Specifications. In the event of conflict, the Engineer shall determine any exceptions to WSDOH, AWWA or WSDOT Standard Specifications.

#### 3.3 WATERMAIN EXTENSION DESIGN REQUIREMENTS

All watermain extensions shall conform to these Standards and WSDOH. Main extensions are also subject to appropriate permits and plan review fees. Contact the City's Permit Center at 253-856-5300, or see the web site at <a href="https://www.ci.kent.wa.us">www.ci.kent.wa.us</a> for the latest permit fee schedules.

#### 3.4 COMPREHENSIVE WATER SYSTEM PLAN

The Comprehensive Water System Plan (WSP) indicates the location and configuration of the major elements of the existing and proposed water supply mains, distribution system, inter-ties and loops. The exact location or configuration of this system may be modified, provided the proposed system remains consistent with the overall intent of the plan. Minor modifications to the WSP require specific approval by the Engineer. In some instances, where existing pressures are not met or cannot be provided, as determined by the Engineer, portions of the WSP may be the direct responsibility of the Developer to complete in order to meet the minimum development requirements. Specific conditions may be placed in the permit approval or conditions of approval for the project.

#### 3.5 MAINLINE WATER EXTENSIONS

Mainline extensions will be required when the property does not front on a watermain, or when the existing main is deemed inadequate for the proposed use. The extension shall be in accordance with the latest adopted WSP and these Standards.

The watermain must be extended to the far edge of the property to be serviced, as approved by the Engineer, regardless of where the service connection is to be made to serve properties in the same service area.

#### 3.6 WATER SYSTEM DESIGN STANDARDS

#### 3.6.A Improvements and/or Alterations

All improvements and/or alteration to the water system must be designed to incorporate the standards described below:

- 1. The desirable system working pressure shall be approximately 60-70 pounds per square inch (psi), but not less than 35 psi under peak hourly demand (PHD). The minimum pressure in the water system under fire flow conditions shall be 20 psi.
- 2. A pressure reducing valve (PRV) shall be installed and maintained on water service lines by the property owner when system pressures are in excess of 80 psi. See Standard Plan 3-13 for service applications up to 2" in size.
- 3. The minimum diameter of watermain for commercial, industrial, multi-family and residential developments shall be 8", except as described in Section 3.6.A.7 below. The minimum pipe diameter may also be reduced to be consistent with the existing water system if the existing pipe is smaller, in good condition, and provides the required fire flows and pressures. The size of the main in all cases must meet fire flow requirements as determined by the Fire Marshal.
- 4. Connections to existing watermains shall be accomplished by "extension", "wet tap" or "cut in" when mainline valves are required on the existing main. Once the new valve has been installed on the existing watermain, the City Water Section shall be responsible for placing a lock on the connecting valve and any operations. The Developer shall not operate the connecting valve for any reason. The Developer shall contact the Inspector assigned to the project for filling or flushing of the new main, or any other need for operation of the connecting valve. No direct connection to the City's existing water system will be allowed until all purity and leakage testing results for the new water main extension have met the requirements of WAC 246.290.125.2b for purity.
- 5. Two cubes for "cubing" shall be installed in the new watermain at the initial connection and at each lateral from the new watermain. The Water Section shall provide the cubes, which can be picked up by the

- Developer at the Water Section Shop located at 5821 South 240th Street.
- 6. Dead end mains shall be avoided whenever possible. Where dead end mains are unavoidable, a minimum 6" blowoff assembly is required. The diameter of the blowoff and tap must be sized to achieve a minimum flow of 2.5 fps in the watermain. Where cubes for "cubing" are required in the main installation, the watermain shall terminate with a fire hydrant as long as pressures and flows meet the minimum requirements for a fire hydrant. If these requirements are not met, then a blowoff assembly shall be used.
- 7. The City may approve a 4" diameter dead end watermain for a single-family residential area serving less than fifteen (15) single-family residences, providing the following conditions are met:
  - a. There is no potential for a future looped system.
  - b. The project is not within an area of known low pressure.
  - c. The proposed 4" diameter watermain extends or "branches" from a looped system. The 4" watermain shall not extend from a line that starts as a larger diameter watermain and then reduces down to 4" diameter.
  - d. No fire hydrants are required to be connected to the 4" diameter watermain.
  - e. The total length of the 4" diameter watermain is no longer than 350'.
  - f. If a 4" diameter watermain is approved by the City, a 4" blowoff assembly shall be installed at the end of the watermain for cubing.

#### 3.6.B Watermain Locations

- 1. Watermains shall be installed at least 10' horizontally from any existing or proposed sanitary sewer. The distance shall be measured from the outside edge of an existing or proposed watermain. Any deviation from this requirement shall meet DOE and WSDOH requirements and be allowed only upon approval of the Engineer.
- 2. Perpendicular watermain crossings of sanitary sewers shall be installed to provide a minimum vertical distance of 18" above the sewer line, measured from the bottom of the water line to the top of the sewer line with no joint in the watermain within 10' of the sewer line. Where separation between the water line and sewer line is less than 18", the sewer line shall be PVC C900 or ductile iron per Section 4.7.B Gravity Sewer Pipe. All sanitary sewer lines which cross above a watermain, regardless of the separation, shall be PVC C900 or ductile iron, with no joints within 10' of the watermain.

- 3. Installation of watermains near other potential sources of contamination may be subject to written approval by the Engineer on a case-by-case basis. The sources may include, but are not limited to, storage ponds, land disposal sites for wastewater or industrial process water containing toxic materials or pathogenic organisms, solid waste disposal sites, or any other facility where failure of the facility would subject the water in the main to toxic chemical or pathogenic contamination.
- 4. Watermains shall be located at least 5' away from any other utility system, including, but not limited to, storm drains, other watermains, power, natural gas, cable television (CATV), private fire lines, etc.

#### 3.6.C Water Valves

- 1. Water valves are required at the following locations:
  - a. 400' maximum spacing in commercial/industrial and multi-family residential areas. Locations involving hospitals, medical clinics, and others determined by the City to be critical applications may be required to have the spacing reduced.
  - b. 800' maximum spacing in residential areas.
  - c. All sides of mainline tees and crosses.
  - d. At all fire line and hydrant connections to the City's watermain system. When fire hydrants are installed on a fire line run, a valve is required prior to the fire line vault but after the fire hydrant connections.
  - e. At both sides of all bridge crossings, railroad crossings and casings/bores.
  - f. Existing gate valves may be subject to replacement with a new resilient wedge gate valve installed at the discretion of the Engineer.

#### 2. Water Valve Types:

- a. 16" diameter valves and smaller shall be resilient wedge gate valves.
- b. Valves larger than 16" shall be butterfly valves and have a bypass with a 6" gate valve. See Standard Plan 3-8.

#### 3.6.D Combination Air/Vacuum Release Valves

Combination air/vacuum release valves shall be located at high points along the main. As a guide, valves are necessary where the difference in elevation between high and low point is 2' or more on a gradual rise, or any abrupt rise. Actual locations shall be approved by the Engineer. The air inlet/discharge opening shall be 36" above finished grade and provided with a screened downward facing vent opening. It shall be located outside of traffic and sidewalk areas, and installed to prevent damage to

landscaping or hazards to pedestrians and bicyclists. See Standard Plan 3-20.

