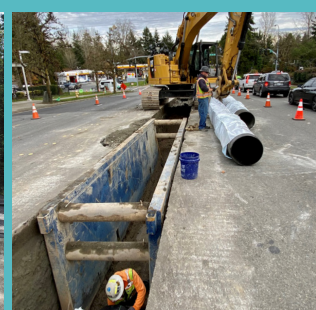
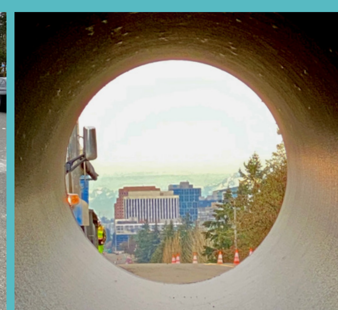
2026

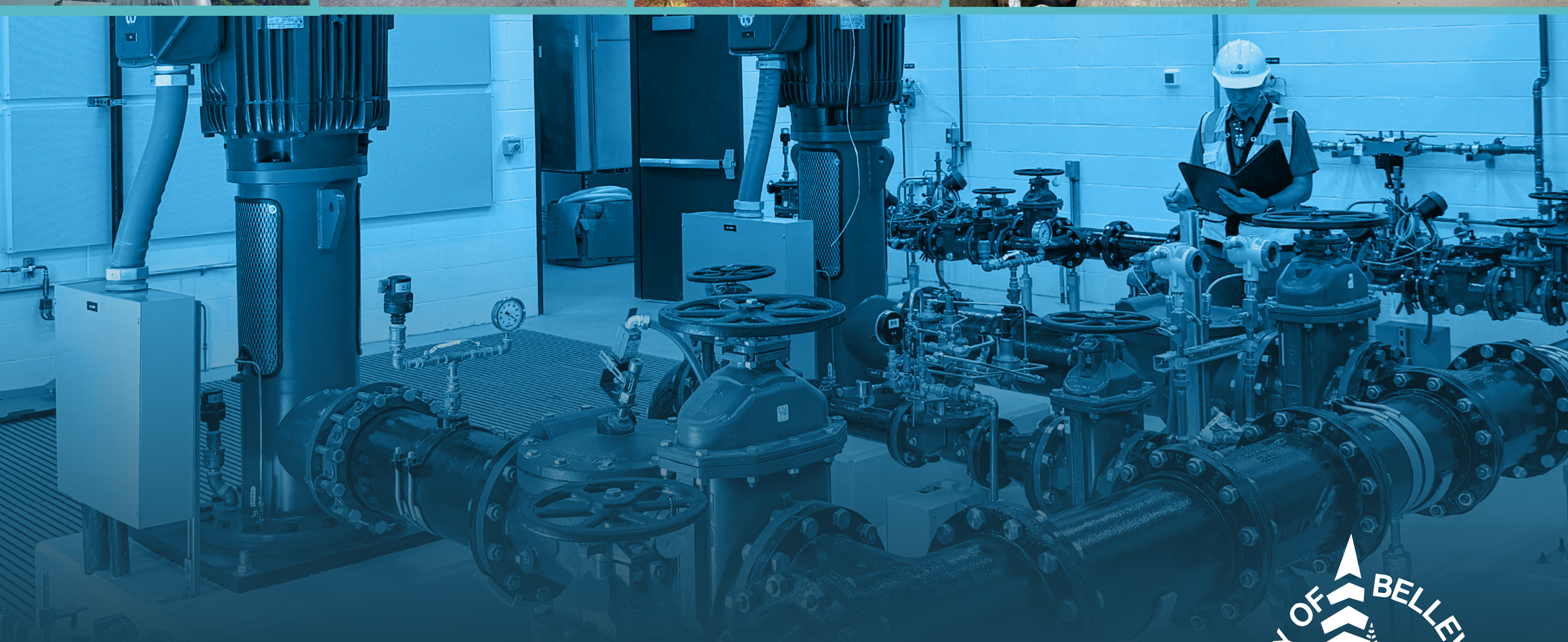
City of Bellevue

WATER SYSTEM PLAN

DRAFT Volume 1 | Water System Plan DRAFT





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City of Bellevue

2026 Water System Plan

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Executive Summary

This Water System Plan provides a comprehensive overview of water system policies and operations, identifies challenges and opportunities, and develops recommendations so Bellevue can continue to provide a reliable supply of safe, high quality drinking water that meets the community's needs in an environmentally responsible and cost-competitive manner.

System History and Background

The Bellevue water utility service area includes all of Bellevue, the Cities of Clyde Hill and Medina, the Towns of Hunts Point and Yarrow Point, and small adjacent portions of Kirkland and unincorporated King County. Since the founding of the original Bellevue Water District near Meydenbauer Bay in 1944, the utility has protected water quality and public health while facilitating economic vitality, desirable neighborhoods and significant growth.

This Water System reflects back on a decade of change since Bellevue's 2016 Water Comprehensive Plan, while charting a course to navigate the challenges ahead. The Plan addresses policies, operational practices, financing, system expansion to accommodate growth, and aging of infrastructure. It revises forecasted growth and uses improved analytical tools to evaluate data and recommend improvements.

The Plan has been prepared in conformance with Washington State Department of Health criteria, as required by WAC 246-290-100. It forecasts anticipated water needs and provides a basis for capital improvement planning and financing for the next 20 years, based on projected growth.

The City has consulted with Bellevue's Environmental Services Commission (ESC) for review and direction of the Plan at key points of Plan development, including policy development review, analysis results and recommendations, and plan review and adoption. The ESC is a panel of seven citizens who reside in Bellevue's water utility service area, appointed by Bellevue City Council to review utility policy and budgets. Their monthly meetings are open to the public. Additional public input was invited at an Open House and during Washington State Environmental Policy Act (SEPA) review (see Appendix A).

Policies

Bellevue Utilities is guided primarily by two planning documents, the Comprehensive Plan which is the city's foundational policy to guide the City as it develops into the future, and the Water System Plan which is more detailed and implementation specific. The Comprehensive Plan was updated in 2023 and 2024 as required by the Washington State Growth Management Act (GMA). The Utilities Element of the Comprehensive Plan (see Appendix E) includes policies that guide the provision of a reliable, cost-effective, safe, and high-quality drinking water supply. Consistent with the GMA, Bellevue's Comprehensive Plan policies require the Utilities Department to anticipate and facilitate growth, and Utility's performance is measured in part on its responsiveness to zoning and development activity. The Comprehensive Plan also requires planning for renewal and replacement. Comprehensive Plan policies specific to the water system are:

- POLICY ED-32. Continue to identify, construct and maintain infrastructure systems and facilities required to promote and sustain a positive economic climate. Anticipate needs and coordinate city infrastructure investments with economic development opportunities.
- POLICY UT-1. Manage utility systems effectively in order to provide reliable, sustainable, quality service.
- POLICY UT-7. Base the extension and sizing of system components on the land use plan of the area. System capacity will not determine land use.
- POLICY UT-10. Emphasize cost effective management of city utility systems over their lifetime, including planning for their renewal and replacement, balancing risk, and maintaining desired service levels. Forecast future capital and maintenance costs and manage rates so that customer rate revenue funds the cost of ownership equitably across generations.
- POLICY UT-12. Develop and periodically update functional utility system plans that forecast system capacity and needs for at least a 20-year planning horizon.
- POLICY UT-39. Provide a reliable, cost-effective supply of safe, secure, high quality drinking water that meets the community's water needs in an environmentally responsible manner.

This Water System Plan is consistent with Bellevue's Comprehensive Plan policies and serves as a functional plan to implement those policies. Furthermore, the Water System Plan itself defines Utilities-specific policies. These Utilities-specific policies, found in Chapter 2, focus on:

- Customer Service
- Facility Abandonment
- Fire Protection
- Service Area
- Water Quality
- Regional Policy Interface
- Financial Policies

System Infrastructure

Bellevue's water service area extends over 37 square miles, serving a local employment base of over 160,000 jobs, and a residential population of over 162,000 in 2024. The system includes approximately 73 separate pressure zones, 6,300 fire hydrants, 1,900 main isolation valves, 38,500 customer accounts with 40,500 customer meters, 24 active reservoirs (plus 6 that are partially owned by adjacent purveyors), 21 pump stations (plus 1 that is partially owned by CCUD), 151 active pressure reducing valve (PRV) stations, and over 610 miles of pipe. Bellevue also has groundwater rights for municipal supply.

Since the 2016 Plan, there has been significant effort to improve water system assessment and understanding. The asset management program assures funding for renewal and replacement to address age-related deterioration and failures. The system inventory (Maximo) and mapping database are continuously updated; field testing of system performance and advanced hydraulic modeling software provide staff with powerful analytical tools. System infrastructure is continually observed during regular maintenance and in response to customer complaints. Bellevue embraces the principles of a High-Performance Organization, which involves field crews and customer feedback in the decision-making process.

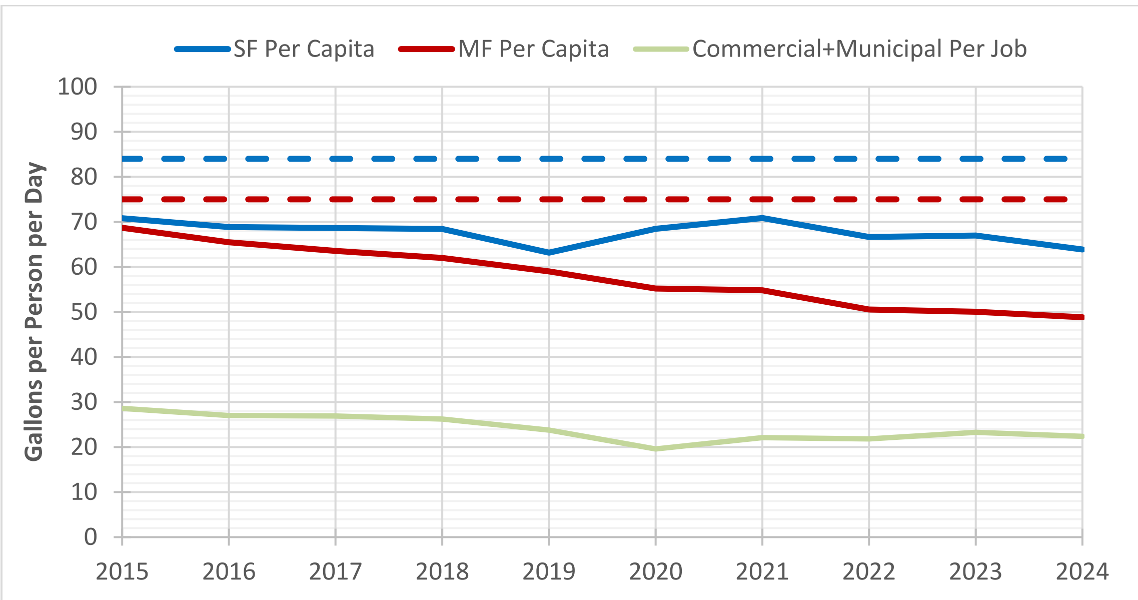
While Bellevue's water system overall is well-maintained and functional, several emerging challenges have been identified due to expected strain on the system with population growth as well as aging infrastructure. These challenges and specific improvement programs designed to address these challenges are discussed in more detail in subsequent Plan chapters.

Water Consumption

Bellevue's water system is continually analyzed to understand water usage patterns, assess system performance, and plan to meet future needs.

Per capita water consumption in Bellevue's water service area has declined, consistent with other utilities in the region. Figure ES-2 shows the average Bellevue water customer's usage for the most recent 10-years, and the projected peak usage from the 2016 Water Comprehensive Plan. This decline presents challenges for maintaining water quality and generating stable revenues, but also helps to reduce the increasing service demand as population increases.

Figure ES-2: Actual Per Capita Water Demands



Since the previous WSP, Bellevue has made significant progress in deploying Advanced Metering Infrastructure (AMI) across its water system. As of June 2025, approximately 95% of water services are equipped with AMI equipment capable of recording hourly consumption. Installation efforts are ongoing for the remaining services, and once a more complete dataset of hourly consumption data spanning multiple years is available, the City plans to conduct an updated diurnal demand analysis to reflect current customer usage patterns more accurately. Daily usage patterns from historic years up to 2014 were used in the modeling efforts for this Plan, shown in Figure ES-3.

Figure ES-3: Historical and Current Water Usage Patterns

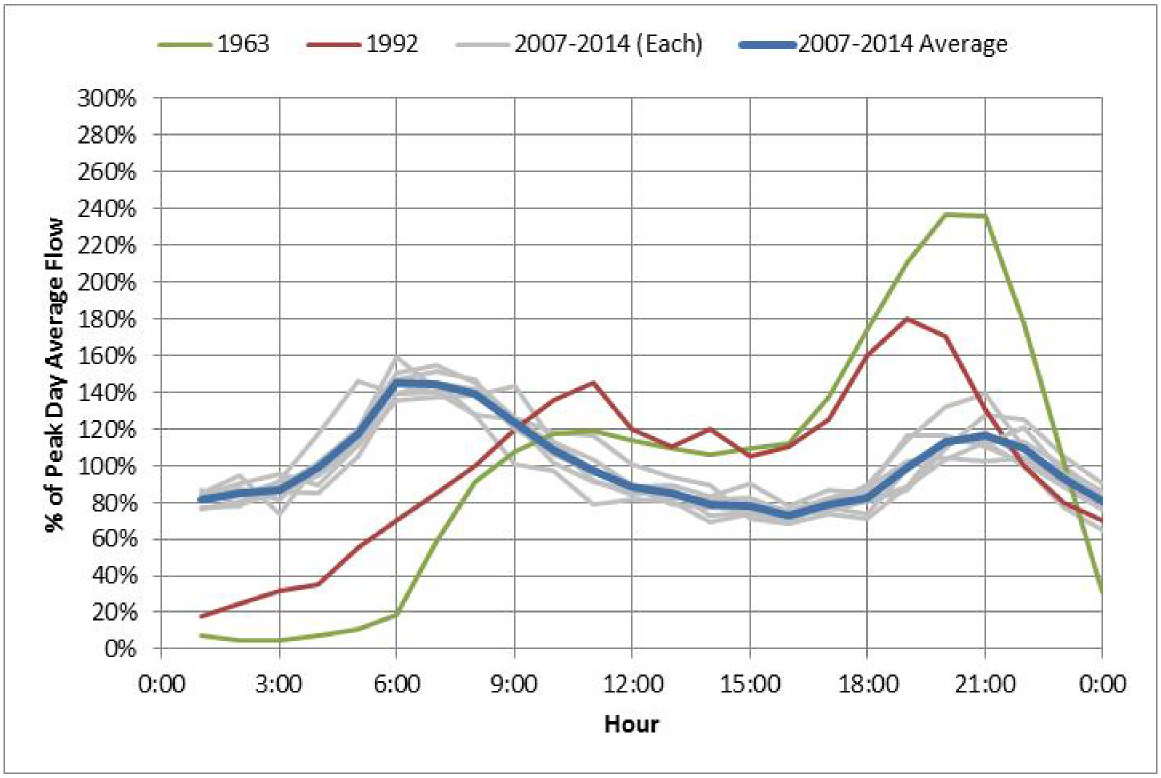


Table ES-1 summarizes updated criteria for system-wide demand projections, based on the range of recent water usage shown in Figure ES-2, and on seasonal analysis described in Chapter 3. The range of criteria shown were used to develop the revised future demand projections discussed on the following pages.

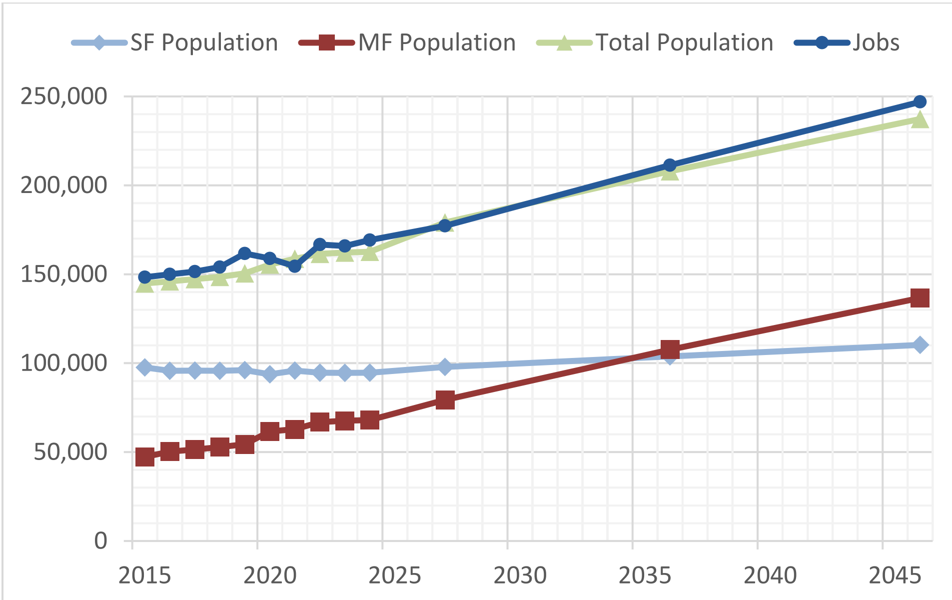
Table ES-1: Recommended Average Day Water Use Projection Criteria(1)

	High Demand Year	Low Demand Year	High 2016 Water Comprehensive Plan Estimate	Low 2016 Water Comprehensive Plan Estimate
SF Residential (gpcd)	71	63	84	66
MF Residential (gpcd)	69	49	75	66
Employee (gpcd)	29	22	32	27
ERU_{ADD} (gpd/ERU)	201	180	232	185
Non-Revenue[1]	9%	4%	6%-9%	3%
MDD/ADD	2.0	1.6	2.2	1.7
WDD/ADD	0.81	0.74	N/A	0.75

Growth and Development

Bellevue's water service area experienced significant population growth throughout the 2010s – 2020s, particularly in downtown Bellevue. Bellevue's service area population has continued to expand and is projected to approach 247,000 by 2046. Most of the growth is anticipated to occur in the Downtown, Wilburton, and BelRed Neighborhoods.