#### 3.6.E Blowoffs

- 1. Blowoffs shall be located at the dead end of all mains for flushing and "cubing" purposes. Blowoff assemblies must be sized and designed to achieve a minimum flow of 2.5 fps in the watermain. These flows are to be used as a guideline but do not relieve the Developer from assuring a clean line. The minimum blowoff size for a permanent installation is 4" for 4" diameter watermain and 6" for pipe diameters from 6" to 12". Temporary blowoff assembly installations may be reduced to a 2" size. See Standard Plan 3-19.
- 2. Where cubes for "cubing" are required in the main line installation, the watermain shall terminate with a fire hydrant as long as pressures and flows meet the minimum requirements for a fire hydrant. If these requirements are not met, then a blowoff assembly shall be used. See Standard Plan 3-19.
- 3. Using water from blowoffs requires a temporary hydrant meter and check valve assembly, issued by the Water Section. Persons using water illegally will be prosecuted.

#### 3.6.F Fire Hydrants

#### 1. Location:

Proposed fire hydrant locations shall be reviewed and approved by the Fire Marshal prior to engineering plan approval. In general, fire hydrants shall be installed at the following locations:

- a. At all street intersections.
- b. 600' maximum spacing in single-family residential areas.
- c. 300' foot spacing in multi-family and commercial areas.
- d. At locations noted on approved project plans.
- e. Within 50' of the fire department connection.
- f. At other locations as directed by the Engineer and/or the Fire Marshal.

Fire hydrants shall not be installed in areas with contaminated soils unless there are no other feasible options. If a fire hydrant must be installed within an area with contaminated soils, it shall be isolated from the City's water system with an approved backflow prevention device per Section 3.16 Backflow Prevention.

- 2. Connection to Existing Main:
  - a. Hydrant lead shall be Class 52 ductile iron.
  - b. Hydrant lead shall not exceed 50' in length.

- c. Wet tap connection with heavy-duty full circumference ductile iron or stainless steel long tapping sleeve and resilient wedge tapping valve is required. No size on size wet tapping will be allowed. No service connections are allowed to hydrant leads.
- d. Using water from hydrants requires a temporary hydrant meter and check valve assembly issued by the Water Section. Persons using water illegally will be prosecuted.
- e. No bends will be allowed on hydrant leads.
- f. The breakaway connection shall be installed no higher than 4" above the finished grade of the surrounding area.

#### 3. Assemblies:

Fire hydrant assemblies shall be shackled on runs of 18' or less, or restrained with an approved type of mechanical restrained joint on runs longer than 18', to the mainline per Standard Plan 3-1.

- a. Public fire hydrants shall be painted white.
- b. Private fire hydrants shall be painted yellow.
- c. Private fire hydrant assemblies require an approved double check detector assembly (DCDA) located on private property as near as possible to the right-of-way line. Installation of the DCDA shall be per Section 3.16 Backflow Prevention and Standard Plan 3-18
- d. An isolation valve shall be installed at the connection to the City watermain.

#### 3.6.G Access Roads

Access roads to all appurtenances are required for maintenance. Access and/or maintenance roads (where required) shall be 15' wide and shall accommodate turning movements for a BUS-40 design vehicle. Access and/or maintenance roads will require an approved all-weather surface, and shall be designed to support an HS-20 vehicle load. The profile grade of an access road shall not exceed 15 percent. Access roads with grades exceeding 12 percent shall be paved. All access roads longer than 150' from the nearest face of curb or edge of pavement of the connecting street shall have approved standard hammerhead turnaround per Standard Plan 3-21, or shall be looped to connect back to a public street. Whenever an easement or right-of-way is fenced, a gate shall be installed matching the width of the easement and a City lock must be placed in "series".

#### 3.6.H Casings

Where a water line passes under or through a retaining wall or is attached to a bridge structure, the pipe shall be cased in steel pipe at least 4" larger than the largest outer diameter of the bell or joint of the water line. No pipe joints will be allowed within the casing, except on bridge

structures or unless otherwise approved by the Engineer. The casing shall extend on either side of the wall a distance equal to the height of the retaining wall, plus 4'. All voids within the casing shall be filled with blown sand except on bridge structures. Casing spacers shall be Cascade Waterworks Manufacturing Company stainless steel casing spacers or approved equal. The casing spacers shall be installed such that the water line is centered and restrained within the casing and spaced such that a uniform profile grade will be maintained within the casing.

#### 3.7 DELETION OF MAINS, STUBS, VALVES AND WATER SERVICES

The Developer shall be responsible for abandoning existing watermains, stubs, valves, water services, and/or appurtenances adjacent to the property being developed when there is no further need for them, or when required by the Engineer as described below:

#### 3.7.A Watermains and Appurtenances

Watermains and appurtenances shall be abandoned by removal and disposal, capping, and/or plugging the cut ends with concrete at the discretion of the Engineer. The plug shall be a minimum of two and one-half (2.5) times as long as the inside diameter of the pipe being abandoned. Any asbestos cement pipe which is to be removed or abandoned in place shall be done in accordance with State and Federal regulations.

#### 3.7.B Stubs, Stub Valves and Appurtenances

Stubs, their valves and appurtenances shall be removed and disposed of, and the tee shall be plugged with a mechanical joint plug or blind flange.

#### 3.7.C Gate Valves

Gate valves on stubs to properties being served by the proposed development not meeting these Standards shall be removed and replaced with new resilient wedge gate valves.

#### 3.7.D Water Services Deletion

- 1. The Developer must write a letter to the City of Kent Finance Customer Service Section requesting that the service be deleted. The water service(s) shall then be abandoned by turning the corporation stop off at the main, cutting and removing a minimum 1' section of the service line from the corporation stop and capping the corporation stop with a brass cap. The City will remove the meter once the Developer has removed the 1' of service line and capped the service.
- 2. Water services larger than 2" shall be abandoned per Section 3.7.A above.

3. The Engineer or designee reserves the right to change the above requirements to better fit unforeseen existing conditions in the field as they are discovered.

#### 3.8 PRIVATE FIRE SYSTEMS

Backflow prevention assemblies shall be installed at each fire service connection to the City watermains. All backflow assemblies shall be from the latest approved list from the WSDOH, and approved by the Engineer prior to installation.

The double check detector assembly, reduced pressure detector assembly, or double check valve assembly shall be designed in accordance with the latest edition of the AWWA's "Cross Connection Control Manual" Pacific Northwest Section; and the Standard Plans. Single detector check assemblies are not allowed by the City as backflow prevention assemblies.

#### 3.8.A Double Check Detector Assemblies (DCDA)

Approved DCDAs are required on the following fire protection systems:

- 1. Wet systems including those with an in-line booster pump or buildings over 30' high.
- 2. Systems with a pumper connection within seventeen hundred (1,700') of an approved auxiliary water supply source, as designated by the Fire Marshal and the Engineer.
- 3. Private looped systems or any system with private yard hydrants.

#### 3.8.B Reduced Pressure Detector Assembly (RPDA)

Approved RPDAs are required for all high hazard fire systems including, but not limited to, the following:

- 1. Systems where an unapproved (non-City potable) source is permanently connected to the fire system, including private storage reservoirs.
- 2. All foamite or chemically charged installations.
- 3. Systems in which anti-freeze is allowed.

## 3.8.C Double Check Valve Assembly (DCVA)

Approved DCVA's are required for all residential fire systems including, but not limited to, the following:

- 1. When grades exceed 12 percent on accessible routes of travel from designated fire department locations.
- 2. When the residence exceeds 3,600 square feet.
- 3. Where fire hydrants are not within acceptable limits from the residence as determined by the Fire Marshal.