Figure ES-4: Projected Water Service Area Population and Employment



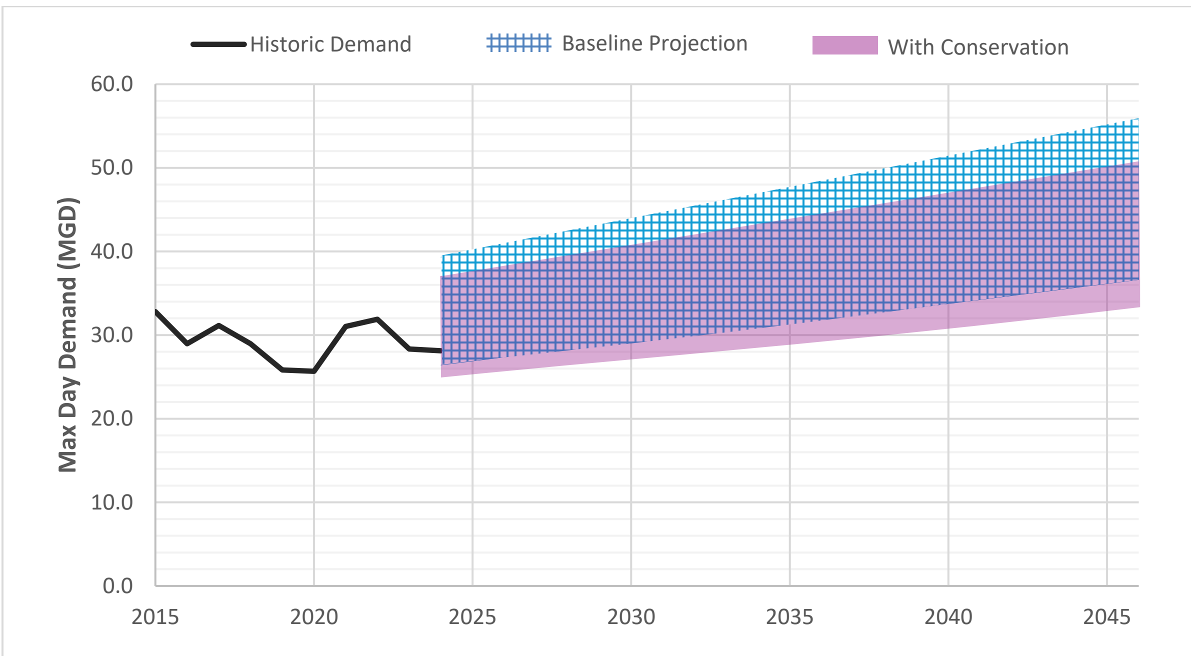
To estimate future water demands, the Water System Plan uses population and land use projections developed by the Bellevue Planning and Community Development Department, and by applicable planning agencies outside Bellevue's City Limits. The projections consider the Bellevue Comprehensive Plan and are consistent with Puget Sound Regional Council forecasts and U.S. census data. Population and water demand projections consider ultimate growth within the City's urban growth boundary limits, in accordance with GMA requirements.

Population and employment projections are used to evaluate the system's ability to meet future needs and form the basis of recommendations for capacity expansion projects.

Figure ES-5 shows projected average day water demands (“Baseline Projection”) based on updated per capita demands (Table ES-1) applied to forecasted growth (Figure ES-4). Bellevue coordinates with the water supplier, Cascade Water Alliance, to meet future water supply and treatment needs, while Bellevue’s CIP projects have been established to meet future needs for storage, supply inlet capacity and transmission capacity in Bellevue’s system.

Figure ES-5 also projects future demands that would occur with additional water conservation, based on Cascade Water Alliance’s stated future goals. It is important to realize the opportunities of further per-capita reductions in water demand, and to understand the potential unintended consequences of building excess capacity. Bellevue will continue to monitor water use trends to inform decision making and optimize the use of existing infrastructure in the years ahead.

Figure ES-5: Projected Water Demands



Asset Management

Bellevue's water infrastructure is aging. Planning for system renewal and replacement (R&R) is necessary to ensure adequate long-term financing and to manage the risk of system failures.

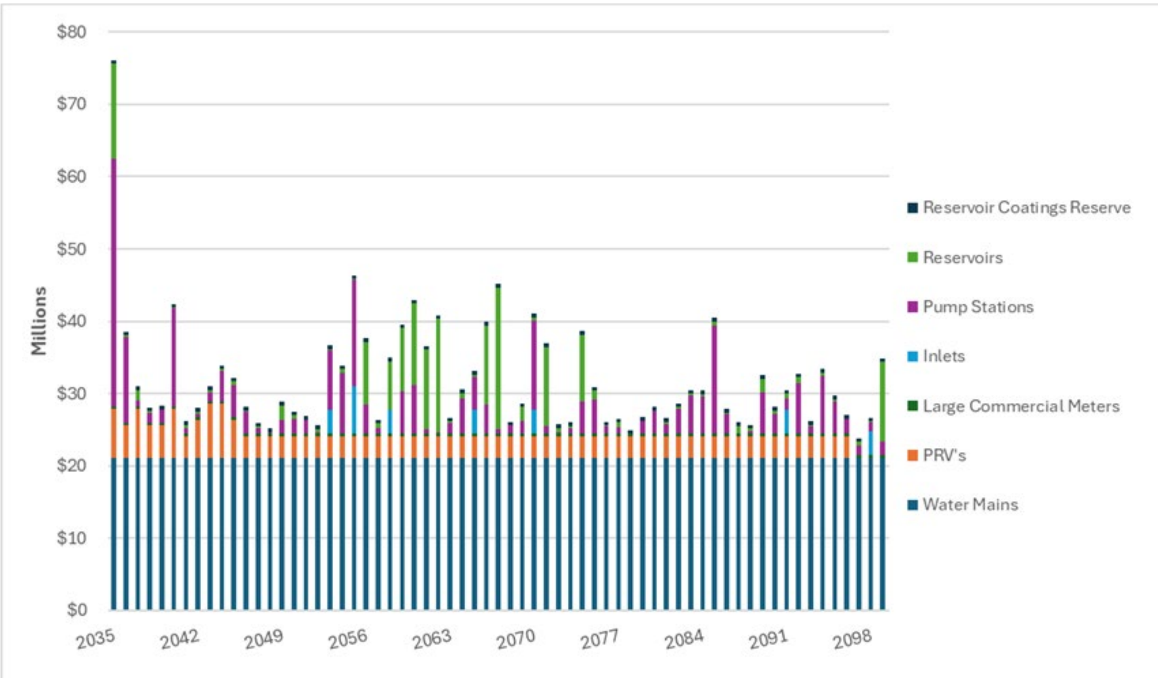
Bellevue’s Utilities Department Asset Management Program incorporates the five core components of the EPA asset management framework:

1. Determine The Current State of the Assets
2. Define Service Levels
3. Determine Asset Criticality and Risk

4. Determine Best Operating and Maintenance (O&M) and Capital Improvement Program (CIP) Strategies to Minimize Life Cycle Costs
5. Determine Funding Strategy

Based on industry standards for asset life expectancy, as well as local factors specific to the City's water distribution system, Bellevue developed a 75-year schedule of annual costs for funding anticipated R&R projects. The 75-year projected R&R cost expenditures are shown Figure ES-1.

Figure ES-1: Projected 75-Year R&R Expenditures



Recommended System Improvements

Bellevue Utilities maintains a 10-year Capital Improvements Plan. Funding for the first 6 years of the CIP is approved by City Council every two years as part of the city's budget cycle. Table ES-2 shows the City's drinking water CIP programs. Some programs are for work that occur annually, like watermain replacement projects (W-16). Other programs are specific to localized improvements like Increase Drinking Water Storage for West Operating Area (W-103). Tracking work by program simplifies fund management when projects span multiple budget cycles or require multiple phases of development. Appendix V lists programs/projects completed during the last water system plan period and projects in the current 10-year plan.

Table ES-2: Current 2027-2034 CIP Budget

CIP No.	Program Name	2027-2036 Proposed Budget
W-16	Water Main Replacement	$ 245,934,000

CIP No.	Program Name	2027-2036 Proposed Budget
W-67	Pressure Reducing Valve (PRV) Station Rehabilitation	$ 8,716,000
W-69	Minor (Small) Water Capital Improvement Projects	$ 1,199,000
W-85	Reservoir Rehabilitation or Replacement	$ 19,733,000
W-91	Water Pump Station Rehabilitation or Replacement	$ 48,834,000
W-98	Replacement of Large Commercial Meter Vaults	$ 5,559,000
W-99	Water Service Line and Saddle Replacement Program	$ 5,287,000
W-103	Increase Drinking Water Storage for West Operating Area	$ 60,849,000
W-105	NE Spring Blvd	-
W-108	Advanced Metering Infrastructure	$ 2,106,000
W-110	Water Supply Inlet Rehabilitation	$ 13,121,000
W-111	Maintenance and Operations Facility - Water	$ 14,231,000
W-112	Water System Capital Planning	$ 147,000
W-115	SCADA Upgrade - Water	$ 610,000
W-118	Water Pressure and Capacity Improvements	$ 6,672,000
W-119	Groundwater Well Improvements	$ 16,879,000
TOTAL		$ 449,877,000

Table ES-3 summarizes the new investments that are recommended in Chapter 4 and summarized in Chapter 9. The source of funding (CIP vs. operating budget) will be determined during each biennial budget update.

Table ES-3: Proposed New Projects and Programs

WSP Section	Description	Estimated Budget	Applicable Policy
4.8	Check valve standardization and replacement program	TBD	Service Reliability; Efficient Water Use; Fire System Responsibility; Emergency Preparedness
4.7	Construct additional storage in Bellevue storage region	TBD	Service Reliability; Service Pressure and Flow; Drinking Water Storage for Emergency Supply Outages
4.5	Continue to work with the City of Issaquah to separate the Bellevue and Issaquah water systems in the South Cove Assumption Area	TBD	Service Ownership/ Responsibility; Water Sales Outside Bellevue's Service Area
4.11	Establish a program to proactively acquire property to meet the long term needs of the Utility	TBD	Service Ownership/ Responsibility
TOTAL		$	

Multiple engineering evaluations are recommended in Chapters 4, as shown in Table ES-4. Based on the results of these evaluations, additional capital projects or programs may be recommended in future CIP updates, however those cannot be identified at this time.

Table ES-4: Proposed Engineering Evaluations

WSP Section	Description	Estimated Budget[1,2]	Applicable Policies
4.5	Complete a new model calibration	$500,000	Regional Policy Development; Fire Flow Improvement Program, Service Pressure and Flow, Service Reliability
4.5	Conduct a modeling analysis of transmission velocity and distribution system pipe capacities for fire flow in recently re-zoned areas	$300,000	Fire Flow Improvement Program, Service Reliability
4.5	Additional evaluation of new Crossroads Pressure Zone	$400,000	Fire Flow Improvement Program, Service Pressure and Flow, Service Reliability
4.7	Evaluate an appropriate site for new Bellevue Region Storage	TBD	Service Reliability; Service Pressure and Flow; Drinking Water Storage for Emergency Supply Outages
4.9	Create new source reliability program which includes electrical supply reliability and seismic resiliency	TBD	Emergency Preparedness; Service Reliability
4.11	Develop and maintain updated property management plan.	TBD	Service Ownership/ Responsibility; Facility Abandonment; Facility Repurposing
4.7	Work with CCUD to secure additional storage for the Newport Hills Storage Region	TBD	Service Reliability; Drinking Water Storage for Emergency Supply Outages
TOTAL		$1,200,000	

[1] Estimated budget is estimated planning-level cost in 2025 dollars, for general information only. Estimated budget includes both consulting fees and City staff labor.
[2] Estimated costs are for engineering evaluation only. Recommendations and costs to implement capital improvements are unknown at this time and will be developed during the evaluation. If appropriate, budget for capital improvements will be proposed as part of future CIP update(s).

Summary of Recommendations

Large potential capital recommendations in this chapter are summarized below in Table ES-5, with a reference to the Capital Improvement Program that each recommendation would fall under. More detailed information on each recommendation is provided in Chapter 4:

Table ES-5: Summary of Suggested Improvements

Suggested Improvement	CIP Reference
Continued replacement of aging mains within the City's water system	W-16
Perform a system-wide hydraulic model calibration. Specific areas requiring more detailed calibration include the following: ○ LH520 Crossroads Area ○ PP550 zone ○ NH580 zone ○ FA290 zone ○ SS850 zone	Table 9-3
Evaluate distribution system pipe capacities for fire flow in recently re-zoned areas	Table 9-3
Evaluation of transmission capacities between inlets and proposed reservoirs	Table 9-3
Complete a transmission velocity modeling analysis	Table 9-3
Inlet station rehabilitations at NE 40th Inlet, Factoria Inlet, and Eastgate Inlet	W-110
Evaluate risk of remaining AC pipe in West Lake Sammamish Blvd and prioritize replacement if appropriate	W-16
Replace the 10" AC main north of the Horizon View 2 Reservoir in the SS850 zone	W-16
Upgrade the capacity of the Clyde Hill 500 Booster Pump Station	W-91
Establish a standardization and replacement program for check valves	Table 9-2
Reservoir replacement or rehabilitation indicated in Table 4-14	W-85
Pump station replacement or rehabilitation indicated in Table 4-15	W-91
PRV station replacement or rehabilitation indicated in Table 4-16	W-67
Perform a risk-based evaluation of pump station vulnerability during power outages	Table 9-3
Ensure key water supply routes are seismically resilient	W-16
Perform recommendations in Emergency Water Supply Master Plan	W-119
Analyze the long-term need for property to support continued water service delivery and acquire property as necessary.	Table 9-2
Develop and maintain updated property management plan	Table 9-3
Continue to cooperate with the City of Issaquah to separate the Bellevue and Issaquah water systems in the South Cove Assumption Area.	Table 9-3
Construct additional storage for the Bellevue Storage Region	Table 9-2
Work with CCUD to secure additional storage for the Newport Hills Storage Region (the current agreement expires in 2028).	Table 9-3

Finances

The City has a sound financial base that can finance the recommended capital improvements. Bond rating agencies have indicated a high level of confidence in the ability of the City's utilities to repay debt obligations, if needed. The Water Utility currently has no outstanding debt and no immediate plans to issue additional debt.

Conclusion

The Plan supports livable communities and a healthy and sustainable environment through high quality utility services. To accomplish this vision, Bellevue should continue to:

- Provide a reliable, cost-effective supply of safe, secure, high quality drinking water that meets the community's water needs in an environmentally responsible manner.
- Proactively fund system renewal and replacement, in order to maintain service levels, keep rate increases gradual and uniform, and maintain generational equity.
- Expand system capacity to accommodate growth, consistent with the Comprehensive Plan.
- Maintain at least one average day's volume of water in reserve, consistent with industry standards, to balance water supply risks with reservoir costs and the risk of water quality deterioration.

The Plan identifies system deficiencies and investments required to accomplish these objectives and maintain appropriate levels of service. Many of these are ongoing projects (Table ES-2), and some are new projects that address potential regulatory risks. A summary of suggested improvements is provided above in Table ES-5.

The plan lays the groundwork for the next 20 years of continued water system growth, improvements, quality, and customer satisfaction.

Volume 1: Water System Plan

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Abbreviations and Definitions

AC	Asbestos cement
AFF	Available fire flow
ADD	Average Day Demand
AMD	Average Month Demand
AMI	Advanced Metering Infrastructure
AMP	Asset Management Plan
AMS	Asset Management System
AVAR	Air Vacuum/ Air Release Valve
AWWA	American Water Works Association
BCC	Bellevue City Code
City	The City of Bellevue
BIP	Bellevue-Issaquah Pipeline
Cascade	Cascade Water Alliance
CCF	Hundred Cubic Feet
CCL	Contaminant Candidate List
CCR	Consumer Confidence Report
CCUD	Coal Creek Utility District
CDD	Community Development Department
CESSL	Cedar Eastside Supply Line
CI	Cast iron
CIP	Capital Investment Program
CMP	Coliform Monitoring Plan
CoF	Consequence of Failure
CWSP	Coordinated Water System Plan
CWSSA	Critical Water Supply Service Area
DBPs	Disinfection Byproducts
DOH	Washington State Department of Health
DSL	Distribution System Leakage
EOA	East Operating Area
EOC	Emergency Operations Center
EPA	United States Environmental Protection Agency
EPS	Extended Period Simulation
ERU	Equivalent Residential Unit; ADD for a single-family household
FEMA	Federal Emergency Management Agency
fps	Feet per second
GIS	Geographic Information System
gpd	Gallons per Day
gpm	Gallon per Minute
HAA5	Haloacetic Acids
HGL	Hydraulic grade line, in Feet
HPC	Heterotrophic Plate Count
I-90	Interstate 90
ICS	Incident Command System
IOC	Inorganic Chemicals
LCR	Lead and Copper Rule
LCRI	Lead and Copper Rule Improvements
LCRR	Lead and Copper Rule Revisions

LoF	Likelihood of failure
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDD	Maximum Day Demand or Maximum Demand Day
MG	Million Gallons
MGD	Million Gallons per Day
mg/L	Milligrams per Liter
MIPL	Mercer Island Pipeline
MMD	Maximum Month Demand
O&M	Operations & Maintenance; or City of Bellevue Utilities O&M Division
PF	Peaking Factor
PFAS	Per & Polyfluoroalkyl Substances
PHD	Peak Hour Demand
ppm	Parts per Million (1 ppm = 1 mg/L in water at 4° C or 39° F)
PRV	Pressure Reducing Valve
psi	Pounds per Square Inch
R&R	Renewal and Replacement
RCW	Revised Code of Washington
RMCS	Resource Management and Customer Service
RTCR	Revised Total Coliform Rule
SAMP	Strategic Asset Management Plan
SCADA	Supervisory Control and Data Acquisition
SDWA	Safe Drinking Water Act
SOA	South Operating Area
SOC	Synthetic Organic Chemical
SOP	Standard Operating Procedure
SPU	Seattle Public Utilities
SWTR	Surface Water Treatment Rule (1989) and revisions (1998, 2002, 2006)
TCR	Total Coliform Rule
TESSL	Tolt Eastside Supply Line
TTHM	Trihalomethanes
TSP	Cascade Water Alliance Transmission and Supply Plan
UAM	Utility Asset Management
UCMR	Unregulated Contaminant Monitoring Rule
ug/L	Micrograms per Liter
Utility	City of Bellevue Utilities Department (referenced in policy language)
VOC	Volatile Organic Chemical
WAC	Washington Administrative Code
WD22	King County Water District No. 22 (Beaux Arts Village)
WD68	King County Water District No. 68
WD97	King County Water District No. 97
WD99	King County Water District No. 99
WD117	King County Water District No. 117 (Hilltop Community)
WDD	Average Winter Day Demand
WFI	Water Facilities Inventory
WOA	West Operating Area
WSDM	WA Department of Health Water System Design Manual, December 2009
WSP	Water System Plan
WUE	Water Use Efficiency

Chapter 1 Description of Water System

1.1 System History and Background

Since World War II, the City of Bellevue's (City's) water system has grown along with development on the east side of Lake Washington. Originally, the area was served by Water Districts No. 68 (WD68), 97 (WD97), and 99 (WD99), as well as some smaller utilities, as shown in Figure 1-1.

The earliest development was on the west side of the service area in what is now the central part of Bellevue. Wells originally supplied water to the area and, at one time, treated surface water from Lake Washington and Lake Sammamish was used. The transition to purchasing water from the Seattle Water Department occurred in the mid-1960s.

In the early 1970s, as the City grew to include most of the current service area, it moved to incorporate WD68, WD97, and WD99 into one utility under the City's management, to provide uniform water service.

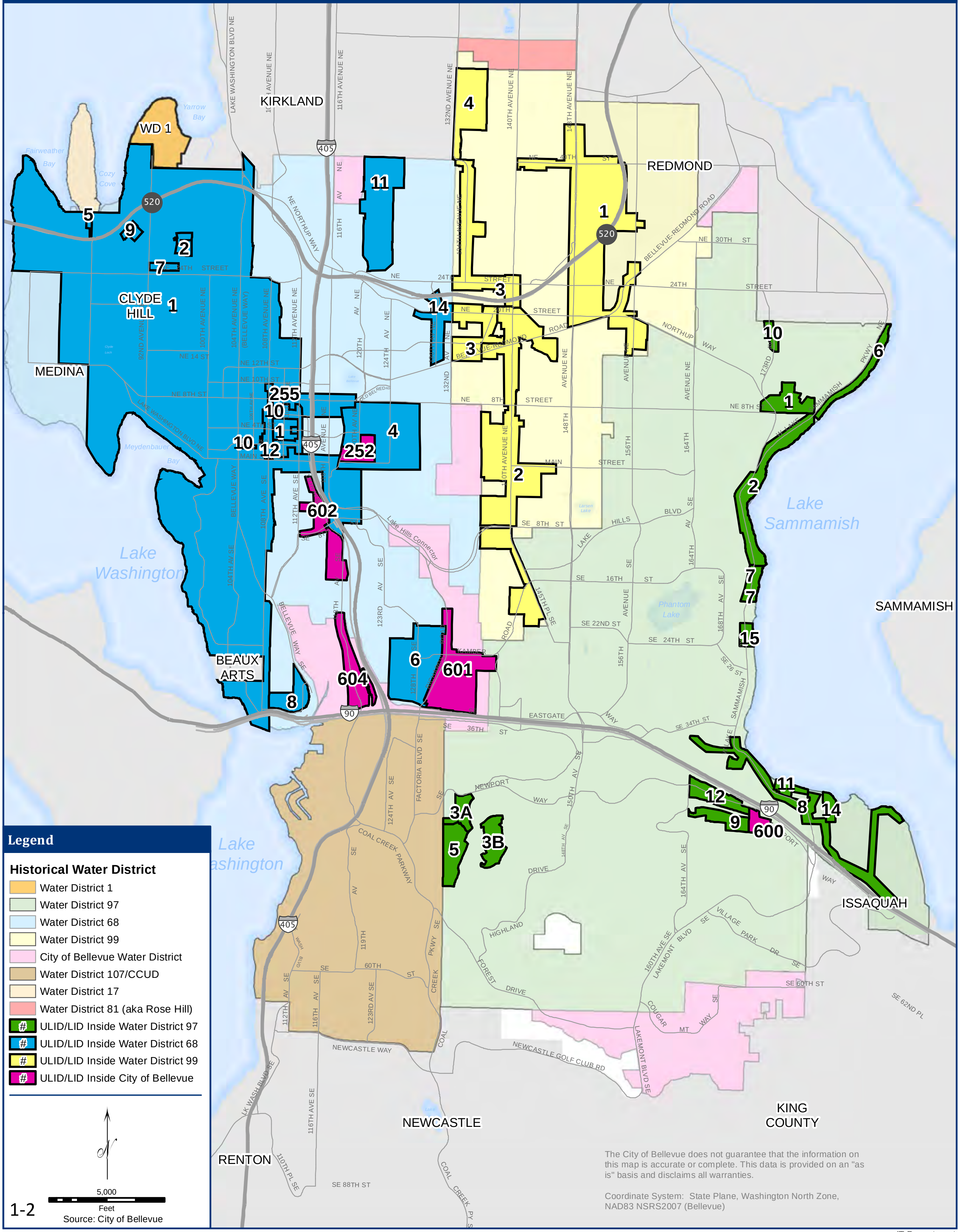
In January of 1994, Rose Hill Water District was assumed by the Cities of Bellevue, Kirkland, and Redmond. The City assumed the portion of the district in its own limits (south of NE 60th Street, between 132nd and 148th Avenues). The three cities also formed a Joint Board, which meets semi-annually for coordination and decision making regarding jointly-owned infrastructure.

In November of 1998, the City assumed Water District No. 17, which provided water service to the northern portion of the Town of Hunts Point.

On December 31, 2003, the City assumed the portion of the Coal Creek Utilities District (CCUD) lying within city limits. The assumption area consists of that portion of the City lying south of Interstate 90 (I-90) and west of 132nd Avenue SE and its extension.

In January 2004, the City began receiving its water supply from the Cascade Water Alliance (Cascade). Cascade was established to provide for the long-term water supply needs of its members and replaced Seattle Public Utilities (SPU) as the City's regional water supplier.

Historical Water Districts
Figure 1-1



1.2 Ownership and Management

The City of Bellevue Utilities Department manages public water, sewer, storm drainage, and solid waste services within the respective service areas for each utility. It operates as part of the City, under the authority of the City Manager and City Council. The Utilities Department produces an annual Utilities Business Profile with additional information, which is publicly available at the Utilities Department website.

The Utilities Department Director and two Deputy Directors oversee management of the department and serve as the primary point of contact for the City Manager, City Council, and Environmental Services Commission. In addition to general management duties, the Director is responsible for reviewing regional and state legislative issues and for implementing policy.

The Utilities Department is separated into four divisions, as listed below. Each Division is led by an Assistant Director, who reports to one of two Deputy Directors:

- Resource Management and Customer Service
- Corporate Strategies Group
- Engineering (Assistant Director)
- Operations and Maintenance (Assistant Director)

A functional organization chart for the Utilities Department is shown in Figure 1-2.

Utilities Director's Office

The Utilities Director's Office oversees strategic planning, process improvement, performance management, organizational development, workforce development, intergovernmental affairs, interdepartmental relations, public information & outreach, and other functions.

Resource Management and Customer Service Division

The Resource Management and Customer Service Division (RMCS) oversees finance, business systems planning and implementation, customer service for all the City's public utilities, and manages the City's solid waste contract. These functions include billing, customer accounts and other related services, utility rate and tax relief programs, and administrative support. The RMCS provides personnel management for the Utilities Department, coordinates bi-annual budget development and monitoring, performs rate forecasting, and manages accounts payable and receivable. In addition, the RMCS's Systems Group manages automation projects and data reporting and serves as the Utilities Department liaison for projects in the City's Information Technology Department.

Engineering Division

The Engineering Division oversees water, sewer, and storm drainage system planning, analysis, mapping, design, asset management, construction, and development review functions. This division is divided into six sections:

- The Water Resources Planning Section is responsible for system planning, hydraulic modeling, mapping, and data management. This section develops the Utility's Capital Investment Program (CIP) and system functional plans, including the Water System Plan (WSP). This section also reviews and evaluates developer requests to determine their effect on system operation.

- The Project Management/Design Services Section employs a team of project managers who plan, coordinate, and manage construction and resource conservation projects at major City facilities. They are responsible for capital project design and management. Design of projects is performed primarily by consultants to effectively manage the City's internal CIP workload. Some minor work requiring rapid response is done by in-house design staff. This section also maintains and updates the Utilities Engineering Design Standards.

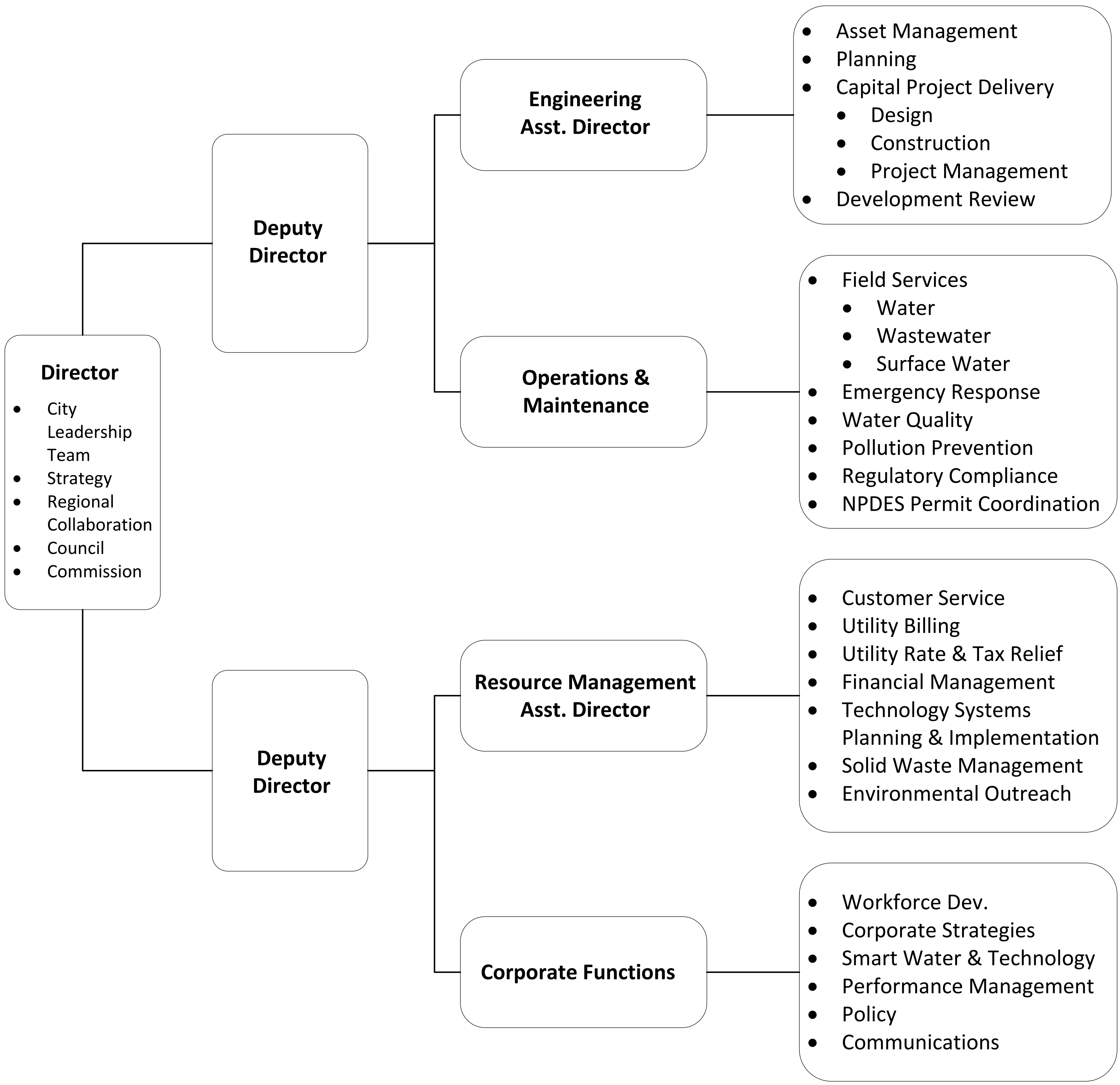
- The Construction Services Section manages construction work for the department to assure timely and efficient completion of projects. This section also provides inspection services to ensure City and developer-built utility projects are installed and constructed according to approved design plans and specifications.

- The Development Review Section conducts permit reviews and administers other development processes requiring coordination within Utilities and other City departments. It also manages and staffs the utility desk at the Permit Center, which is the first contact for customer service and information on development requests. This section is responsible for approving developer extension designs for construction.

- The Asset Management Section manages the asset management program which involves adopting a life cycle approach to managing infrastructure, establishing service levels, providing optimal value through balancing cost, risk, and performance of assets, ensuring environmental and financial sustainability, and endorsing evidence-based decisions to make data-driven capital improvement and infrastructure operating decisions.

CITY OF BELLEVUE UTILITIES

Water Utility Fund, Sewer Utility Fund, Storm & Surface Water Utility Fund, Solid Waste Fund



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Operations & Maintenance Division

The Operations & Maintenance Division (O&M) maintains and operates the City's public water, sewer, and storm drainage infrastructure. This includes physical components as well as system telemetry. O&M monitors and assesses the condition of infrastructure to minimize failures and extend the life of system components. It provides water quality regulatory compliance, code enforcement and works to ensure the integrity of the existing infrastructure during development and redevelopment. O&M manages the City's unidirectional flushing program, provides emergency response, and responds to customers who report system problems. Additional O&M information is provided in Chapter 6.

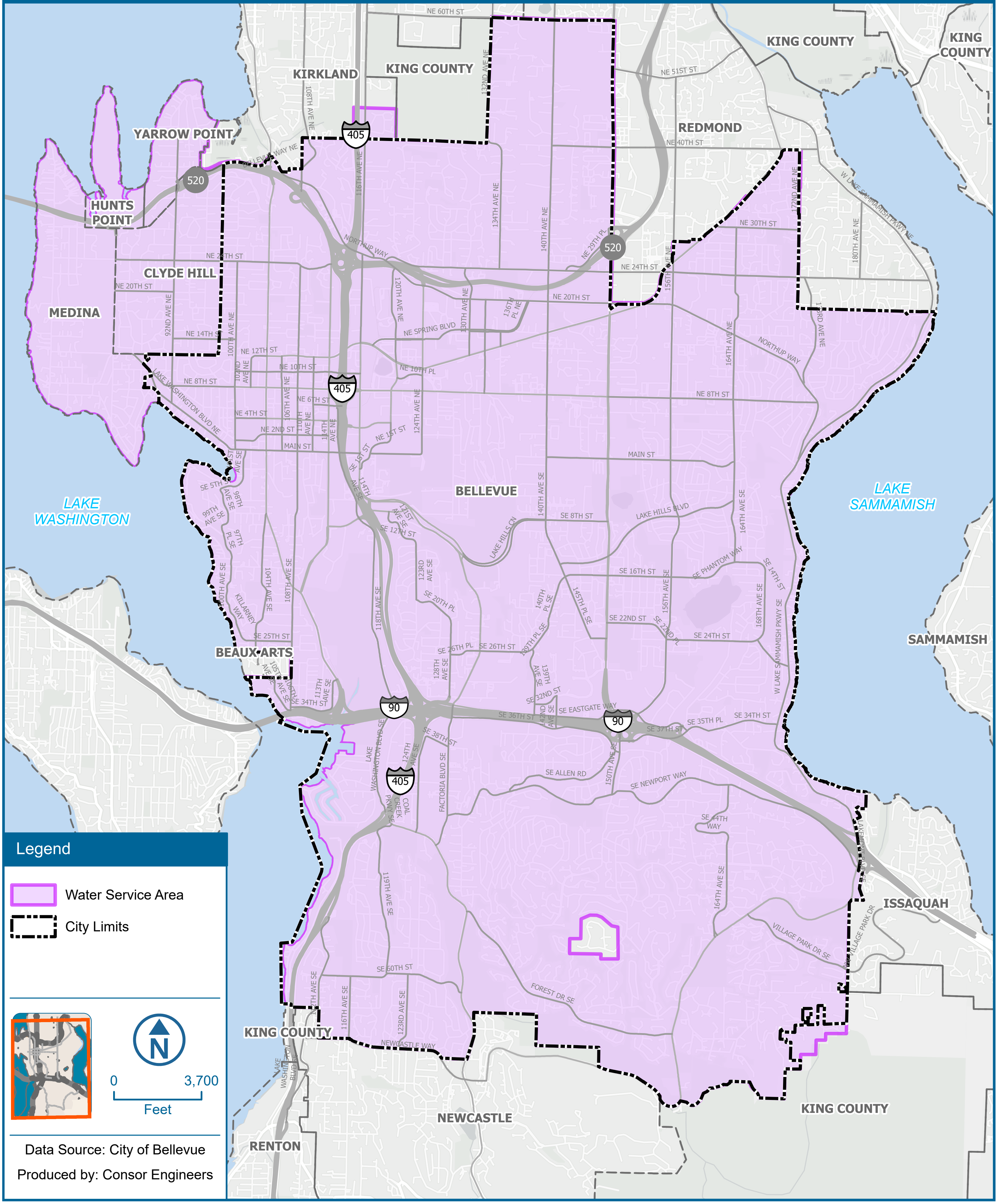
1.3 Service Area

The City's water utility service area includes all of the City plus the Cities of Clyde Hill and Medina, the Towns of Hunts Point and Yarrow Point, and small adjacent portions of Kirkland and unincorporated King County. There are two individual community wells operating within the service area: the Hilltop Community (WD117) and Trails End. The South Cove/Greenwood area located within Issaquah on the City's eastern edge was assumed by Issaquah in 2017. The City also has agreements with neighboring water systems to provide limited services. Local municipal boundaries and the City's current water service area are shown in Figure 1-3.

There are currently no plans to expand the City's water service area. However, water districts outside the retail area may request to be assumed by the City, or the City Council may choose to initiate an assumption within the City limits. Policies to guide such actions are described in Chapter 2. Potential further expansion is limited because the City is surrounded by natural physical barriers or other communities with existing water service.

King County Water District No. 1 was assumed by the City in 2023 according to the terms of a January 2004 agreement (City of Bellevue Resolution 6952; see Volume 3).

Water Service Area
Figure 1-3



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Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community

1.4 Inventory of Existing Facilities

The City's distribution system includes approximately 73 separate pressure zones, 6,300 fire hydrants, 1,900 main isolation valves, 38,500 customer accounts with 40,500 customer meters, 24 active reservoirs (plus six that are partially owned by adjacent purveyors and three that have been reservoirs decommissioned by the City), 21 pump stations (plus one that is partially owned by CCUD and one that has been decommissioned by the City), 151 active pressure reducing valve (PRV) stations, and over 610 miles of pipe. More information on major assets is provided below.

The City's Washington State Department of Health (DOH) water system ID is 05575-B, as indicated on the Water Facilities Inventory (WFI) form provided in Appendix B.

Water Supply Facilities

The City receives its water supply from regional inlet stations. These are metered connections to regional transmission pipelines, including SPU's Tolt Eastside Supply Line (TESSL), SPU's Cedar Eastside Supply Line (CESSL), SPU's Mercer Island Pipeline (MIPL) and Cascade's Bellevue-Issaquah Pipeline (BIP). Both the MIPL and the BIP are regional pipelines that provide additional distribution from the main North-South TESSL and CESSL regional pipelines. Under normal conditions the TESSL and BIP provide water from SPU's Tolt supply, while the CESSL and MIPL provide water from SPU's Cedar supply.

Table 1-1 lists the water supply inlet stations that supply the City. Fourteen are active inlets operated by the City under continuous service. Three inlets are operated by adjacent utilities, with water supplied to the City through interties per local agreements (see Table 1-2). Three additional inlets are no longer in service but could be re-commissioned to serve in an emergency, following minor piping modifications. Inlet #10 has been decommissioned and repurposed to function as a PRV for the Bellefield 200 pressure zone.

These inlets, as well as separate connections to adjacent utilities, are shown in Figure 1-4. Each inlet station has both an SPU meter and one or more Cascade meters, to provide redundancy. More detailed analysis of inlets, including contract minimum flow/pressure and available hydraulic capacity, can be found in Chapter 4. Water supply agreements are in Volume 3.