4. Where fire flows are less than 1,500 gallons per minute.

## 3.8.D Installation Requirements

The required backflow prevention assembly shall be installed in accordance with the following:

- 1. DCDAs shall be located on private property, at or as near as possible to the edge of the City right-of-way, in a location approved by the Engineer in an above ground enclosure of adequate size and structural design for the specific Site application, as indicated on Standard Plan 3-18. DCDAs may be allowed in a below grade reinforced concrete vault per Standard Plan 3-18, only with the approval of the Engineer.
- 2. The DCDA may be installed in a building only where zoning allows for a 0' setback in the Downtown Overlay District. See Standard Plan 3-18.

## 3.8.E System Upgrade

Where an existing fire line and/or yard hydrant system is extended to serve a new building or a building addition, the existing fire line, fire hydrant(s) and/or yard hydrant and all related backflow protection assemblies shall be upgraded to comply with current City codes, these Standards, Standard Plan 3-18 and the latest edition of the AWWA "Cross Connection Control Manual" Pacific Northwest Section.

#### 3.9 DOMESTIC WATER SERVICE

Each service connection to the City watermain shall be metered. Unless specifically approved otherwise, all buildings shall have a separate service connection and a single meter.

All domestic and industrial consumption of water, except for fire systems, shall be metered. Water service connections and plumbing shall conform to relevant Washington State Plumbing Codes and these Standards. All domestic water service connections require an approved water permit from the City. The City shall own and maintain the water service from the watermain to, and including, the water meter, as well as the meter box and setter. The service line, from the connection to the setter to the premises or building is the sole responsibility of the Developer per Kent City Code 7.02.040.

#### 3.10 WATER METERS

All water meters shall be located within an easement or right-of-way, and shall be located in such a manner as to provide easy access for the meter reader and maintenance and operations crews.

#### 3.10.A Service Installation

The Developer shall be responsible for the installation of all new domestic water services from the water main. The Developer shall also be responsible for relocation, reconnection, replacement and abandonment of existing services. All new construction, service upsizing, or service relocations shall require the service to be renewed back to the main. Water services may be required to be upgraded to these Standards at the discretion of the Engineer when a remodel, demolition, or change in type of use is made. Existing services no longer providing service shall be abandoned in accordance with these Standards. All costs are to be borne by the Developer.

The location of the service line shall be as shown on the approved Engineering Plans, or as directed by the Engineer. There shall be a minimum 3' separation between service taps at the water main, and installed as near perpendicular as possible to the street centerline where applicable. The Engineer, or designee, shall inspect the installation and verify the pressure test prior to approval to backfill. The meter box shall be installed to final grade, and final approval granted prior to the installation of the water meter. See Section 3.12 for meters larger than 2".

#### 3.10.B Meter and Meter Box Location

- 1. New Service The meter shall be located so that the meter box is directly behind the sidewalk, or curb if there is no sidewalk, and perpendicular to the street, with the top of the angle stop 8-10" below the finish grade. See Standard Plans 3-10 and 3-11.
- Exception If there is no sidewalk between the edge of pavement and the property line, the meter box will be installed behind the shoulder and/or ditch at a location approved by the Engineer. It will be necessary to culvert the ditch at the meter location for meter reading access.
- 3. It may be necessary to place the meter box in the sidewalk. In such cases, the edge of the meter box shall be no closer than 6" to any edge of the sidewalk. A minimum of 2" (edge to edge) must be maintained between adjacent meter boxes. See Standard Plans 3-10 and 3-11.
- 4. Meter boxes shall not be installed within driveway approaches unless no other location is feasible. In that case, traffic bearing meter boxes and lids shall be used.
- 5. It shall be the Developer's, and subsequent Owner's, responsibility to install and maintain the service from the setter connection to the premises or building served by City water, per KCC 7.02.040.

When wireless meter readers are required, they shall be installed by the Developer and become a part of the installation.

#### 3.10.C Meter Box

The type of box shall be as follows, or an approved equal in writing by the Engineer:

Table 3.1

Meter Size	Location	Туре	
5/8 x ¾ to 1"	Planters*	Carson 1220-12	
5/8 x 3/4 to 3/4 "	Sidewalks, driveways or pavement, or within 5' of a driveway	Olympic Foundry #SM29	
1½" to 2"	Planters*	Carson 1730-15	
1" to 2"	Sidewalks, driveways or pavement, or within 5' of a driveway	Olympic Foundry #SM30	
3" and larger	Planters***	Concrete Vault***	

<sup>\*</sup> All plastic boxes are to be black polyethylene

## 3.10.D Irrigation Box

The type of box will be as follows or approved equal in writing by the Engineer:

Table 3.2

DCVA or PRV Size	Вох Туре
3/4" to 1" (and all PRV's)	Carson 1324-15G
(Green lid, solid)	Carson 1324-2L
(Extension Boxes, 6")	Carson 1324B-1L
1½" to 2"	Carson 1730C-1B for 15" high
	Carson 1730D-1B for 18" high
(Green lid, solid)	Carson 1730-P2L

<sup>\*\*</sup> Installation in sidewalks, driveways or pavement will not be allowed unless there is no other feasible alternative

<sup>\*\*\*</sup> See Standard Plan 3-12

#### 3.10.E Premise I solation

The type of box will be as follows or approved equal in writing by the Engineer:

Table 3.3

DCVA	Box Type
<sup>3</sup> / <sub>4</sub> " to 2"	Same as section (D) above
3" and larger	Concrete Vault*

<sup>\*</sup> See Standard Plan 3-12

Table 3.4

RPBA	Box Type
3/4" and larger	Insulated Enclosure – above ground

Enclosures shall be large enough to meet the minimum clearances noted on Standard Plan 3-14.

#### 3.10.F Meter Setter

The meter setter shall have dual-purpose end connections for iron pipe thread male adapters on both ends. It will be used with type "K" copper tubing or polyethylene plastic pipe, with a brace pipe eye and pipe to hold the setter vertical. The setter will be equipped with an angle shut-off valve with padlock wings, and on the outgoing side a check valve to prevent backflow. The check valve is to be spring loaded, of brass and stainless steel construction with a removable back for maintenance purposes. This check must be of the same type used at the present time by the Public Works Department. See Standard Plans 3-10 through 3-12.

The following products are standard. Other approved equal products require written approval of the Engineer:

Table 3.5

Meter Setter Size	Туре
3/4"	Ford VH 72-15W
<sup>3</sup> / <sub>4</sub> " x 15"	Mueller H1422-2(Double purpose connection)
1"	Ford VH74-15W
1" x 15"	Mueller H1422-2(Double purpose connection)
11/2"	Ford VFH66-15 x 13 L/BP
1½" x 15"	Mueller H1422-2L/BP
2"	Ford VFH77-15x17 L/BP

#### 3.11 WATER SERVICE LATERALS

## 3.11.A Depth

The service lateral shall have a minimum cover of 24" at the meter connection and shall increase in depth to the elevation at the main. The corporation stop shall be installed at a 22 degree upward angle from the center line of the main, and must be tapped on the same side of the watermain as the service lateral. A minimum separation of 3' must be maintained between service taps through the end of the service run.