Table 1-1: Regional Water Supply Inlet Stations

Station Name	SPU Station Number	Cascade Meter Dia	SPU Meter Dia	Pressure Zones Supply	Pressure Zones Service
161st Inlet[1]	182	12”	10”	BIP	LH520
Bel Red Inlet	62	12”	12”	TESSL	BV400
Cherry Crest Inlet[2]	63	8”, 12”	10”	TESSL	BV400
Eastgate Inlet	60	16”	10”	TESSL	LH520
Enatai	66	8”	8”	MIPL	EN300
Inlet #10	---	NIS[3]	NIS[3]	CESSL	NS200
Inlet #11	124	8”	8”	MIPL	FA290
Inlet #6	47	6”	8”	CESSL	NH470
Inlet #7	---	NIS[3]	NIS[3]	CESSL	5
Inlet #8	55	6”	6”	CESSL	FA290, FA460
Inlet #9	---	NIS[3]	NIS[3]	CESSL	FA290
NE 40th Inlet	65	18”	10”	TESSL	LH520
NE 8th Inlet	61	16”	24”	TESSL	LH520
Old PRV #48	---	NIS[3]	NIS[3]	TESSL	PP550
Richards Road	59	8”	8”	CESSL	WD450 WD370 WD340 RV300 BV400
SE 28th Inlet	58	16”	12”	TESSL	LH520
Somerset	56	12”	8”	CESSL	SS700
CCUD #4	48	N/A	8”	CESSL	CCUD580
CCUD #5	52	N/A	12”	CESSL	CCUD475
Kirkland Supply Station S1[4]	72	12”	12”	TESSL	Kirkland 545
136th Ave Inlet	198	12”	12”	TESSL	BV400

[1] 161st Inlet also includes two 8-inch meters that measure flow to Issaquah in the BIP (not listed in the table). All flow to the City from this inlet station passes through the 12-inch meter shown.

[2] Flow branches to two separate meters downstream of Cherry Crest Inlet.

[3] Emergency use only. Inlet is not currently active and would require installation of a spool piece by SPU to return to service.

[4] Bellevue has a 13.4 percent share in water supply through Kirkland’s Supply Station S1 (a.k.a. Station 8) per 1997 Rose Hill Water District interlocal agreement. The station is located in Redmond but maintained by the City of Kirkland.

Inlets and Interties

Figure 1-4

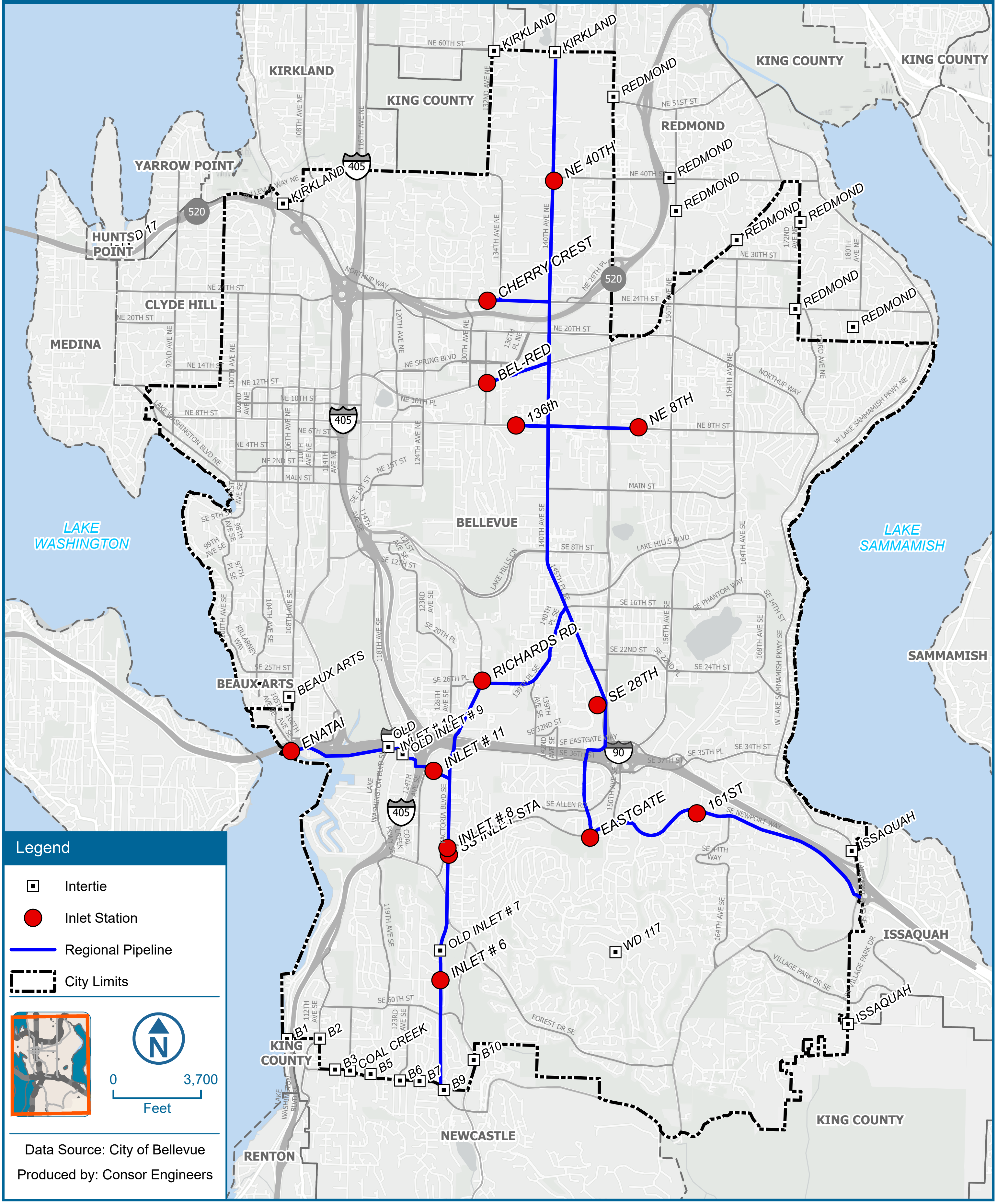


Table 1-2 lists connections to adjacent water utilities ("interties"), per local agreements (Volume 3). Some interties flow in one direction, but some flow both into and out of the City and are equipped with bi-directional meters. On net, the City receives water from CCUD and Kirkland, but supplies water to Issaquah. The Beaux Arts Village (WD22) connection was installed for emergency use but is metered and now provides backup water supply when their well cannot meet summer demands. Hilltop (WD117) has a normally closed, unmetered emergency connection to the City.

Table 1-2: Connections to Adjacent Utilities

Adjacent System	WFI #	Station Name (If Applicable)	To Bellevue	From Bellevue	Emergency	Metered	Meter Diameter	Zones Supply	Zones Service	Description
CCUD	41750 C	Station B1	X	X		X	4"	CCUD170	NS200	
		Station B2	X	X		X	4"	CCUD475	NH470	
		Station B3	X	X		X	6"	CCUD475	NH470	
		Station B5	X	X		X	6"	CCUD475	NH470	
		Station B6	X	X		X	6"	CCUD580	NH580	
		Station B7	X	X		X	6"	CCUD580	NH580	
		Station B9	X	X		X	4"	CCUD580	NH580	
		Station B10	X	X		X	1",1"	CCUD580	NH580	
		Station B4	X	X	X		8"	CCUD475	NH580	Closed Valve
Redmond	71650B			X		X	†	LH520	Redm 520	Many interties
				X		X	†	LH435	Redm 435	
			X			X	4"	Redm 520	LH520	
			X			X	†	Redm 335	RM330	
			X			X	†	Redm 545	RH545	
			X	X	X			RM400	Redm 330	Closed Valve
			X	X	X			Redm 545	LH520	Closed Valve
Kirkland	42250T		X			X	6"	Kirk 545	RH545	
			X	X	X		8"	BV400	Kirk 285	Closed Valve
			X	X	X		6"	Kirk 650	PP670	Emergency PRV
			X	X	X		TBD	Kirk 285	CL335	(Proposed)
Issaquah	363505			X		X	8"	CM1150	Montreux	
				X		X	†	LH520	Lakemont	
			X	X		X	8"	SA270	South Cove	
Hilltop (WD117)	41980D			X	X		6"	HV1175	WD117	Closed Valve
Beaux Arts (WD22)	051600			X	X	X	6" 2"	EN300	Beaux Arts 243	Backup Only

† Denotes "Direct Read" areas (sum of customer meter volumes is used in lieu of a master meter).

Redmond's Overlake area is supplied by SPU's TESSL through jointly-owned (Bellevue/Redmond) facilities located in the City. Redmond's 520 zone and the City's LH520 zone were operated as a single pressure zone by WD99 (independent of political boundaries), and are still hydraulically interconnected today, through many connection points.

Cascade bills Redmond directly for water consumption through joint-use areas in the City. There is no City wheeling charge for this volume, since facilities are jointly-owned. Redmond's metered volume is provided to the City for operational use, and for the purpose of water balance calculations and non-revenue flow estimates (see Chapter 5). Customer demands in Redmond's 520 zone are recorded through a combination of "direct read" (summation of individual customer meters; west of State Route 520 and three master meters (shown in Figure 1-4), as defined in interlocal agreements (see Volume 3). One master meter on Bel-Red Road also serves to measure flow from Redmond back into the City’s LH520.

Separately, Redmond's 435 zone is a "direct read" area fed by the City's LH435 zone, while small portions of the City’s RM310 and RH545 zones are “direct read” areas fed by Redmond. There are also multiple closed isolation valves serve as emergency connections between various zones.”

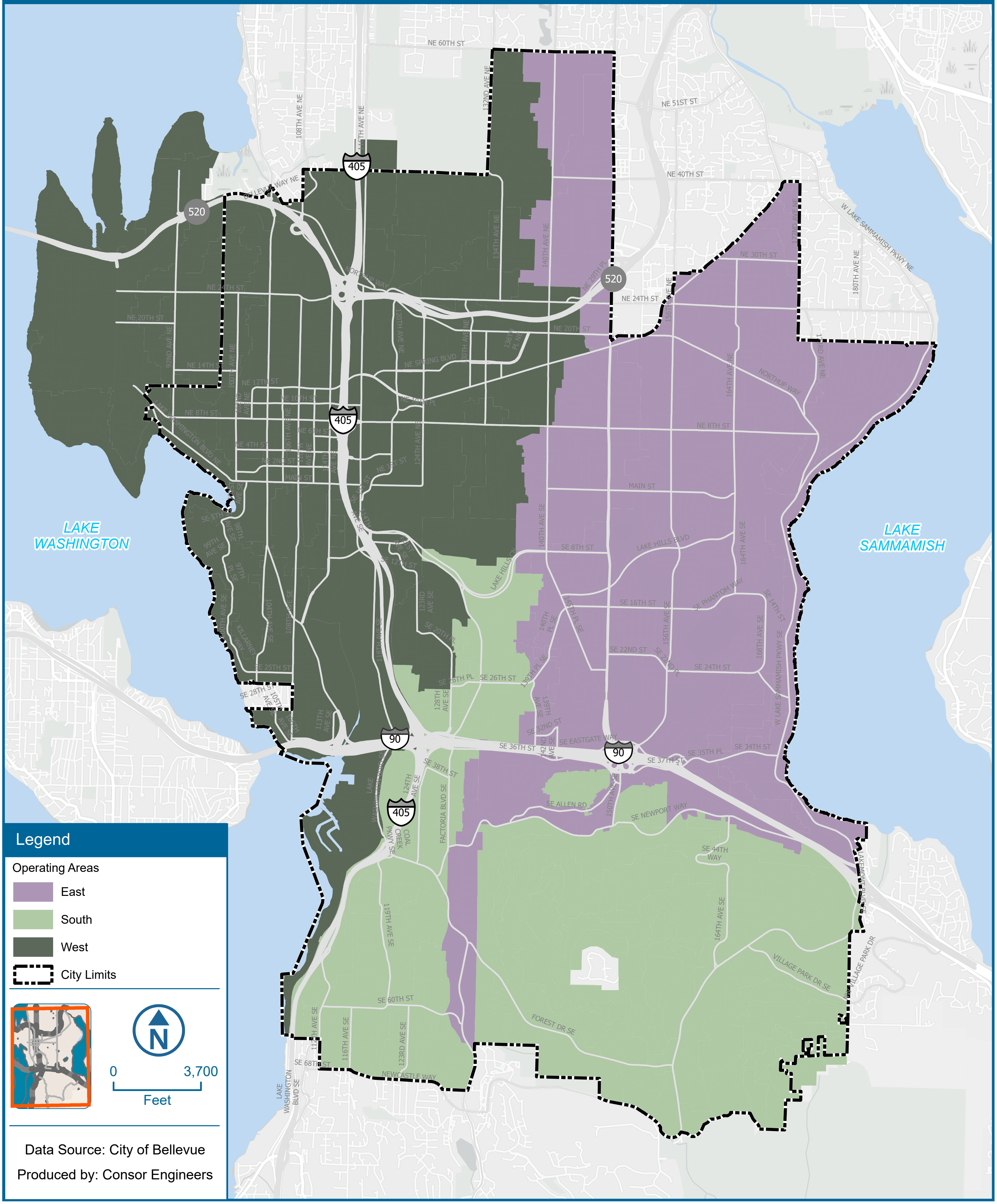
Operating Areas

The City’s service area has historically been conceptualized into three operating areas, as shown in Figure 1-5. The West Operating Area (WOA) and East Operating Area (EOA) generally include the service area north of I-90, roughly divided by 140th Avenue NE. The South Operating Area (SOA) includes most of the area south of I-90.

Although these areas rely mostly on separate supply inlets, they are not fully independent, and their delineations have become somewhat arbitrary due to increasing interconnectivity over time.

Water Operating Areas

Figure 1-5



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Pressure Zones

Table 1-3 and Figure 1-6 show the pressure zones in the City's water service area. Although there are 73 named zones, two of these include two non-contiguous areas that operate independently, for a total of 75 separate zones. Figure 1-7 shows a hydraulic profile of the entire system.

The number in each zone name is the approximate nominal hydraulic grade line (HGL) under static conditions (with no head loss). Actual HGL varies seasonally and hourly and rarely matches the zone name. For zones with storage, the name typically indicates the reservoir overflow elevation (in feet), and therefore the max HGL. For pump and PRV-fed zones, the number is determined on a case-by-case basis, reflecting local operating conditions.

Table 1-3: Pressure Zones

Pressure Zone	Abbreviation	Supply	Storage	Storage Upstream
Bellefield 220	BF220	Gravity	No	Yes
Bellevue 400	BV400	Gravity	Yes	No
Clyde Hill 340	CL340	Gravity	Yes	Yes
Clyde Hill 500	CL500	Pump	No	Yes
Coal Creek 380	CC380	Pump (via PRV)	No	Yes
College Hill 380	CO380	Gravity	No	Yes
College Hill 400	CO400	Gravity	No	Yes
College Hill 420	CO420	Gravity	No	Yes
Cougar Mountain 1000	CM1000	Pump (via PRV)	No	Yes
Cougar Mountain 1150	CM1150	Pump	Yes	Yes
Cougar Mountain 1290N	CM1290N	Pump (via PRV)	No	Yes
Cougar Mountain 1465	CM1465	Pump	Yes	Yes
Cougar Mountain 1575	CM1575	Pump	No	Yes
Couger Mountain 1290S	CM1290S	Pump (via PRV)	No	Yes
Eastgate 300	EG300	Gravity	No	Yes
Eastgate 340	EG340	Gravity	No	Yes
Eastgate 370	EG370	Gravity	No	Yes
Eastgate 400	EG400	Gravity	No	Yes
Eastgate 590	EG590	Pump (via PRV)	No	Yes
Enatai 300	EN300	Gravity	No	Yes
Factoria 290	FA290	Gravity	Yes	Yes
Factoria 460	FA460	Gravity	No	Yes
Forest Hills 1100	FH1100	Pump (via PRV)	No	Yes
Forest Hills 465	FH465	Pump (via PRV)	No	Yes
Forest Hills 550	FH550	Pump (via PRV)	No	Yes
Hilltop 1080	HT1080	Pump (via PRV)	No	Yes
Horizon View 1080	HV1080	Pump (via PRV)	No	Yes
Horizon View 1175	HV1175	Pump	Yes	Yes
Horizon View 590	HV590	Pump (via PRV)	No	Yes
Horizon View 610	HV610	Pump (via PRV)	No	Yes
Horizon View 700	HV700	Pump	Yes	Yes
Horizon View 940	HV940	Pump (via PRV)	No	Yes

Pressure Zone	Abbreviation	Supply	Storage	Storage Upstream
Hunts Point 230	HP230	Gravity	No	Yes
Kelsey Creek 300	KC300	Gravity	No	Yes
Kelsey Creek 450	KC450	Gravity	No	Yes
Lake Hills 380	LH380	Gravity	No	Yes
Lake Hills 400	LH400	Gravity	No	Yes
Lake Hills 435	LH435	Gravity	No	Yes
Lake Hills 520	LH520	Gravity	Yes	Yes
Lakemont 1000	LM1000	Pump (via PRV)	No	Yes
Medina 230	MD230	Gravity	No	Yes
Meydenbauer 252	MB252	Gravity	Yes	Yes
Newport Hills 320	NH320	Pump (via PRV)	No	Yes
Newport Hills 340	NH340	Pump (via PRV)	No	Yes
Newport Hills 380	NH380	Pump (via PRV)	No	Yes
Newport Hills 475	NH475	Pump	No	Yes
Newport Hills 580	NH580	Pump	Yes	No
Newport Shores 200	NS200	Pump (via PRV)	No	Yes
Pikes Peak 550	PP550	Gravity	Yes	No
Pikes Peak 600	PP600	Gravity/Pump[1] (via PRV)	No	Yes
Pikes Peak 670	PP670	Gravity/Pump[1]	No	Yes
Redmond 310	RM310	Gravity	No	Yes
Redmond 335	RM335	Gravity	No	Yes
Redmond 400	RM400	Gravity	No	Yes
Richards Valley 300	RV300	Gravity[3]	No	Partial[2]
Rose Hill 545	RH545	Gravity	Yes	No
Sammamish 270	SA270	Gravity	Yes	Yes
Sammamish 400	SA400	Gravity	No	Yes
Somerset 1000	SS1000	Pump (via PRV)	No	Yes
Somerset 550	SS550	Pump (via PRV)	No	Yes
Somerset 700	SS700	Pump	Yes	No
Somerset 850	SS850	Pump	Yes	Yes
Somerset 940	SS940	Pump (via PRV)	No	Yes
Summit 1060	SU1060	Pump (via PRV)	No	Yes
Summit 1080	SU1080	Pump (via PRV)	No	Yes
Summit 1300	SU1300	Pump	No	Yes
Sunset Hills 425	SH425	Gravity	No	Yes
Weowna 430	WE430	Gravity	No	Yes
Woodridge 340	WD340	Gravity	No	No
Woodridge 370	WD370	Gravity	No	Partial[3]
Woodridge 450	WD450	Pump	No	Yes
Yarrow Bay 300	YB300	Gravity	No	Yes
Yarrow Point 220	YP220	Gravity	No	Yes

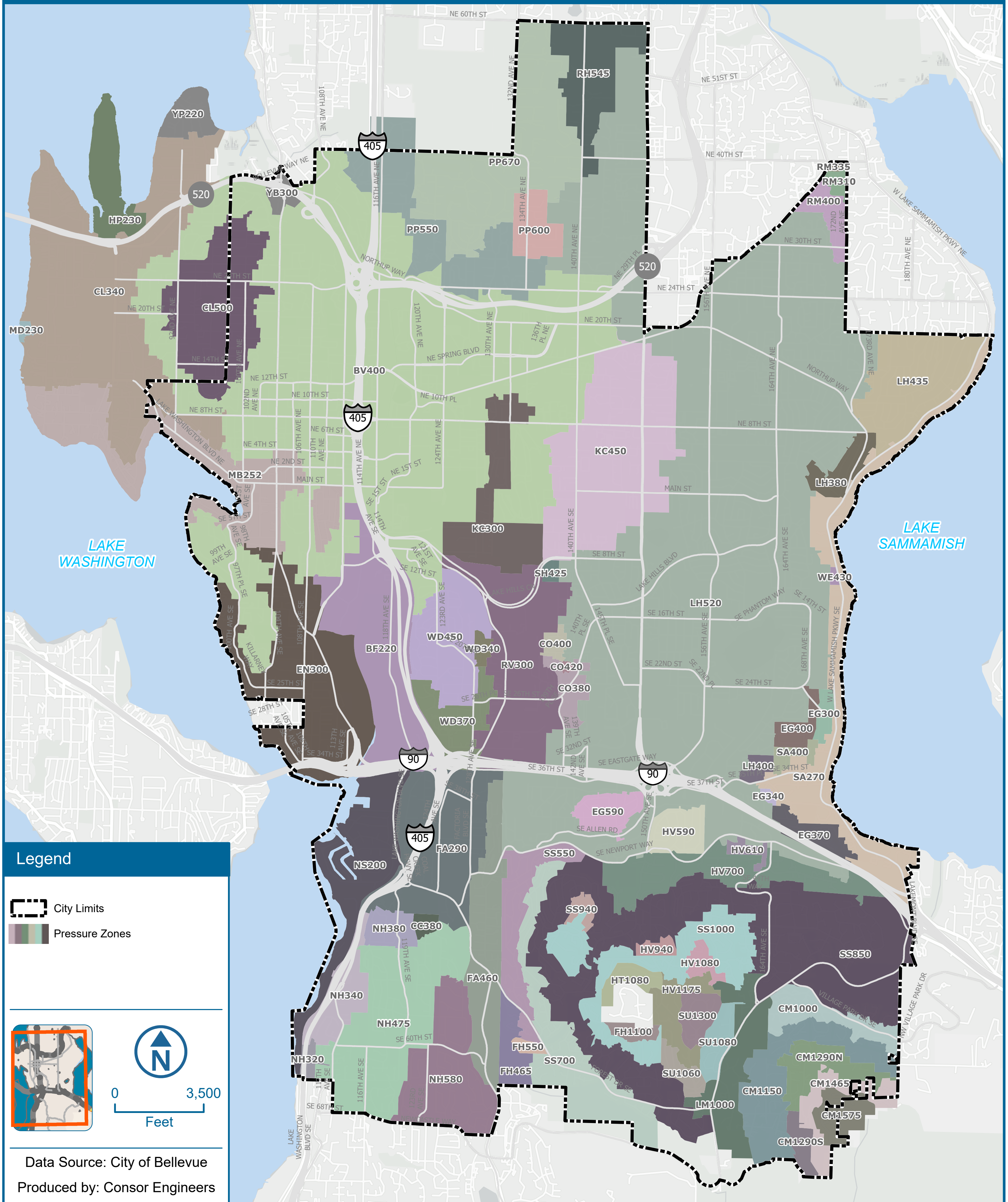
[1] PP600 and PP670 are fed by gravity or pumping based on seasonal HGL fluctuation in the TESSL.

[2] RV300 is normally fed both directly from the CESSL (PRV #86) and from CO380 (PRV #40, #158). In the event of a CESSL shutdown, fire flows would be reduced, but storage is accessible from the EOA.

[3] WD370 is fed directly from the CESSL, but has access to storage in WD450 via PRV #12. In the event of a CESSL shutdown, PRV #12 has limited capacity to meet fire flow needs, so storage is not fully available.

Pressure Zones

Figure 1-6



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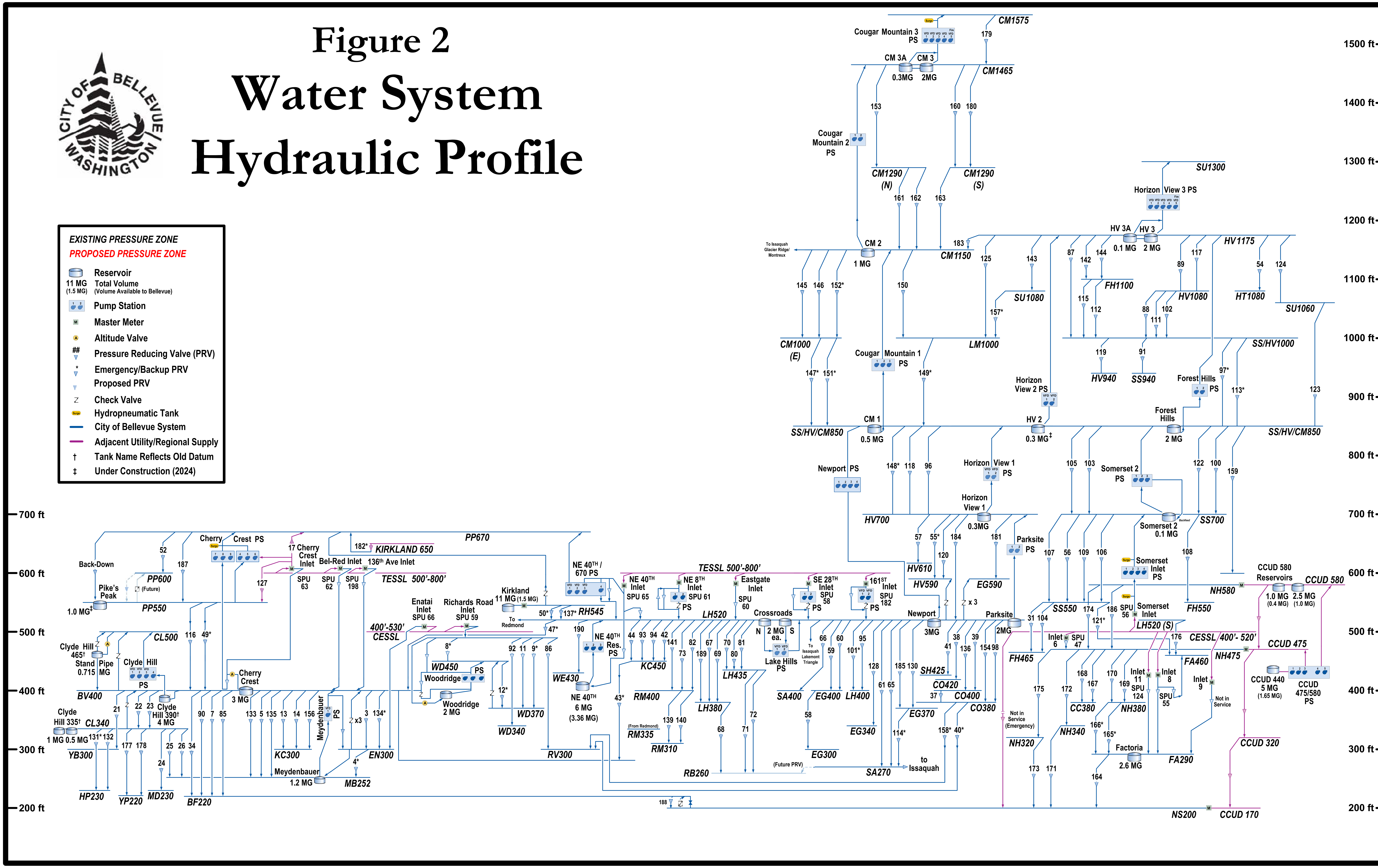


Figure 2
Water System Hydraulic Profile

Pipe

Table 1-4 summarizes the approximate length of various pipe sizes and materials in the City's water distribution system. Quantities shown are current as of 2025, based on the best available information, and do not include hydrant stubs, customer service lines, or exposed piping at facilities such as pump stations.

Table 1-4: Inventory of Pipe Materials

Dia (inch)	Total Length (miles)	AC	CI	DI	GST	HDPE	PVC	STEEL	UNK
< 4"	3.7	0.0	0.0	0.2	0.1	0.5	2.2	0.0	0.7
4"	28.7	5.9	0.8	21.8	0.0	0.0	0.2	0.0	0.0
6"	128.2	111.5	7.9	8.6	0.0	0.0	0.1	0.0	0.1
8"	330.4	71.4	18.3	240.0	0.0	0.0	0.4	0.0	0.2
10"	15.4	8.5	1.4	5.1	0.0	0.3	0.0	0.0	0.1
12"	80.8	22.9	8.9	48.9	0.0	0.0	0.0	0.0	0.0
14"	2.9	0.8	0.3	1.7	0.0	0.1	0.0	0.0	0.0
16"	14.9	1.1	0.9	12.8	0.0	0.0	0.0	0.1	0.0
18"	0.6	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
20"	0.8	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0
24"	3.4	0.0	1.0	2.3	0.0	0.0	0.0	0.0	0.0
Total:	610.0	222.2	40.2	342.6	0.1	0.9	2.9	0.1	1.1
AC = Asbestos Cement, CI = Cast Iron, DI = Ductile Iron, GST = Galvanized, UNK = Unknown									

[1] Lengths shown are pipes owned or maintained by Bellevue.

Piping inventory is continually changing due to systematic pipeline replacements, developer projects, and relocations to accommodate transportation improvements (State Route 520, Sound Transit East Link, City street re-paving, etc).

Figure 1-8 and Figure 1-9 show the length and relative percentage of pipe materials overall. The percentage of ductile iron pipe in the distribution system is continually increasing, as smaller, less robust asbestos cement (AC) and cast iron (CI) mains are replaced.

Figure 1-8: Distribution System Pipe Sizing

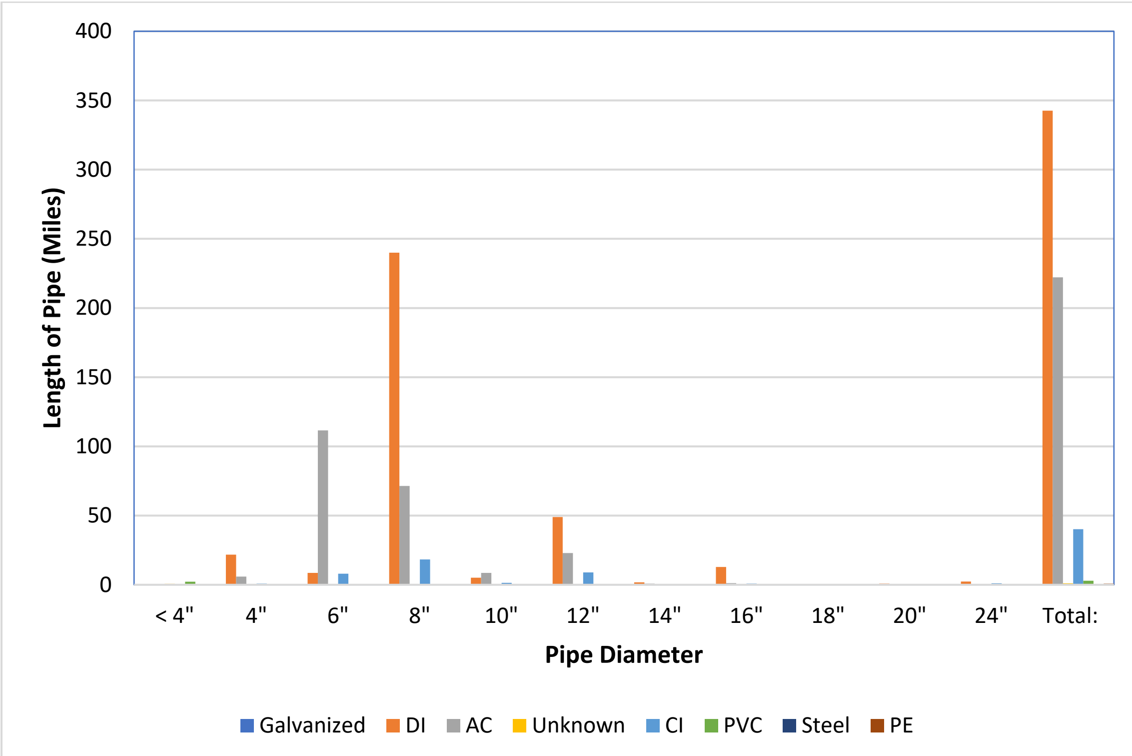
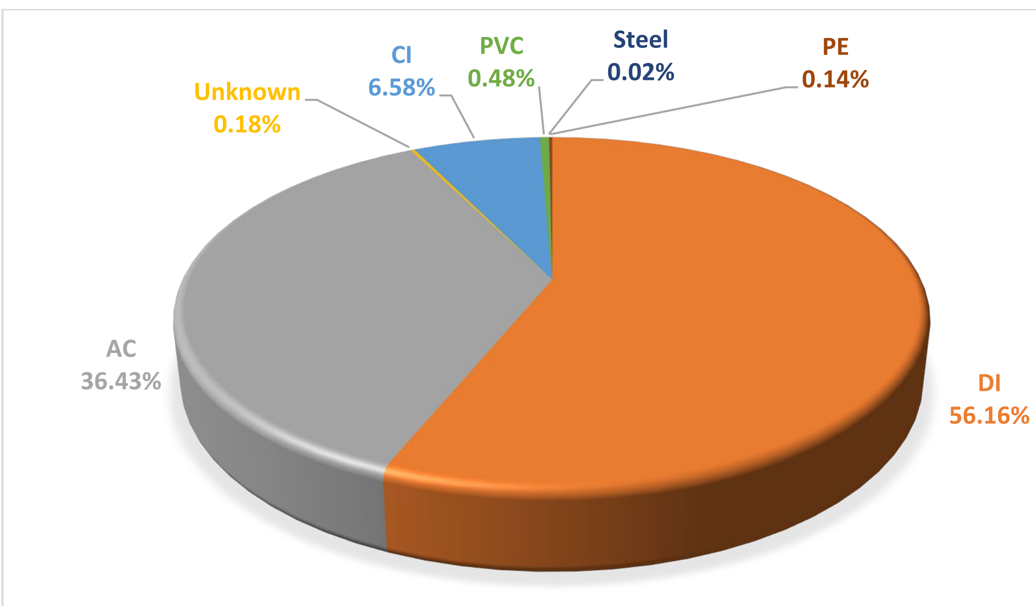


Figure 1-9: Distribution System Pipe Materials (% of Total Length)



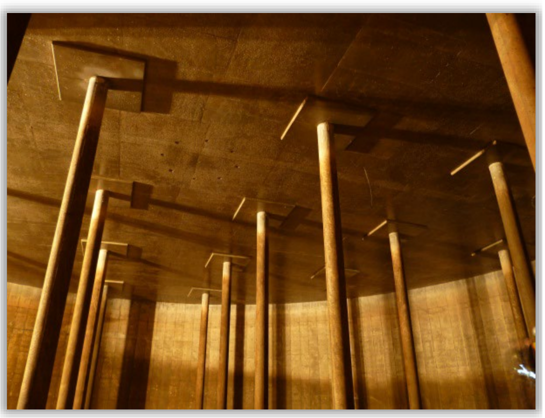
Reservoirs

City of Bellevue Utilities maintains and operates 24 reservoirs, including one joint-use reservoir shared with Redmond (NE 40th Reservoir). An additional reservoir was decommissioned but is still owned by the City. The active reservoirs owned by the City are shown in Figure 1-10.

In addition, the City owns a portion of water in four reservoirs maintained by neighboring utilities. Table 1-5 summarizes the reservoir storage available to the City.

Parksite Reservoir

Factoria Reservoir



Forest Hills Reservoir

Woodridge Reservoir

Reservoirs
Figure 1-10

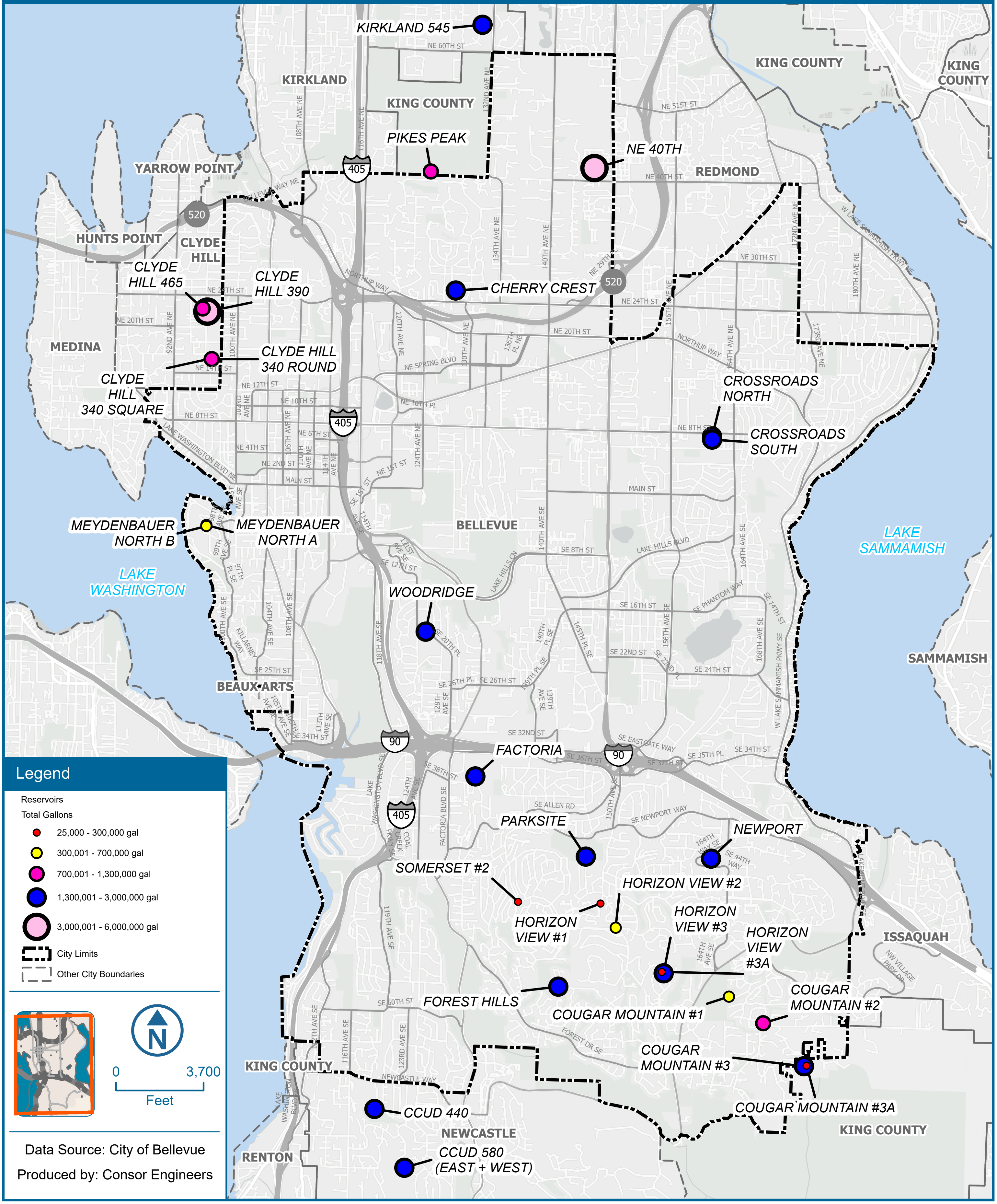


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Table 1-5: Reservoir Inventory