#### 3.11.B Material

- 1. Shall be a minimum of 1"diameter (Iron Pipe Size).
- 2. Copper Type K, per Section 9-30.6(3)A of the WSDOT Standard Specifications. Copper shall be used for all 2" diameter and smaller service laterals in areas of know contaminated soils.
- 3. Polyethylene Conforming to AWWA C901, high molecular weight with a 200 psi rating, per Section 9-30-6(3)B of the WSDOT Standard Specifications. Plastic pipe shall <u>not</u> be used in areas subject to contamination by petroleum distillates or other contamination that potentially could leach into pipe as determined by the Engineer.
- 4. Service laterals that are  $1-\frac{1}{2}$ " and 2" diameter shall be polyethylene.
- 5. In situations where the flow needs exceed the capacity of a 2" diameter pipe, the service lateral shall be increased to a minimum 4" diameter and shall be ductile iron pipe.

#### 3.11.C Locator Wire

A 12-gauge solid copper, single strand continuous locating wire with plastic insulation is to be wound on the outside of all polyethylene laterals. The wire shall be stripped of insulation at the connection and then securely and permanently connected to the corporation stop at the watermain and to the meter setter so as to maintain continuity. See Standard Plans 3-10 through 3-12. No splices will be allowed in the locator wire.

#### 3.11.D Service Saddles

The service saddle shall be an approved equal to Smith Blair, Romac, or Mueller double strap style. A 3' minimum separation will be required between other services, saddles and appurtenances.

#### 3.11.E Corporation Stops

Ford corporation stops, or approved equals, shall be brass and are to be used to isolate the service lateral from the City watermain. They are to have iron pipe thread to connect to the saddle and the adapter.  $1-\frac{1}{2}$  and 2 diameter laterals shall have ball corporation stop type.

#### 3.11.F Connections

Ford or Mueller pack joint adapters or approved equals shall be brass and are to be used to connect the service line pipe to the corporation stop and meter setter. All connections and service lines shall be placed, as near as practical, at 90 degrees to the water line.

#### 3.11.G Water Meter Installation

The water meter shall be set by the Water Section following approval of the water permit and approval of the water service installation and final inspection. Contact the Permit Center for a current fee schedule.

#### 3.11.H Water Use

Using water from water services prior to meter installation requires a temporary hydrant meter and check valve assembly, issued by the Water Section. Persons using water illegally will be prosecuted.

### 3.11.1 Service Markings

In new projects or subdivisions where street improvements are to be made, each service lateral shall be marked by a "WS" in the curb where it crosses perpendicular to the curb. The marking shall be done at the time the curb is installed and shall be as-built by stationing. Lettering shall be 3" high and a minimum 1/4" deep.

#### 3.12 3" AND LARGER COMPOUND METERS

Compound meters for service connections larger than 2" shall be installed within a pre-cast concrete vault in accordance with Standard Plan 3-12. Compound meters shall be the Sensus OMNI T2 and installed by the Developer. Turbine type compound meters will only be allowed on a case-by-case basis. All services larger than 2", not including the meter, shall be pressure tested, disinfected, flushed, and have acceptable purity sample results prior to being accepted and turned on by the City. All meters are to be tested by an approved meter testing company for accuracy after installation. The test report shall be reviewed and approved by the Engineer prior to acceptance of the meter. An isolation valve in accordance with Section 3.21 shall be installed at the connection to the City watermain.

#### 3.13 WATER USE ONLY OR DEDUCT METERS

The deduct meter is a private meter purchased, installed and maintained by the Developer downstream of the domestic meter. The reading on the deduct meter is deducted from the reading on the domestic meter to determine the monthly sewer charge. The installation of a deduct meter requires an approved Water Permit and the approval of both City and King County Department of Natural Resources Wastewater Treatment Division (KC/DNR-WTD). The City obtains approval from KC/DNR-WTD on behalf of the Developer. Contact the Permit Center for a current fee schedule.

The landscape irrigation deduct meter shall be located on private property adjacent to the City meter. The location shall be as indicated in Standard Plan 3-16. The Engineer may approve other locations prior to installation. Deduct meters located inside buildings or in access restricted areas require remote readouts to be located near the City meter. The type of meter and remote assembly shall be approved by the City and shall be subject to periodic inspections and certifications. Irrigation deduct meters do not require KC/DNR-WTD approval.

When the water use only meter is a direct service connection to the City main, the meter assembly and installation is the same as all domestic meters, however, there is no sanitary sewer charge computed for this type of service. See Standard Plan 3-16 for landscape irrigation deduct meter installation, and Standard Plans 3-10 through 3-12 for water use only service installation. A drawing is required for deduct meters used for processing equipment.

#### 3.14 SEWER RATE METERS

The sewer rate meter is a private meter purchased, installed and maintained by the Developer. The metering system is subject to approval by the City and KC/DNR-WTD. Meter shall read cubic feet. There are several use applications:

## 3.14.A All Sources Discharged Metering

When the sewer rate meter is used to meter <u>all</u> public and/or private sources of water discharged to the sewer, the domestic meter is changed to water use only. <u>Deduct meters are not used in this system</u>. The sewer rate meter determines the sewer charges. This application is installed in two ways:

- 1. In a manhole, in line with the side sewer.
- 2. In the building, in plumbing pipes at location(s) that will read all public and private water that discharges to sewer.

#### 3.14.B Partial Sources Discharged Metering

When the sewer rate meter is used to meter <u>part</u> of public and/or private sources of water discharged to the sewer and deduct meters are used to meter the uses not discharged to the sewer. The domestic meter determines water and sewer charges. The sewer rate meter is added to the sewer charges. The deduct meter(s) are deducted from the sewer charges. The meter for this type of installation is located in three ways:

- 1. In the building, in plumbing pipes at location(s) that will pick up that portion of the public and/or private sources of water discharged to the sewer but prior to its use.
- 2. In line with the discharge pipes of processing equipment fed from the public meter prior to discharge to the building plumbing or side sewer. This water must be free of debris that could clog the meter used.

3. In line with the discharge pipes of processing equipment fed from the public meter or private source of water. This water may contain debris.

The sewer rate meter shall be located on private property in a location that is convenient to the Developer with a remote readout located near the City water meter as approved by the Engineer. The type of meter and remote used is subject to the approval of the Engineer and <u>shall read in cubic feet only</u>.

The sewer rate meter requires a sewer permit from the City and waste discharge approval from KC/DNR-WTD. An industrial rate charge is normally added to the sewer bill for sewer permits with waste discharge approval as determined by KC/DNR-WTD.

#### 3.15 CROSS CONNECTIONS

There shall be no cross connection whatsoever between the City water distribution system and any unapproved pipes, wells, pumps, private hydrants, tanks, non-potable fluid or any other contaminating materials that may backflow into the potable water system. The City's potable water distribution system includes all City owned watermain, service pipe up to and including the meter for residential services and appurtenances up to the DCVAs or DCDAs located after the water service meter.

#### 3.16 BACKFLOW PREVENTION

The degree of public health protection required must be commensurate with the degree of hazard presented as defined in WAC 246.290. In situations of high health hazards, whether known or potential physical or toxic health hazards, air gap separation and/or reduced pressure backflow assemblies (RPBAs) shall be required. DCVAs or pressure vacuum breakers are generally utilized where low health hazard, aesthetic or detrimental effects on water quality may occur.

Each water system connection has unique problems arising from location, climatic conditions, service demands, and other factors. Consequently, each cross-connection shall be evaluated on an individual basis and the City shall make the final determination as to the degree of backflow protection required. See testing and annual inspection requirements set forth in KCC 7.02.050 through 7.02.105.