Reservoir Name	Zone	Year Built	Type	Bottom EL*	Overflow EL*	Gal/Ft	Volume (MG)
Cherry Crest	BV400	1999	CIPC	384’	404’	150,394	3.01
Clyde Hill 465	BV400	1958	Steel	371.1’	470.5’	7,614	0.72
Clyde Hill 390	BV400	1970	PSC	363’	393.4’	132,183	4.02
Clyde Hill 335 Rd.	CL340	1952	Steel	314’	338’	41,452	0.79
Clyde Hill 335 Sq.	CL340	1948	CIPC	322.2’	338.2’	31,603	0.51
Cougar Mt. 1	SS850	1992	PSC	823’	846’	21,860	0.50
Cougar Mt. 2	CM1150	1991	PSC	1118’	1150’	31,307	1.00
Cougar Mt. 3	CM1465	1997	Steel	1445.15’	1465.6’	99,284	2.00
Cougar Mt. 3A	CM1465	1997	Steel	1445.15’	1465.6’	14,687	0.30
Factoria	FA290	1981	Steel	265.3’	295.5’	99,284	2.63
Forest Hills	SS850	1977	PSC	824.7’	848.4’	84,600	2.00
Horizon View 1	HV700	1963	Steel	668.8’	700’	5,925	0.3
Horizon View 2	SS850	1963	Steel	820.9’	853.7’	14,025	0.39
Horizon View 3	HV1175	1976	PSC	1157.6’	1178.6’	100,000	2.08
Horizon View 3A	HV1175	1988	CIPC	1164’	1179’	6,732	0.10
Lake Hills North	LH520	1959	Steel	448.5’	523.7’	27,165	2.04
Lake Hills South	LH520	1962	Steel	448.5’	523.7’	27,165	2.04
Meydenbauer N	MB252	2004	CIPC	231’	251’	32,927	0.65
Meydenbauer S	MB252	2004	CIPC	231’	251’	32,927	0.65
N.E. 40th[5]	LH520	1991	PSC	376.5’	412.5’	169,781	3.38†
Newport	LH520	1976	PSC	502.1’	523.1’	150,394	3.16
Parksite	LH520	1964	Steel	483.9’	523.9’	50,811	2.03
Pikes Peak	PP550	2023	CIPC	530’	550’	39,985	1.08
Sammamish	SA270	1981	PSC	224.5’	259.5’	0	0
Somerset 2	SS700	1962	CIPC	693.2’	703.5’	9,574	0.10
Woodridge	WD450	1956	Steel	333’	403.9’	29,615	2.10
Kirkland 545[6]	545	1971	Steel	495.08’	545.08’	224,000	1.5†
CCUD 580 East[7]	580	1967	Steel	540’	580’	25,000	0.4†
CCUD 580 West[8]	580	1971	Steel	540’	580’	62,500	1†
CCUD 440[9]	470	1987	Steel	420’	440’	250,000	1.65†

* Estimated, in NAVD88 Datum.
† Volume available to the City based on contractual agreement (attached in Volume 3)

Somerset #1 and Somerset #3 (100,000-gallon capacity each) have been removed from service and Somerset #1 was physically demolished. Pikes Peak (1 million-gallon (MG) capacity) was replaced in 2023. The new Pikes Peak reservoir continues to operate 1 MG capacity. The additional 0.25 MG is capacity for future growth and could be added to service with the addition of localized

[5] The City has a 56 percent share of the 6.0-MG NE 40th Reservoir per 1990 agreement with the City of Redmond.
[6] The City has a 13.4 percent share of Kirkland’s 11-MG 545 Reservoir per 1997 Rose Hill Water District agreement.
[7] The City has a 40 percent share of CCUD’s 1.0-MG 580 East Reservoir per 2002 partial assumption agreement.
[8] The City has a 40 percent share of CCUD’s 2.5-MG 580 West Reservoir per 2002 partial assumption agreement.
[9] The City has a 33 percent share of CCUD’s 5.0-MG 440 Reservoir per 2002 partial assumption agreement.

installation of personal PRVs. The Somerset reservoirs were originally installed by developers as part of local residential development and have since become unnecessary due to ample storage in the SOA. The Sammamish reservoir is owned by the Issaquah but operated by the City, and supplies water to both cities. Issaquah is planning to decommission this reservoir.

Pump Stations

The City maintains and operates 21 pump stations, as shown in Figure 1-11 and listed in Table 1-6. It also shares some joint-use facilities:

- NE 40th Reservoir Pump Station is a joint-use facility shared with the City of Redmond (56 percent Bellevue / 44 percent Redmond). It is located in and operated and maintained by the City.
- The City owns a 33 percent share of capacity in CCUD’s 475/580 pump station.
- The 161st Avenue Inlet Pump Station is owned and maintained by the City, but all costs for operations, maintenance, repair, and replacement related to this station are the responsibility of Cascade and are reimbursed to the City per agreement.
- The City and SPU share capital and operating costs for the NE 8th Inlet Pump Station and the SE 28th Inlet Pump Station.

The only recent change to the City’s pump stations is the removal of the Pikes Peak Pump Station in 2021.

Table 1-6: Pump Station Inventory

Name		Zone From	Zone To	Pump No.	Motor Hp	Full Speed Rating Point gpm	@ TDH	Install or Rehab Year	Approx Site EL
Cherry Crest		TESSL	PP670†	4 VFD	7.5	64	175	2020	396’
		TESSL	PP670†	5 VFD	40	550	150	2020	
		TESSL	PP670†	6 VFD	40	550	150	2020	
		BV400	PP670†	7 VFD	125	1,309	285	2020	
		BV400	PP670†	8 VFD	125	1,309	285	2020	
		BV400	PP670†	9 VFD	125	1,309	285	2020	
Clyde Hill		BV400	CL500†	1 VFD	15	200	139	1987	366’
		BV400	CL500†	2 VFD	40	650	139	1987	
		BV400	CL500†	3 VFD	40	650	139	1987	
		BV400	CL500†	4	40	650	139	1987	
Cougar Mt. 1		SS850	CM1150	1 VFD	100	750	365	2025	833’
		SS850	CM1150	2 VFD	100	750	365	2025	
		SS850	CM1150	3 VFD	100	750	365	2025	
Cougar Mt. 2		CM1150	CM1465	1	125	1,000	350	1997	1127’
		CM1150	CM1465	2	125	1,000	350	1997	
Cougar Mt. 3		CM1465	CM1575†	1 VFD	7.5	100	125	2019	1445’
		CM1465	CM1575†	2 VFD	7.5	100	125	2019	
		CM1465	CM1575†	3 VFD	20	326	120	2019	
		CM1465	CM1575†	4 VFD	20	326	120	2019	
		CM1465	CM1575†	5 VFD	125	1,636	195	2019	
Forest Hills		SS850	HV1175	1	150	1,000	405	1989	833’
		SS850	HV1175	2	150	1,000	405	1989	
Horizon View 1		HV700	SS850	1 VFD	125	1,800	183	2017	671’
		HV700	SS850	2 VFD	125	1,800	183	2017	
Horizon View 2		SS850	HV1175	1 VFD	150	1,200	360	2025	825’
		SS850	HV1175	2 VFD	150	1,200	360	2025	
Horizon View 3		HV1175	SU1350†	1	3	30	226	2016	1168’
		HV1175	SU1350†	2	3	30	226	2016	
		HV1175	SU1350†	3 VFD	20	192	264	2016	
		HV1175	SU1350†	4 VFD	50	600	178	2016	
		HV1175	SU1350†	5 VFD	100	1,770	157	2016	
Lake Hills		LH520	LH520	1 VFD	60	1,750	58	2000	448’
(Crossroads)		LH520	LH520	2 VFD	60	1,750	58	2000	
Meydenbauer		MB252	BV400	1 VFD	50	800	170	2004	239’
NE 8th Inlet		TESSL	LH520	1	200	4,720	134	1983	316’
		TESSL	LH520	2	200	4,720	134	1983	

Denotes on-site generator

Denotes receptacle for portable generator

† Denotes “closed” zones with no storage downstream

* Somerset 2 Pump Station Rehabilitation is currently in design (new pump data is not yet available). Existing pump information is available in the 2016 Water Comprehensive Plan.

Name	Zone From	Zone To	Pump No.	Motor Hp	Full Speed Rating Point gpm	@ TDH	Install or Rehab Year	Approx Site EL
NE 40th Reservoir	TESSL	LH520	1	100	2,000	142	1991	393’
	TESSL	LH520	2	200	4,000	142	1991	
(56% Bellevue)	TESSL	LH520	3	200	4,000	142	1991	
Newport	LH520	SS850	1	125	1,000	350	2013	510’
	LH520	SS850	2	125	1,000	350	2013	
	LH520	SS850	3	75	530	340	2013	
Parksite	LH520	HV700	1	150	1,980	220	1983	484’
	LH520	HV700	1	150	1,980	220	1983	
SE 28th Inlet	TESSL	LH520	1	300	4,200	210	1983	424’
	TESSL	LH520	2	250	3,800	210	1983	
Somerset Inlet	CESSL	SS700	1	60	400	392	1993	274’
	CESSL	SS700	2^{VFD}	200	1,200	392	1993	
	CESSL	SS700	3	200	1,200	392	1993	
	CESSL	SS700	4	125	800	392	1993	
Somerset 2	SS700	SS850	1	100	1,100	216	1993	705’
	SS700	SS850	2	100	1,100	216	1993	
	SS700	SS850	3	60	650	216	1993	
Woodridge	BV400	WD450†	1^{VFD}	30	800	104	1993	332.5’
	BV400	WD450†	2^{VFD}	100	3,000	102	1993	
	BV400	WD450†	3^{VFD}	100	3,000	102	1993	
161st Ave Inlet	BIP	LH520	1^{VFD}	40	3,500	38	2002	
	BIP	LH520	2^{VFD}	40	3,500	38	2002	
670	TESSL	PP670†	1^{VFD}	10	200	110	1991	299’
	TESSL	PP670†	2^{VFD}	15	300	110	1991	
	TESSL	PP670†	3^{VFD}	75	1,800	110	1991	
	TESSL	LH520	4	40	2,500	40	~1984	
CCUD 475/580	CCUD440	CCUD475	1^{VFD}	15	600	66	2011	420’
(33% Bellevue)	CCUD440	CCUD475	2^{VFD}	25	1,200	66	2011	
Operated and	CCUD440	CCUD475	3^{VFD}	25	1,200	66	2011	
Maintained by	CCUD440	CCUD580	4	75	1,200	192	1995	
CCUD	CCUD440	CCUD580	5	75	1,200	192	1995	

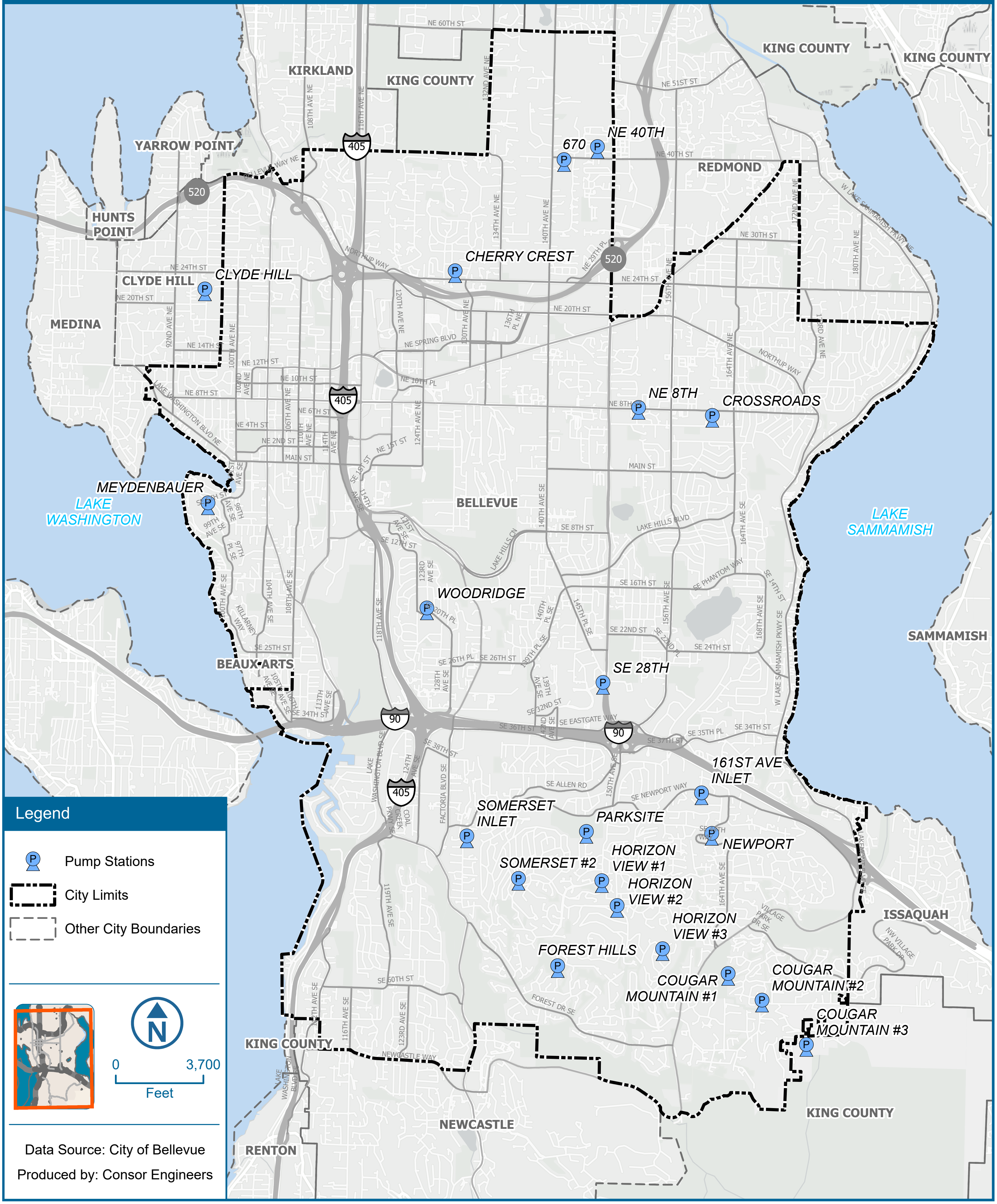
Woodridge Pump Station

670 Pump Station

Meydenbauer Pump Station

NE 8th Inlet Pump Station

Pump Stations
Figure 1-11



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Pressure Reducing Valves

The PRV stations are used to supply water from a higher pressure zone to a lower zone based on the downstream pressure setting(s). Active PRV stations are listed in Table 1-7 and shown in Figure 1-12. Breaks in sequential numbering are for stations that are no longer in service.

A typical PRV station in the City's system includes both a low flow PRV (2 to 3-inch diameter) and a high flow PRV (6 to 8-inch diameter) arranged in a parallel configuration. Normally the larger valve is set 5 pounds per square inch (psi) lower than the smaller valve, so that the smaller valve modulates under normal demands, but the larger valve opens up during a fire event or main flushing. Settings (psi) shown in Table 1-7 are as recorded in O&M records, but do not correspond necessarily to the calibrated settings in the hydraulic model (actual settings vary).

The City performed an elevation survey of all PRV stations in 2013. Surveyors recorded elevation typically at the top slab of the PRV vault. The elevations reported in Table 1-7 include the results of this survey, along with any changes in elevations since 2013, with measurements down to the valve from the surveyed elevation to determine the actual valve elevations. Elevations are reported in North American Vertical Datum of 1988 (NAVD88).

Table 1-7: PRV Station Inventory

PRV	Asset	Zone		Approx	Small Valve		Large Valve		Install or
Station	No.	Supply	Serves	EL	dia	psi	dia	psi	Last Rehab
3	101010	BV400	EN300	80.1	3"	81	8"	76	2008
4	101091	EN300	MB252	69.3	2"	74	6"	69	2024
5	101005	BV400	MB252	62.9	3"	86	6"	81	1994
7	101003	BV400	BF220	43.8	2"	78	6"	73	1990
8	100978	CESSL	WD450	299.7	2"	70	6"	65	2011
9	510837	CESSL	WD370	191.7	2"	80	6"	75	2012
11	101102	CESSL	WD370	83.4	3"	135	8"	130	1997
12	101101	WD450	WD370	246.6	2"	54	6"	49	1985
13	101100	BV400	KC300	164.8	2"	55	6"	50	2011
14	510839	BV400	KC300	112.5	2"	80	6"	75	2010
17	101097	TESSL	PP670	400.1	3"	103	8"	98	1998
21	101096	BV400	YB300	153.4	2"	56	6"	51	2001
22	101086	BV400	CL340	159.4	2"	70	6"	65	1984
23	101094	BV400	CL340	118.5	3"	88	8"	83	1994
24	101103	CL340	MD230	163.7	3"	38	8"	33	1997
25	520013	CL340	MB252	104.9	2"	65	6"	60	2011
26	101050	CL340	MB252	58.9	2"	83	6"	78	2003
31	101062	SS550	FH465	332.5	2"	60	6"	55	1983
34	520018	BV400	BF220	28.8	2"	80	6"	75	2016
37	100871	CO400	CO380	233.7	2"	64	6"	59	1992
38	100872	LH520	CO420	289.4	2"	65	6"	60	2017
39	100882	LH520	CO400	284.6	2"	48	6"	43	1992
40	100884	CO380	RV300	173.0	2"	52	6"	47	1992
41	520026	LH520	SH425	297.5	2"	55	6"	50	2009

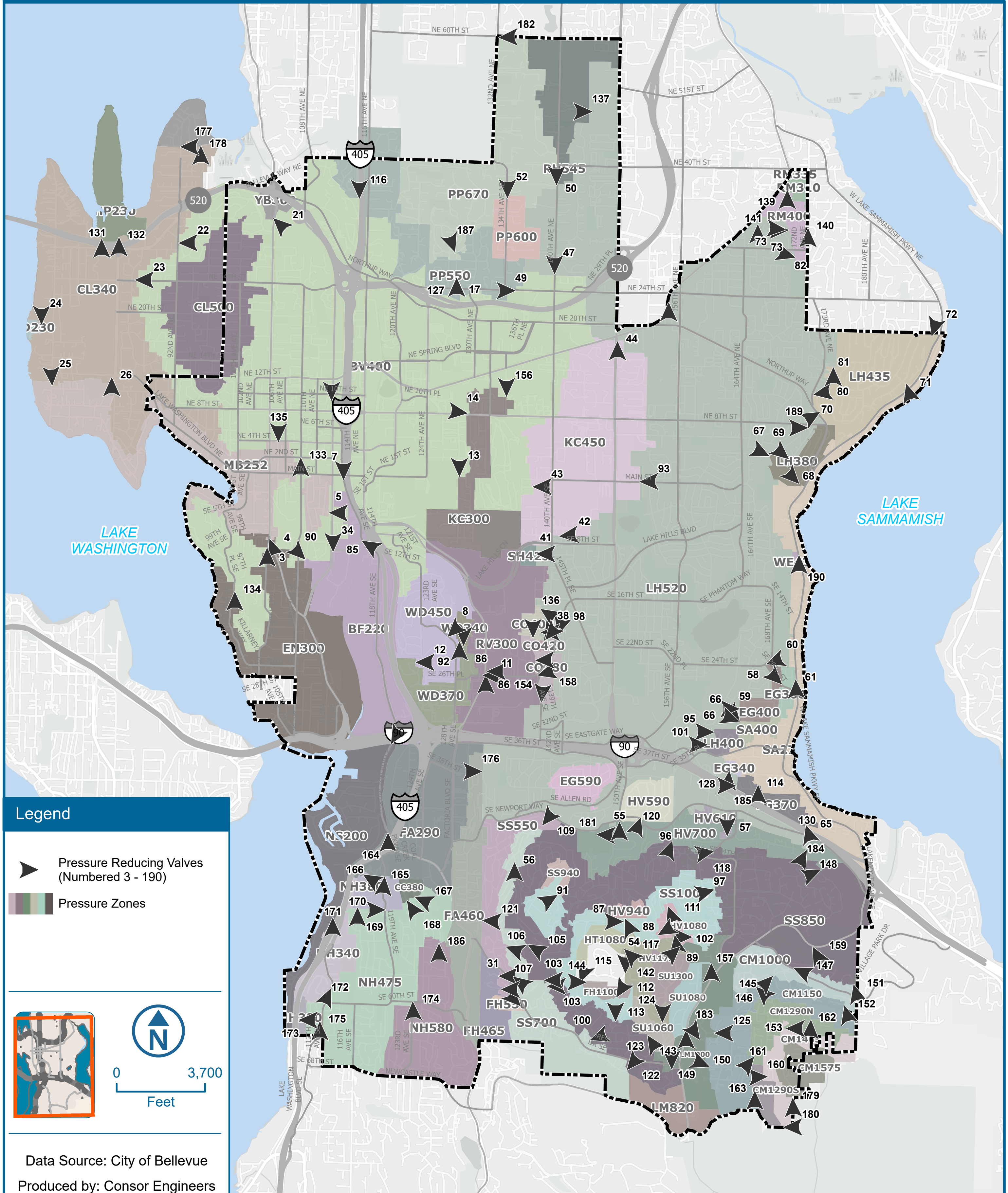
PRV	Asset	Zone		Approx	Small Valve		Large Valve		Install or
Station	No.	Supply	Serves	EL	dia	psi	dia	psi	Last Rehab
42	510842	LH520	KC450	286.9	3"	65	8"	60	2012
43	100877	KC450	BV400	229.8	8"	65	---	---	2008
44	100878	LH520	KC450	290.1	3"	66	8"	61	1995
47	100880	LH520	BV400	213.7	3"	80	8"	70	1994
49	520015	PP550	BV400	298.4	2"	0	6"	29	2016
50	100873	RH545	LH520	290.8	2"	96	6"	88	1994
52	100901	PP670	PP600	424.4	3"	72	8"	67	1997
54	537369	HV1175	HT1080	981.0	2"	58	6"	53	2017
55	510840	HV700	HV590	448.0	2"	75	6"	70	2012
56	535404	SS700	SS550	530.7	2"	9	6"	3.5	2019
57	100897	HV700	HV610	477.8	2"	58	6"	53	2000
58	510844	EG400	EG300	160.1	2"	52	6"	47	2010
59	454114	LH520	EG400	305.9	2"	55	6"	50	2008
60	520023	LH520	EG440	283.8	2"	60	6"	55	2009
61	100903	LH520	SA270	85.9	3"	75	8"	70	1994
65	101080	LH520	SA270	200.7	3"	20	8"	27	2005
66	100895	LH520	SA400	267.3	2"	74	6"	69	2017
67	520560	LH520	LH380	305.0	2"	30	6"	25	2011
68	101082	LH380	SA270	93.2	2"	70	6"	65	2022
69	101083	LH520	LH380	310.3	2"	30	6"	25	2001
70	520017	LH520	LH435	270.0	2"	71	6"	66	2008
71	454045	LH435	SA270	190.9	3"	31	8"	26	2008
72	520025	LH435	SA270	0.0	3"	22	6"	17	2014
73	101060	LH520	RM400	299.6	2"	39	6"	34	2017
80	454063	LH520	LH435	307.1	3"	50	8"	55	2008
81	520028	LH520	LH435	287.4	2"	64	6"	59	2014
82	520016	LH520	RM400	282.0	2"	47	6"	42	2008
85	101055	BV400	BF220	24.5	3"	83	8"	78	2002
86	101056	CESSL	RV300	0.0	3"	99	8"	92	2017
87	101067	HV1175	SS1000	826.5	2"	75	6"	70	2024
88	537909	HV1080	SS1000	885.5	2"	47	6"	42	2019
89	520024	HV1175	HV1080	973.5	2"	55	6"	50	2012
90	510843	BV400	BF220	119.3	2"	39	6"	34	2010
91	101075	SS1000	SS940	781.0	2"	68	6"	63	1998
92	454104	CESSL	WD340	210.7	2"	50	6"	45	2008
93	101078	LH520	KC450	275.0	2"	75	6"	70	2023
94	101068	LH520	KC450	328.0	2"	52	6"	47	2010
95	520021	LH520	LH400	299.5	2"	47	6"	42	2012
96	101085	SS850	HV700	578.4	2"	48	6"	44	1979
97	510836	SS1000	SS850	737.6	2"	45	6"	40	2010
98	101073	LH520	CO380	282.1	2"	44	6"	38	1980
100	520014	SS850	SS700	570.5	2"	54	6"	49	2014
101	520019	LH520	LH400	0.0	2"	43	6"	38	2014
102	101069	HV1080	SS1000	871.5	2"	54	6"	49	1979
103	100959	SS850	SS700	574.9	2"	53	6"	48	2020
104	510838	SS550	FH465	350.4	2"	48	6"	43	2010

PRV Station	Asset No.	Zone Supply	Zone Serves	Approx EL	Small Valve dia	Small Valve psi	Large Valve dia	Large Valve psi	Install or Last Rehab
105	101113	SS850	SS700	612.9	3"	40	8"	35	1980
106	100925	SS700	SS550	435.2	2"	50	6"	45	2010
107	101182	SS700	SS550	440.7	2"	48	6"	43	1982
108	101183	SS700	FH550	449.8	2"	48	6"	43	1982
109	101184	SS700	SS550	450.1	2"	45	6"	40	1982
111	101195	HV1080	SS1000	890.3	2"	47	6"	42	1982
112	101186	FH1100	SS1000	901.4	2"	42	6"	37	1982
113	101185	SS1000	SS850	737.3	2"	44	6"	39	1983
114	101188	EG370	SA270	176.7	2"	37	6"	32	1982
115	101181	FH1100	SS1000	893.8	2"	48	6"	43	1983
116	101190	PP550	BV400	276.1	2"	56	6"	51	1984
117	520027	HV1175	HV1080	977.7	2"	47	6"	42	2014
118	101192	SS850	HV700	508.5	2"	81	6"	76	1984
119	101193	SS1000	HV940	826.5	2"	49	6"	44	2024
120	526354	HV700	HV590	463.0	2"	55	6"	50	2015
121	101140	SS550	FA460	311.3	6"	63	---	---	2004
122	101189	SS850	SS700	574.7	2"	54	6"	49	2007
123	101177	SU1060	SS850	752.6	2"	48	6"	43	1987
124	101179	HV1175	SU1060	957.2	2"	47	8"	42	1987
125	101150	CM1150	LM1000	881.2	2"	54	6"	49	1993
127	101194	TESSL	PP550	402.4	3"	68	6"	75	1998
128	101166	LH520	EG340	183.7	2"	80	6"	75	2007
130	101139	LH520	EG370	201.3	3"	76	8"	71	2005
131	517803	CL340	HP230	25.7	2"	87	8"	82	2012
132	101137	CL340	HP230	59.5	2"	74	6"	69	1989
133	101136	BV400	MB252	149.0	2"	44	6"	39	1986
134	510845	BV400	EN300	111.6	2"	82	6"	77	2010
135	101134	BV400	MB252	121.6	2"	58	6"	53	1988
136	101133	LH520	CO400	314.4	2"	35	6"	30	2001
137	101123	RH545	LH520	344.1	2"	70	6"	60	1986
139	101174	RM400	RM310	192.5	2"	43	6"	38	1986
140	101180	RM400	RM310	196.8	2"	48	6"	43	1986
141	101187	LH520	RM400	275.6	2"	46	6"	41	1989
142	101270	HV1175	FH1100	985.0	2"	53	6"	48	1992
143	101395	HV1175	SU1080	793.5	3"	132	8"	127	1991
144	101251	HV1175	FH1100	938.2	4"	75	8"	70	1990
145	101362	CM1150	CM1000	922.1	2"	35	6"	30	1992
146	101363	CM1150	CM1000	875.3	4"	55	8"	50	1992
147	101373	CM1000	SS850	767.6	2"	35	6"	30	1992
148	101365	SS850	HV700	631.9	2"	29	6"	24	1992
149	101175	LM1000	SS850	727.4	2"	50	6"	45	1988
150	101367	CM1150	LM1000	884.0	2"	53	6"	48	2004
151	101378	CM1000	SS850	748.9	2"	42	6"	37	1995
152	101369	CM1150	CM1000	876.9	2"	50	6"	45	1996
153	101360	CM1465	CM1290N	1213.9	2"	26	6"	21	1998
154	101371	LH520	CO380	229.0	2"	64	6"	59	1996

PRV	Asset	Zone		Approx	Small Valve		Large Valve		Install or
Station	No.	Supply	Serves	EL	dia	psi	dia	psi	Last Rehab
156	101160	BV400	KC300	141.5	2"	64	6"	59	1997
157	101366	SU1080	LM1000	822.3	2"	75	6"	70	1997
158	101364	CO380	RV300	179.8	2"	55	6"	49	1998
159	101173	SS850	600	527.3	6"	30	---	---	1999
160	101172	CM1465	CM1290S	1190.3	2"	58	6"	53	1999
161	101171	CM1290N	CM1150	1038.5	2"	47	6"	42	2001
162	101170	CM1290N	CM1150	1040.5	2"	43	6"	38	1999
163	101169	CM1290S	CM1150	1046.8	2"	38	6"	33	2002
164	101159	FA290	NS200	60.0	3"	62	8"	57	2010
165	101167	NH380	FA290	185.2	2"	43	6"	38	1988
166	101176	NH380	FA290	185.8	6"	42	---	---	1999
167	101165	NH475	CC380	250.6	2"	50	6"	45	1998
168	101164	NH475	CC380	246.1	2"	50	6"	45	1998
169	101163	NH475	NH380	266.0	2"	51	6"	46	2011
170	101162	NH475	NH380	290.0	2"	40	6"	35	1988
171	520022	NH340	NS200	70.7	2"	39	6"	34	2015
172	101372	NH475	NH340	241.0	2"	43	6"	38	1988
173	101131	NH320	NS200	98.1	2"	46	6"	41	1988
174	101242	NH580	NH475	349.3	2"	60	6"	55	2011
175	101232	NH475	NH320	231.7	2"	48	6"	43	1988
176	101240	LH520	FA460	295.0	3"	74	8"	70	2005
177	101249	CL340	YP220	97.8	2"	48	6"	43	2005
178	101238	CL340	YP220	122.6	2"	37	6"	33	2005
179	101237	CM1575	CM1465	1319.8	2"	60	6"	55	2009
180	101236	CM1465	CM1290S	1204.5	2"	50	6"	45	2009
181	101235	HV700	EG590	414.5	2"	76	6"	71	2009
182	454134	K650	PP670	485.7	8"	62	---	---	2013
183	519381	HV1175	CM1150	827.3	2"	138	6"	133	2015
184	519994	HV700	LH520	421.3	2"	42	6"	37	2015
185	532270	LH520	EG370	261.0	2"	47	6"	37	2019
186	532274	NH580	NH475	349.5	2"	52	6"	37	2019
187	539916	PP670	PP550	468.2	2"	32	6"	27	2020
188	523293	BF220	NS200	29.9	2"	74	6"	69	2021
189	543516	LH520	LH380	309.9	2"	30	6"	25	2021
190	550786	LH520	WE430	321.0	2"	47	6"	42	2024

Pressure Reducing Stations

Figure 1-12



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Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community

Wells

The City currently owns four municipal supply wells, as listed in Table 1-8. The City has not relied on its wells or adjacent lake water intakes for potable water supply since it transitioned to regional water supply in the 1960's but currently uses the wells for non-potable use and emergency water supply. These wells could be redeveloped to include potable use if determined to be in the best interest of the Utility rate payers.

Historically, several more wells and surface water intakes were operated in the current service area by WD68, WD97 and Washington Water Service Co. Inc. These are listed in Table 1-9 for historical reference.

The City's Water Rights Self-Assessment and water right certificates are provided in Volume 2 as Appendix C. The location of the City's wells, historical wells, and some nearby wells owned by other water districts are shown in Figure 1-13.

Table 1-8: Existing Well Inventory

NAME	Dept. of Ecology File No.	Certificate #	Max Instantaneous Flow (gpm)	Max Annual Withdrawal (Acre-Feet)
WD97 Well No. 3	G1-*04201CWRIS	3252	850	1,360
WD97 Well No. 5	G1-*06470CWRIS	4454	500	800
WD97 Well No. 6	G1-*06472CWRIS	4453	600	960*
WD97 Well No. 7	G1-*06350CWRIS	4391	700	1,120

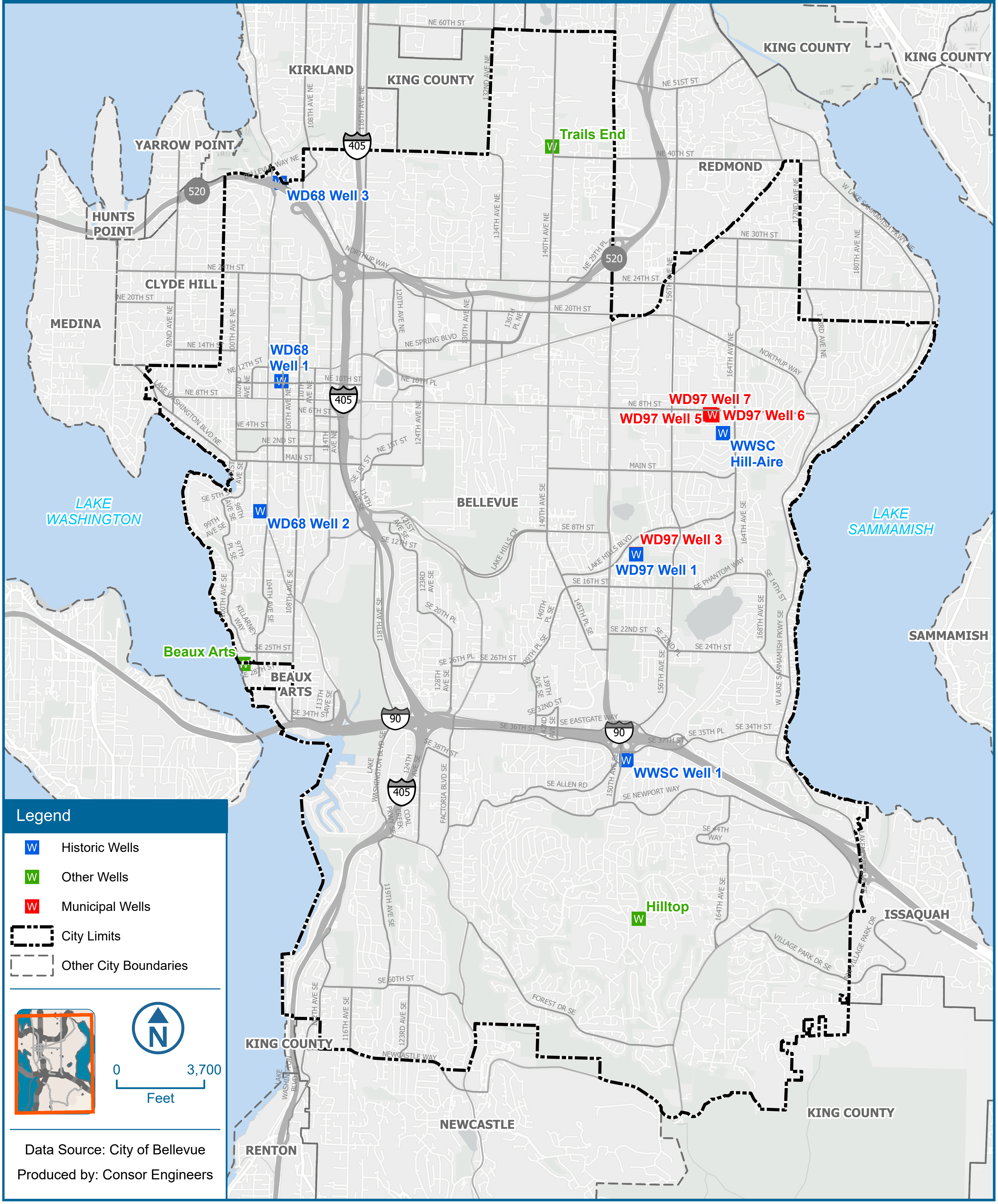
* 750 Acre-Feet/Year Additive, 210 Acre-Feet/Year Non-Additive

Table 1-9: Historical Water Supply Inventory

NAME	Dept. of Ecology File No.	Certificate #	Max Instantaneous Flow (gpm)	Max Annual Withdrawal (Acre-Feet)
WD68 Well No. 1	G1-*00182CWRIS	00518	300	487
WD68 Well No. 2	G1-*00490CWRIS	00360	700	780
WD68 Well No. 3	G1-*00582CWRIS	00521	700	780
WD97 Well No. 1	G1-*04058CWRIS	02539	400	450
WWSC Well No. 1	G1-*03251CWRIS	02429	300	480
WWSC Hill-Aire	G1-*01214CWRIS	02630	80	40
WD68 LWSW	S1-*10081CWRIS	#05820	6.7 (cfs)	Un-Determined
WD 68 LWSW	S1-*11486CWRIS	#06489	13 (cfs)	Un-Determined

Domestic (Group A) Water Supply Wells

Figure 1-13



Date: 4/8/2026 File Name: C:\Users\cory.owsen\Consor North America, Inc\City of Bellevue WSP - Plan Development\GIS Figures and Shapefiles\Description of Water System Figures\Description_of_System_Figures.aprx

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community

1.5 Related Plans

The City's local and regional relationships require coordinated water system planning. The following planning documents impact the City's WSP and are available from their respective agencies.

Cascade Water System Plan

Cascade's WSP forecasts the wholesale water supply needs for all its members, including the City. It is being updated in 2025.