Backflow protection assemblies proposed for use can be found on the current list of approved assemblies by the WSDOH. All backflow assemblies are required to be tested annually by a Washington State certified backflow assembly tester. Copies of these inspection reports shall be sent to the City: Public Works Operations, Attn: Water Manager, 5821 South 240<sup>th</sup> St., Kent, WA 98032.

A separate water permit will be required for each backflow device installed. An annual inspection and fee will be required for each backflow device.

#### 3.17 PREMISE ISOLATION

Where the City determines protection of the public water distribution system is necessary, a backflow preventer shall be installed at the property line commensurate with the degree of hazard as defined in WAC 246.290.490. A sample use requiring such protection would be a medical/dental office building. Installation of air gaps shall be approved by the City based on submitted drawings in accordance with the latest edition of the City of Kent Cross-Connection Control Program Manual. RPBAs shall be per Standard Plan 3-14.

In situations where a non-residential building has multiple tenants or the potential to have future multiple tenants, an RPBA per Standard Plan 3-14 shall be required at the property line.

#### 3.18 IRRIGATION SYSTEM

Irrigation system cross connection protection is required for all irrigation systems. In areas of flooding, on hillside installations, or where injection systems are used, an RPBA is required. See Standard Plan 3-14.

#### 3.19 WATERMAIN MATERIALS

The installation of watermains and the materials used shall be in accordance with the applicable sections of the WSDOT Standard Specifications, except as herein modified.

#### 3.19.A Watermains and Fittings

The following materials and appurtenances are accepted for City watermains:

- 1. Pipe Ductile iron pipe, Class 52, with cement mortar lining.
- 2. Joints Mechanical or push-on joints with rubber gaskets.
- 3. Fittings Cast iron or ductile iron, with cement mortar lining.
- 4. Fitting Joints Mechanical or flanged joints with rubber gaskets.
- 5. Jointing Coupling pipes and cut-ins shall be joined by mechanical joint ductile iron long pattern sleeves unless prior approval is given by the Engineer. "Dresser type" couplings will not be allowed, except to join different sizes or dissimilar piping materials, and only upon approval by the Engineer.
- 6. Installation of watermains and/or appurtenances in known contaminated materials should be avoided whenever possible. If a watermain must be installed in a location with contaminated materials, the rubber gaskets used for all joints shall be Viton gaskets composed of FE, flouroelastomer, or fluorocarbon rubber.

#### 3.19.B Water Valves

- 1. Gate Valves Shall be used for 16" diameter and smaller applications and shall be resilient wedge per AWWA standards.
- 2. Butterfly Valves Shall be used for larger than 16" diameter applications and shall be per AWWA standards. Valves larger than 16" shall have a 6" by-pass with a gate valve.
- 3. Valve Operation All valves must open by rotating the valve stem in the counter clockwise direction.
- 4. Valve Joints Mechanical or flanged fittings.
- 5. Stem Nuts Valve stem nuts shall be no shallower than 1-½' and no deeper than 3' below finished grade. In cases where valves are deeper, an extension rod assembly with a rock guard must be installed on the operating nut. See Standard Plan 3-7.
- 6. Valve Marker Posts Concrete valve marker posts shall be furnished and installed for each valve located outside of the paved street. Marker posts shall be white with black lettering. See Standard Plan 3-4.

#### 3.19.C Valve Box

- 1. Valve boxes in all areas, except as described in Section 3.19.C.2 below, shall include the following components:
  - a. Valve Box Bottom Section –VB1C or Rich 24" bottom compatible with the top section.
  - b. Valve Box Top Section with Covers –VB 940 with a 2" "deep skirt" cover and "WATER" cast in the cover.
  - c. Covers shall be installed with the ears in line with the water flow. See Standard Plan 3-7. Alternates must be standard equals.

#### 2. Transmission Main:

- a. Zone Separation or other applications specified by the Engineer.
- b. Valve Box Bottom Section –VB1C or Rich 24" bottom compatible with the top section.
- c. Valve Box Top Section with Covers -VB-045D/T with compatible cover and "WATER" cast in the cover. Covers shall be installed with set screws in line with the water flow. See Standard Plan 3-7. Alternates must be standard equals.

### 3.19.D Fire Hydrant Assemblies

Fire hydrants shall be compression type, break-away (traffic model) hydrants conforming to AWWA C502, except as herein modified. See Standard Plan 3-1.

#### 1. Valves and Nozzles:

Fire hydrants shall have a bottom valve size of at least 5", one  $4-\frac{1}{2}$ " pumper nozzle and two  $2-\frac{1}{2}$ " nozzles. Nozzles shall have National Standard Threads (NST), with  $1-\frac{1}{4}$ " pentagonal nuts on the nozzle caps and operating nut.

#### 2. Hydrant Leads:

The hydrants leads shall be a minimum of 6" in diameter. An auxiliary valve shall be installed in the hydrant lead located at the connection to the City main.

#### 3. Drainage:

All hydrants shall be equipped with a drain. A gravel pit or dry well shall be provided. Hydrant drains shall not be connected to, or located within, 10' horizontally of sanitary sewers or storm drains.

#### 4. Painting:

Public owned hydrants shall be painted with two (2) coats of Farwest Wonderglow Quickset white gloss enamel #1100 series - V1814-W. Private hydrants shall be painted with two (2) coats of Farwest Wonderglow Quickset yellow gloss #1100 series - V1814-Y, #3472.

## 5. Fire Hydrant Guard Posts:

Concrete fire hydrant guard posts shall be furnished and installed with fire hydrants as required by the City. After installation, the posts shall be painted with two (2) coats of Farwest Wonderglow Quickset Gloss Alkyd Enamel #1100 series and match the color of the hydrant installed.

#### 6. Standard Fire Hydrant Types:

Standard Fire Hydrant types shall be Clow Medallion, Mueller Centurion or M&H 929. No Corey type hydrants allowed.

#### 7. Fire Hydrant Clearance:

3' clearance with maximum 2 percent slope shall be provided around all fire hydrants, as well as clear access to/from the traveled way.

#### 3.20 WATERMAIN INSTALLATION

#### 3.20.A Pipe Bedding and Foundation Material

Pipe bedding shall be placed under and all around the pipe meeting the requirements of Gravel Backfill for Pipe Zone Bedding per Section 9-03.12(3) of the WSDOT Standard Specifications, latest edition. It shall be compacted in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe to 95 percent compaction ASTM D-1557. See WSDOT Standard Specifications and Standard Plan 3-22 in this chapter.

Where determined necessary by the Engineer, ballast material shall be used below the pipe bedding to stabilize the trench. This ballast shall meet the requirements of shoulder ballast per Section 9.03.9(2) of the WSDOT Standard Specifications.

## 3.20.B Pipeline Cover (Backfill)

All watermains shall be covered with sufficient earth or other insulation to prevent freezing. The pipe shall be placed at a constant profile grade to provide the minimum cover as shown below and to allow for the release of air within the system. The minimum depth of cover for watermains is:

#### Table 3.6

Main Size	Minimum Cover

10" and smaller 36" cover 12" and larger 48" cover

Pipe trench backfill shall be crushed surfacing top course (CSTC) under all arterial classifications of roadways and those local streets adjacent to commercial or industrial land uses. Gravel borrow shall be used for pipe trench backfill in all other locations if, in the opinion of the Engineer, existing trench Excavation soils are unsuitable. CSTC or gravel borrow shall be from a pit approved by the Engineer and shall meet the requirements of CSTC per Section 9.03.9(3) or gravel borrow per Section 9.03.14(1) of the WSDOT Standard Specifications. Each layer shall be compacted to 95 percent in paved areas and 90 percent in unpaved areas in accordance with ASTM D 1557, in lifts not to exceed 18". The maximum particle size shall not exceed 6" or 2/3 the depth of the layer being placed, whichever is less.

Pipe trench backfill for lateral runs crossing existing or proposed improved City streets shall be CSTC meeting the requirements of Section 9.03.9(3) of the WSDOT Standard Specifications.

In paved areas, the trench patching shall be in accordance with Standard Plans 3-64 through 3-69.

## 3.20.C. Blocking

All fittings changing the horizontal or vertical alignment of the pipe shall be installed with Class 3000 cement concrete thrust blocking in conformance with Section 6-02.3 of the WSDOT Standard Specifications. Blocking shall bear against solid undisturbed earth at the sides and bottom of the trench Excavation and shall be securely wrapped with 4-mil polyethylene sheeting. Restrained joint pipe shall be required in areas where soils consist of peat or other low bearing strength materials or other areas as determined by the Engineer. Tie rods can be used in conjunction with thrust blocking for hydrant installations See Standard

Plan 3-1 or fittings as approved by the Engineer. Mega Lugs or Mechanical Restrained Joint Pipe may be used in place of blocking only upon approval by the Engineer.

#### 3.20.D Corrosive Soils

In areas with corrosive soils, and at the sole discretion of the City Engineer, the watermain shall be encased in 4-mil high density polyethylene, in accordance with Method A of the most recent M41 AWWA Manual and all applicable AWWA Standards.

#### 3.21 CONNECTION TO AN EXISTING WATER MAIN

A physical separation between all untested and potentially contaminated watermains (or main extensions) and the City's existing water system shall be maintained at all times unless the connection is protected by an approved City and WSDOH backflow device. See Standard Plan 3-2.

A hydrant meter and an approved backflow prevention device shall be used whenever drawing water from the City's water system. Hydrant meters and backflow prevention devices may be obtained from the Public Works Operations Division, Water Section located at 5821 South 240th Street. The Developer will be required to complete the billing forms for a Water Permit and making the required damage deposit. There will be a charge for all water used in accordance with KCC 7.02.180 - Temporary Water Meters.

Prior to the new watermain being installed, the contractor has the option of cutting in the connection tee on the existing watermain, or providing potable water from an existing hydrant or blowoff to provide a temporary water supply. If the contractor chooses the option of installing a new connection tee, the contractor shall install new resilient wedge valves on all sides of the tee, or otherwise as required by the Engineer. A mechanical joint plug with a 2" minimum tap and proper blocking shall be installed on the new incoming mainline valve at the new tee with piping accessible to accommodate filling the new water main.

#### 3.22 CUBING

Foam cubes (pigs) shall be inserted into and pushed through the new water main to remove any residue, dirt, debris, obstruction or possible foreign material in the new water main.

#### 3.22.A Cube Usage

- 1. The Water Section will supply the foam cubes to the contractor based on the water system design as shown on the approved Engineering Plan.
- 2. The Developer shall pickup the cubes at Public Works Operations and shall install two (2) foam cubes at the initial connection and two (2) foam cubes at each lateral connection 6" in diameter and larger

(downstream of each connecting valve), as the new main is installed. This would include all 6" and larger diameter lateral runs to hydrants that are longer than one full pipe length, or have more than a single joint in them.

- 3. A mechanical joint cap with a 2" minimum tap shall be installed with proper blocking at the initial connection point on the new main with piping accessible to accommodate both flushing and chlorine injection.
- 4. The Water Section shall retrieve the foam cubes when the contractor performs the cubing process. All cubing and flushing shall be under the supervision of the Water Section or the Inspector.
- 5. To accommodate the launch and the retrieval of the cubes, the minimum blow-off size shall be 6" for watermain diameters up to 12".
- 6. It shall be the contractor's responsibility to properly dispose of all flush water per Section 3.23 below as well as locating and retrieving any "lost" or missing cubes or partial cubes from the watermain.
- 7. In the event that the initial cubing does not adequately clean the new water mains, the contractor shall be required to provide additional point(s) for launching and retrieval of additional cubes, and re-cube those sections of main that have debris in them until clean, as determined by the Water Section.

#### 3.23 CHLORINE INJECTION

After the Developer has cleaned the watermain by Cubing and flushing, the Developer shall inject a liquid chlorine solution evenly throughout the new main and all connections and Appurtenances for complete and optimal disinfection. The chlorine dosage shall be a minimum of 50 mg/l and a maximum of 100 mg/l. AWWA C651-99 Standards include detailed procedures for the adequate disinfection, flushing and microbiological testing of all watermains. If the Developer wishes the Water Section to do the injection, the Inspector shall give the Water Section five (5) working days notification to perform the chlorine injection. The Contractor must sign a waiver holding the City harmless for any failure of purity samples due to the work performed by the Water Section, as well as agreeing to reimburse the City for all costs associated with the disinfection process. Work may be scheduled after hours, outside of the 5-day notification period, or refused by the City due to manpower or workload constraints.

The chlorine shall remain in the main for the time specified according to the procedure used from AWWA Standards C651-99. After the 24-hour disinfection period, the remaining residual throughout the watermain and Appurtenances shall not be lower than 25 mg/L, if so it would require reapplication of chlorine. The Contractor shall be responsible for disposing of all chlorinated water. Chlorinated water shall be disposed of in an approved sanitary sewer. If a sanitary sewer is not available, or the capacity of the sanitary sewer will be at risk, the Developer shall be responsible for disposing of the water per all applicable regulations.

Amount of chlorine needed to produce 50mg/L in 18' of pipe (one pipe length) for 5.25% household bleach (with no additives), 12.5% sodium hypochlorite solutions and 65% available dry calcium hypochlorite is shown in the following table.

Table 3.7

Diameter	5.25% (gal)	12.5% (gal)	65% (lb)
4"	0.009	0.005	0.007
6"	0.022	0.011	0.017
8"	0.039	0.019	0.029
10"	0.061	0.031	0.052
12"	0.087	0.044	0.047
16"	0.156	0.078	0.119
18"	0.197	0.098	0.152
24"	0.352	0.176	0.271
30"	0.548	0.275	0.422

Formula: Gals Required = (Pipe Length/18) x Disinfectant Amount

Example: How many gallons of fresh 5.25% sodium hypochlorite will be required to disinfect 5,000' of 8" main?

 $5,000' \div 18' = 278 \text{ lengths of } 8'' \text{ pipe}$ 

 $278 \times 0.039 = 11 \text{ gallons required}$ 

All Costs for re-injecting, including the Inspector's time to come back due to the Developer "not being ready," will be the responsibility of the Developer. Costs shall be the actual costs including hourly overtime rate for labor, overhead, equipment and materials and any other associated charges. The costs shall be based on the latest cost schedule prepared and approved annually by the Engineer.

#### 3.24 BACTERIOLOGICAL PURITY SAMPLES

Two (2) consecutive sets of acceptable purity samples, taken at least 24 hours apart, shall be collected from representative points of the new watermain, all appurtenances and all other connections to the new watermain(s).

Water Section personnel will take the first bacteriological purity sample(s) after the chlorine is removed, flushing is completed and the chlorine level is no greater than, or less than, the level present in the adjacent distribution system. Water services installed prior to watermain testing shall also be purity tested with the water main and all other connections to the new watermain. The second set of purity samples shall be taken 24 hours after the first set of samples. A representative background

sample of the City water system may be taken from the distribution source at the same time purity samples are taken from the new main.

In the event that the Water Section or the Inspector determines that trench water, dirt or debris has entered the new main during construction, the first purity samples shall not be taken until the water has stood in the new main for at least 16 hours after final flushing. As above, the second set of purity samples shall not be taken until the water in the new main has stood for an additional 24 hours.

No water shall be flushed during the 16- or 24-hour incubation periods described above, or prior to the purity samples being taken.

It shall be the Developer's responsibility to make arrangements to transport the sample(s) to a state-certified laboratory approved by the Water Section. The Developer shall be responsible for paying all costs for the purity samples.

Two (2) consecutive samples, 24 hours apart, must show no coliform presence before performing final connections to the existing water system.

The Water Section may be available during normal working hours, depending upon workload, (7:30 am to 4:00 pm), excluding holidays and weekends, to take purity samples, assist with cubing and chlorine injections. The Developer shall reimburse the City for all associated costs including labor, overhead, equipment, and material charges. Outside of normal working hours, the Developer shall reimburse the City at the most current hourly overtime rate for labor, overhead, equipment and material and any other associated charges. The costs shall be based on the latest cost schedule prepared and approved annually by the Engineer.

## 3.25 PRESSURE AND LEAKAGE TESTS

All new water mains, extensions of existing mains, water system appurtenances and water services larger than 2" shall be pressure tested for leakage in accordance with Section 7-17.3(2) of the WSDOT Standard Specifications. Water appurtenances 2" and smaller installed prior to watermain testing shall also be pressure tested with the watermain. At no time will the temporary water system connection or backflow device remain connected or in place during the pressure test procedures.

All costs for re-testing, including the Inspector's time to come back due to the Developer "not being ready," will be the responsibility of the Developer. Costs shall include labor at overtime rates, overhead, equipment, material and any other associated charges. The costs shall be based on the latest cost schedule prepared and approved annually by the Engineer.

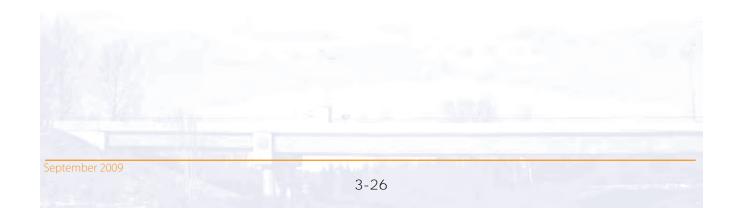
## 3.26 FINAL CONNECTION(S) TO THE EXISTING WATER MAIN

When both sets of purity sample results are satisfactory and received in writing from the state-certified laboratory, and all other City water system standards have been met, the Developer shall be allowed to connect the new mains to the existing distribution system following City and AWWA Standards. It shall be the

## 2009 CITY OF KENT DESIGN & CONSTRUCTION STANDARDS

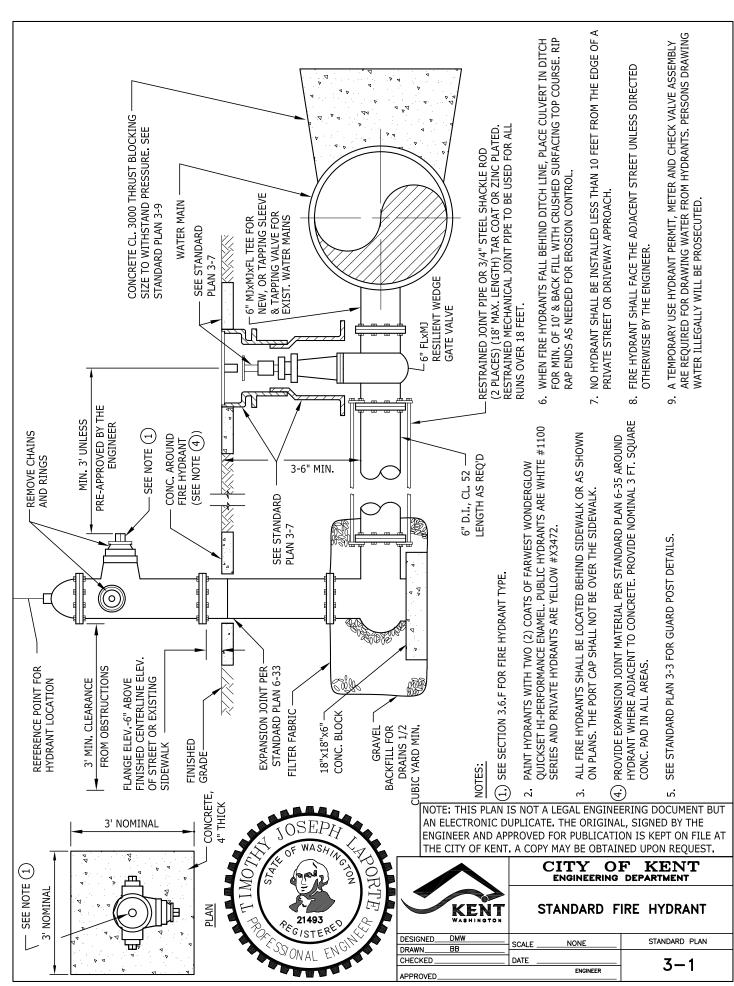
Contractor's responsibility to prevent, at all times, the contamination of the new and existing watermains with trench water, dirt, debris, or other foreign material.

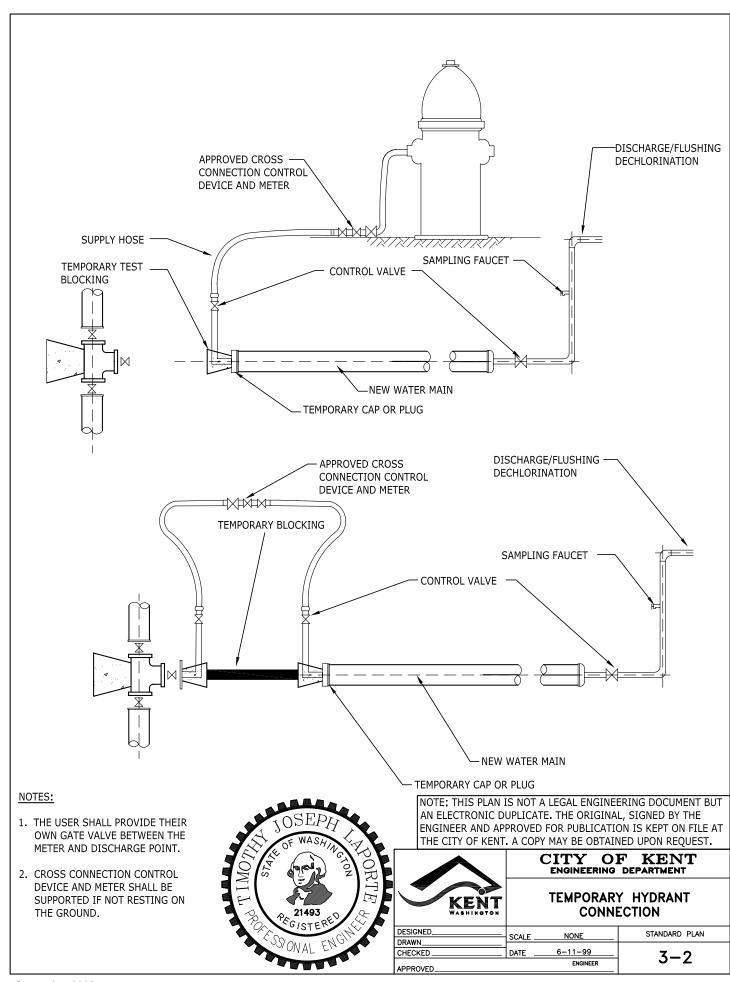
The Inspector and/or Water Section representative must be present to witness the final connection(s) to the existing water system, to turn on and flush the new water system, and to place the new water system and appurtenances into service.

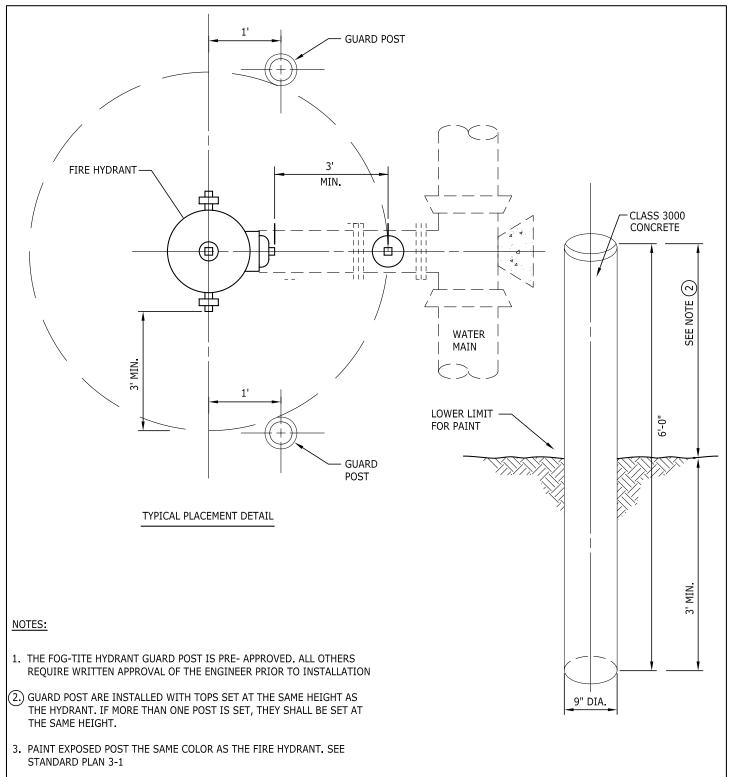


## 2009 CITY OF KENT DESIGN & CONSTRUCTION STANDARDS

3.27	WATER SYSTEM STANDARD PLANS
3-1	Standard Fire Hydrant
3-2	Temporary Hydrant Connection
3-3	Guard Post
3-4	Valve Marker Post
3-5	Connection to Concrete Cylinder Main (4" to 12")
3-6	2" Connection to Concrete Cylinder Main
3-7	Valve Box and Operating Nut Extender
3-8	18" or Greater Valve By-Pass
3-9	Concrete Blocking
3-10	Service Connection 1" Service
3-11	Service Connection 1½" and 2" Service
3-12	Compound Water Meter with By-Pass
3-13	Pressure Reducing Valve with Box for ¾", 1", 1½" or 2" Service Lines
3-14	Domestic Service Connection Premise Isolation
3-15	Irrigation Service Installation
3-16	Single-Family Residential Domestic Waterline / Fireline
3-17	Multi-Family Residential Domestic Waterline / Fireline
3-18	Double Check Detector Assembly
3-19	Standard 6" Blowoff Assembly
3-20	Combination Air/Vacuum Valve and Vault
3-21	Tapping Sleeve and Valve Assemblies
3-22	Typical Pipe Trench







4. SEE STANDARD PLAN 3-1 FOR FIRE HYDRANT DETAILS.

5. GUARD POSTS ARE NOT USED WHERE FIRE HYDRANT IS LOCATED BEHIND CURB AND GUTTER OR POSTED SPEED LESS THAN 40 MPH

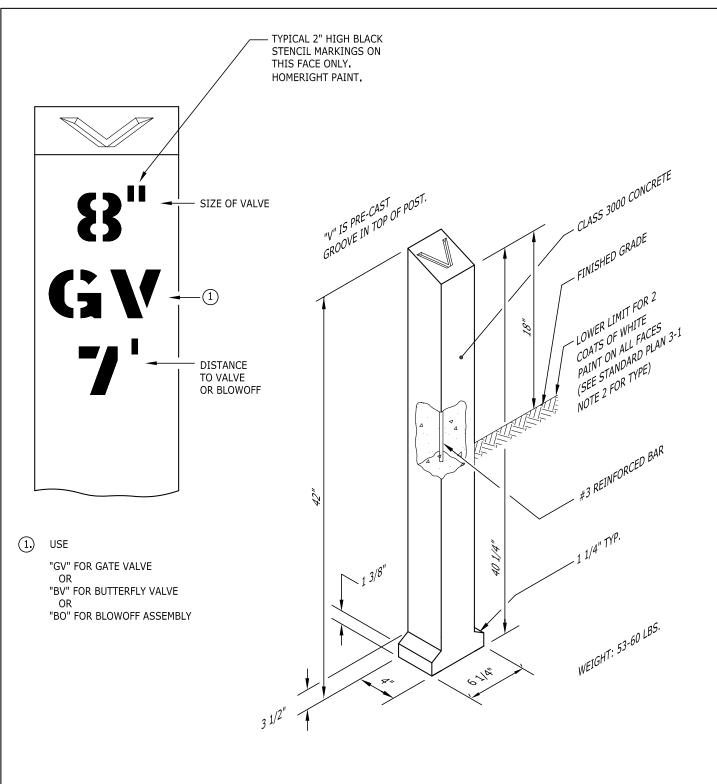
6. GUARD POST SHALL BE LOCATED OUTSIDE OF THE CLEAR ZONE. SEE STANDARD PLAN 6-50.

7. FOR USE ON PRIVATE PROPERTY.



NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION IS KEPT ON FILE AT THE CITY OF KENT. A COPY MAY BE OBTAINED UPON REQUEST.

		CITY OF KENT ENGINEERING DEPARTMENT		
	KENT	GUARD POST		
DESIGNED	DMW	SCALE	NONE	STANDARD PLAN
DRAWN	BB	SCALE	HOIL	
CHECKED		DATE		7_7
APPROVED_			ENGINEER	3-3



#### NOTES:

- 1. FOR USE ON PRIVATE PROPERTY.
- 2. THE FOG TITE INC. VALVE MARKER POST WITH THE "WATER" LEGEND IS THE PRE-APPROVED PRODUCT. ALL OTHERS REQUIRE THE WRITTEN APPROVAL OF THE ENGINEER PRIOR TO INSTALLATION.



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	<u> </u>	CITY OF KENT ENGINEERING DEPARTMENT  VALVE MARKER POST		
	KENT			
DESIGNED_	DMW	SCALE _	NONE	STANDARD PLAN
DRAWN	BB	SCALL _	TIONE	
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APPROVED_			ENGINEER	3-4