Cascade Transmission and Supply Plan

Cascade's Transmission and Supply Plan (TSP) was developed in 2013 and extended in 2019. The TSP presents a Water Supply Portfolio that includes a combination of Member Independent Supplies, wholesale water supply purchase from SPU, Tacoma Public Utilities, and water efficiency programs to provide for the projected needs of the Cascade members through 2030.

Emergency Water Supply Master Plan

The City developed an Emergency Water Supply Master Plan that will guide its actions to help improve water system resilience in the future and reduce impacts to the community from natural hazard risks. The plan is included in Volume 2 as Appendix X; plan attachments are available on the City's website.

Adjacent Utility Water System Plans

The City's water system planning and operations are affected by adjacent water utilities. The following documents are relevant to the City's water system:

- CCUD Water & Sewer System Plans
- City of Redmond WSP
- City of Issaquah WSP
- City of Kirkland Comprehensive WSP
- SPU WSP

East King County Coordinated Water System Plan

The Revised Code of Washington (RCW) Chapter 70.116 requires water utilities to coordinate through the creation of Critical Water Supply Service Areas (CWSSAs). Each CWSSA is required to maintain a Coordinated Water System Plan (CWSP).

The King County Council declared East King County a CWSSA in 1986 (Ordinance No. 7893) and created a Water Utility Coordinating Committee (Ordinance No. 7894), consisting of representatives of water system agencies (including the City) having 50 or more service connections. King County Council adopted the CWSSA boundaries in 1987 (Ordinance No. 8214).

The Water Utility Coordinating Committee, with the assistance of the East King County Regional Water Association, last updated the CWSP in 1996. Some provisions of the CWSP have been superseded by the formation of Cascade, and by other recent interlocal agreements, annexations, and assumptions of water utility infrastructure.

1.6 Duty to Serve

Washington Administrative Code (WAC) 246-290-106 requires water utilities to provide retail water service to all new service connections within its retail service area if it can be available in a timely and reasonable manner. This requirement is reinforced in Bellevue City Code (BCC 24.02.065), and is complied with by the City.

1.7 Consistency with Local Planning Agencies

The City's Comprehensive Plan complies with the WAC 365-196 requirements of the Growth Management Act. This WSP (per WAC 246-290-100) allows for water system growth consistent with the City's Comprehensive Plan, and therefore the Growth Management Act.

The WAC 246-290-108 requires water utilities to request a planning consistency review from each municipality in its service area. The purpose of this review is to confirm that the WSP's population and employment projections are consistent with those from local planning agencies. These reviews are being conducted concurrently with the Washington State Environmental Policy Act review (Appendix A) of the Draft WSP. Consistency statements and adjacent utility comments are provided in Appendix D.

1.8 Consistency for Local Watersheds

No watershed plan is in effect for the City's sub-regional area.

Chapter 2 Water Utility Policies

The City's Utilities Department (the Utility) drinking water policies are defined in this chapter. These policies complement the City's Comprehensive Plan (the Utilities Element is attached as Appendix E), Water Utility Code (BCC 24.02), and Water Engineering Standards (Volume 4).

2.1 Customer Service

These policies define the level of service provided to utility customers, as well as public and private ownership and responsibility for water system components. Customer interaction policies are defined separately in the Citizen Engagement element of the City's Comprehensive Plan.

Service Ownership/Responsibility

The Utility shall own and maintain all water facilities in public rights-of-way, all water facilities in easements dedicated to the public and accepted by the Utility, and all service lines up to and including the meter, except to the extent that private ownership is otherwise indicated as a matter of record. For unmetered connections (fire sprinklers), City ownership ends at the customer side of the valve closest to the water main.

The Utility shall require private ownership of facilities on private property that exclusively benefit the underlying property or a single adjacent property.

Except meters and the service line upstream of the meter, all other water facilities located on private property are owned by the private property owner(s), unless otherwise assigned or dedicated by easement to the City, except to the extent that public ownership is indicated as a matter of record. Property owners shall be responsible for the development, maintenance, and repair of all private water facilities, including pressure reducing valves, pumps, and backflow prevention assemblies on the customer side of the meter.

The Utility uses meters on services to monitor and charge for water consumption. It needs to control the meter to enforce payment and compliance with Utility standards. The meter is normally located at the property line and provides a logical separation point between City and private ownership and responsibility. There are isolated existing instances where ownership of the line to the meter is private, under separate arrangement.

Property owners must maintain private facilities and piping, including the joint at the connection point inside the meter box, in serviceable condition to allow routine maintenance and replacement of the meter. Any breaks or leaks due to the condition of private facilities is the property owner's responsibility. The meter box, but not everything within it (as described in this paragraph) is owned by the Utility.

New service connections should be through the right-of-way frontage of the property, and not through adjacent property or easements, to the greatest extent feasible. Connections to water mains in private property or easements limit the Utility's future ability to abandon pipe and creates the potential for private landowner disputes concerning public assets.

Emergency Preparedness

The Utility will prepare and periodically update an Emergency Management Plan. The plan will include provisions for an organized response to the most likely types of emergencies that may endanger the health or safety of the general public or jeopardize the operation of the public water system. The plan will also address issues related to long-term system recovery for orderly and complete restoration of the water system after an emergency.

A key Utility responsibility is to respond to the needs of all water utility customers and the general public during times of crisis. The continued availability of potable water during a disaster and restoration of service following a disaster is essential.

The Emergency Management Plan focuses on problems created by major disasters, such as an earthquake or flood. The plan encourages local and regional partnerships to strengthen response capabilities. It is not intended to address minor isolated system interruptions such as those caused by isolated main breaks and power outages; standard operating procedures (SOPs) have been established to address these minor interruptions.

The Emergency Management Plan complies with applicable RCW and WAC requirements, as well as the requirements of the water supply contract between the Utility and Cascade. Reconstruction of damaged infrastructure should be to current codes and standards and should be consistent with current WSP Policies. This is to protect current and future customers, assure consistency with the City's long-range plans, and ensure access to federal funds for reconstruction where available.

Service Pressure and Flow

The Utility shall provide domestic water to utility customers in sufficient quantity to meet peak hour demands and at a pressure that meets or exceeds applicable regulations.

The Utility's goal is to provide minimum system pressure of 30 psi, measured at the service meter under normal conditions, or 20 psi during fire flow and other emergency conditions, in accordance with WAC 246-290-230. Property owners may install private booster pumps to achieve higher pressures if they choose. Ownership, maintenance, and liability associated with such private booster pumps are the responsibility of the property owner.

Customer complaints of low water pressure are often caused by corroded internal plumbing which restricts flow volume, rather than system pressure. In such cases, increased system pressure would make very little difference in the actual service provided. Where modification of utility-owned pipes would significantly improve flow, such as replacement of single service lines that serve more than one home with adequate internal plumbing, the Utility should make such modification.

Service Reliability

The Utility shall invest resources as necessary to construct, maintain, and renew water system infrastructure and equipment such that Utility customers are provided consistent, reliable service, except during maintenance activities. Where practicable, the distribution system shall have operational redundancy. Connections with adjacent water systems should be encouraged to improve reliability and reduce vulnerability to loss of water service or improve distribution capability.

The Utility shall provide sufficient maintenance and use appropriate operation practices to keep the water system infrastructure in good working order. Where O&M procedures are not sufficient or cost effective, capital projects shall be scheduled and funded to replace or rehabilitate infrastructure facilities.

Wherever possible, the Utility shall anticipate system interruptions and the system shall be designed and operated to minimize the impact of such interruptions to customers. For that reason:

- No more than 250 equivalent residential units (ERUs) should be supplied water from a single pipeline.
- Onsite backup power generation or a receptacle to connect a portable generator should be provided at all pump stations.
- To the extent practicable, equipment redundancy should be provided (i.e., provide facilities to pump maximum demand flow rates with the largest pump out of service.)
- Service interruptions are sometimes required to replace, maintain, or repair the Utility's infrastructure, or to facilitate system expansion. Although continuous service is not guaranteed, the Utility strives to limit interruptions and requires isolation valves to limit the size of the affected areas.

Drinking Water Storage for Emergency Supply Outages

The Utility shall construct and operate water storage facilities sufficient to keep a minimum volume of one average day's water usage in reserve, for use in case of water supply disruption. This storage shall be in addition to the volume of storage used for daily operations and fire flow.

The DOH requires water storage for operational, equalizing, fire, and standby purposes. The minimum DOH requirement for standby volume is generally based on a formula of one day's worth of maximum day demand (MDD) for water systems with one source. However, for water systems with multiple sources, the DOH allows for standby volumes to be less than one day's worth of MDD, or one day's average water usage, if multiple sources provide mechanical, electrical, treatment, and transmission redundancy and resilience to a single contamination event.

The City's long-standing practice has been to maintain at least one day of standby storage, to temporarily serve customers in the event of a local or regional water supply emergency.

Construction, maintenance, and operation of water storage reservoirs are a significant cost to Utility rate payers. In addition, excessive storage can negatively impact water quality. The City's water is supplied from two independent sources, the Tolt and Cedar River watersheds, which adds supply redundancy. There is also significant regional system storage nearby (SPU's Eastside Reservoir).

Considering the cost and negative water quality considerations of additional storage and multiple water supply sources to mitigate risk, one day of average water usage is an appropriate standby storage volume for the Utility's service area.

Green Buildings

The Utility should anticipate, investigate, and prepare for the construction or use of buildings with zero net water usage. The Utility supports sustainable development consistent with existing policies, public safety, and ratepayer equity.

Innovative green building technologies are likely to be proposed for development in the City in the next planning period. The Utility should anticipate policy and technical issues that may be associated with such development such as:

- Reduced water consumption
- Building Code and regulatory changes
- On-site water reclamation and the need for backflow prevention
- Appropriate service charges for public system asset management including replacement, fire protection, and other benefits received.

Where appropriate, Utility codes and standards should be updated in anticipation of and preparation for such development.

2.2 Facility Abandonment

These policies specify how to address facilities that are identified for abandonment by the Utility.

Facility Abandonment

When the Utility abandons a facility, it shall be done in a safe and environmentally sound manner consistent with all applicable federal, state, and local regulations at the time of abandonment.

Occasionally, the Utility no longer needs some element of the water system infrastructure, such as a pipe, a pump station, or a reservoir. When a facility is abandoned in-place, detailed as-built records should be maintained. Facility abandonment should be done in the manner directed by the Engineering Standards.

In the case of abandoned AC pipe, standard practice and currently accepted environmental policy dictates that the City should leave the pipe in-place. Asbestos fibers in AC pipe are not released or harmful unless the pipe is broken or disturbed (e.g. during excavation and removal). In that case, the pipe must be dealt with as a hazardous material, and special precautions must be taken to prevent fiber inhalation. For this reason, it is preferable to limit the disturbance of this material and leave AC pipe in place, in the right-of-way. However, when AC pipe is abandoned in an easement on private property, where it is unlikely the City would be aware of future pipe disturbance, it may be removed by the Utility unless dictated by specific circumstances.

Facility Repurposing

If an abandoned utility facility would be appropriate for another use, it may be repurposed, provided all costs and future liability are borne by the beneficiary of the facility, and provided opportunities for revenue are pursued as appropriate.

Occasionally, the Utility no longer needs some element of the water system infrastructure, such as a pipe, a pump station, or a reservoir. Whenever such facilities are abandoned, surplus of the facility should be considered, as well as opportunity to generate revenue from repurposed facilities. Utility liability associated with use of the facility should be considered and minimized. Sale or disposition of utility assets requires City Council Resolution, per BCC section 4.32.070.

2.3 Fire Protection

These policies detail the City's responsibility for providing fire flow, including system requirements for new and existing construction and the Utility's commitment to system improvements.

Fire System Responsibility

The Utility is responsible for providing and maintaining the public water system infrastructure to deliver water for fire protection to currently-served customers.

The water system infrastructure, including water mains, storage, hydrants, pump stations, and related facilities, shall be designed to meet all applicable codes at the time of construction, including the capability to store, convey, and deliver water for fire protection.

The Utility is responsible for maintaining, repairing, or replacing mains, lines, hydrants, and valves, as necessary, to keep said facilities in good working order. Where fire protection is provided, benefited properties should pay for that benefit, even if they don't use the public water system for their drinking water supply.

Fire Flow Requirements for New Construction

The applicant or developer of new development or redevelopment is responsible for providing the minimum fire flow requirement established by the Fire Marshal for that development.

It is the developer's responsibility to install all facilities needed to serve its development, to meet applicable development standards, and to meet the required fire flow established by the Fire Marshal for the developer's proposed project. If necessary, to meet these requirements, the developer shall make off-site water system improvements. If off-site improvements result in benefit to a broader geographic area, the Utility may contribute an equitable share of the improvement costs, provided sufficient financial resources are available. An example might be an improvement which increases fire flow to the Utility's minimum standard fire flow of 1000 gpm or greater in an area that had less than 1000 gpm available prior to the improvement.

Fire Flow Requirements for Existing Construction

The minimum fire flow available to existing facilities shall be the fire flow requirements at the time of construction.

Existing structures are not required to upgrade the water system infrastructure to meet current fire flow and development standards unless redevelopment of the structure or property triggers such upgrades. Similarly, the Utility is not obligated to upgrade available fire flow to meet current code requirements. However, when analyzing the need for water system improvements, improved fire flow should be considered when weighing the project's merits.

Fire Flow Improvement Program

The Utility shall continue to make system improvements with the objective of providing a minimum fire flow of 1,000 gpm throughout the distribution system.

The Utility has systematically improved infrastructure capacities toward providing a minimum level of fire flow protection to all customers within the service area. The program should continue to make improvements such as replacing undersized water mains to provide at least 1,000 gpm (while meeting system performance criteria for pressure and velocity), installing new hydrants to provide maximum hydrant spacing of 500 feet, and replacing all two-port hydrants with three-port hydrants throughout the system. System improvements should generally be prioritized and scheduled according to the severity of deficiencies, although opportunities to make improvements in conjunction with other construction should be considered for economic efficiency. Because larger pipelines increase water age in the system, additional investments to monitor and/or improve water quality may also be necessary, as part of this program.

Customers who have at least 1,000 gpm fire flow available but require additional fire flow to support proposed new development or redevelopment, are required to make the necessary on or off-site improvements. Alternatively, developers may make on-site design choices, such as fire suppression systems, that reduce the fire flow requirement per the Fire Code.

2.4 Service Area

Service area policies concern the existing and ultimate service area boundaries and conditions for service extension within those boundaries.

Satellite/Remote Systems

Satellite/Remote Systems are not allowed within Bellevue's service area. Requests for water service will be accommodated only through direct connection to Bellevue's water system.

The City has in place all the major facilities (pump stations, storage reservoirs, etc.) and water mains required to make water available throughout its service area via short water main extensions. The Utility will work with property owners to facilitate developer or City-installed construction of water main extensions, as needed, to provide service. Therefore, the creation of remote water systems is unnecessary and there is no identified need for the City to become a satellite management agency.

This policy does not preclude the Utility from evaluating and entering interlocal agreements if more efficient and effective service can be provided via connection to an adjacent utility's system.

Service Extension

Water system service will be extended to unserved areas of the water service area, including potential annexation areas, if the City's costs are reimbursed and sufficient financial resources are available. Service will be extended only upon annexation to the City.

It is most efficient and economical for the City to provide services to City residents. Therefore, the water service area coincides with the Potential Annexation Area within the Urban Growth Boundary defined in the City's Comprehensive Plan. The policy is consistent with the Utilities Element of the Comprehensive Plan.

Property owners are responsible for extending water service to their property, and to the extreme of the property to accommodate subsequent development at one or more locations, as deemed necessary by the Utility. The developer is responsible for the cost of extensions both on and off-site and may recover some costs from other benefited properties to the extent allowed by law.

Occasionally, the Utility may require a developer to install a larger water main than is needed to meet its fire flow requirement. This is done to ensure that the fire flow requirements of nearby future development can be met without having to up-size an existing water main. When oversizing is required, the utility will reimburse the developer for the incremental cost increase of the larger pipe and may recover the cost of oversizing from future development.

The City may extend the system to assure orderly system development, in which case, benefited property owners would be responsible for an equitable share of extension costs.

Requests for Assumption by Water Districts or Private Water Systems

Bellevue may assume the operation of a water district or private water system at their request if the following conditions are met and subject to the approval of the Bellevue City Council:

1. **The district or private system is adjacent to or within Bellevue's water service area.**
2. **The district's or private system's facilities meet Bellevue's performance criteria and engineering standards, or a plan is in place to assure they will be brought up to Bellevue's standards without adversely impacting Bellevue's existing customers financially or with regard to level of service.**
3. **The assumption of the district or private system is permitted by State law.**

King County Water District #1 approached the City requesting eventual assumption, and an agreement in conformance with this policy was reached in 2004.

Two other small districts could potentially request assumption: King County Water District #22 (Beaux Arts) is outside of City limits but relies on the City for emergency water supply. The service area of WD117 (Hilltop Community) was annexed into the City. The City has not been approached by the owners of either of these districts to request assumption.

A limited number of small, private water systems use well water within the City's service area. None of these systems have indicated an interest in assumption by the City.

Bellevue Initiated Assumption of Water Districts

Bellevue will seek to assume the operation of a water district when the City Council determines that the assumption is in the best interest of the City, is consistent with the Comprehensive Plan, and would be permitted by state law.

It is the City's policy, as stated in the Comprehensive Plan, to own and operate all public utility systems within the City limits unless circumstances dictate otherwise. Assumption of water districts within City limits at the direction of the City Council are in conformance with this policy.

Water Sales Outside Bellevue's Service Area

New requests for the sale of water outside of the Utility's service area will be considered only under the following circumstances:

1. **The requester first obtains a water supply agreement with the agency responsible for supplying Bellevue's water.**
2. **The provision of water does not compromise design and performance standards for existing water customers.**
3. **The sale of water does not result in any adverse financial impact to Bellevue's existing water customers.**

The City's water system has been planned and designed to accommodate the current and anticipated needs of customers within the City's water service area and existing wholesale customers in accordance with the wholesale water service agreements. Any additional area that requests water supply from the City must address issues relating to limited water supply and adverse impacts on the water system and customer service levels. Water service within another jurisdiction's service area would be per interlocal agreement.

2.5 Water Quality

These policies explain the obligations of Cascade, SPU, the City, and the customer regarding water quality standards from supply to the point of use.

Water Quality Responsibility

The Utility will rely on the agency supplying Bellevue's water, Cascade Water Alliance, to provide water that meets applicable water quality standards in accordance with the supply agreement. The Utility will take action necessary to ensure that applicable water quality standards are met to the point of delivery to the customer.

The City's supply agreement with Cascade requires that water delivered to the City meet all state and federal water quality standards. Water samples collected from throughout the system are tested for compliance.

Water is a perishable product. Water quality can fall below accepted standards before reaching the customer if microbial regrowth occurs, excessive levels of disinfection by-products (DBPs) form, or outside contaminants are introduced into the water system. The Utility will take the necessary steps to ensure that water reaching the point of delivery meets or exceeds all water quality standards. To accomplish this, the Utility will maintain programs to prevent microbial regrowth, excessive DBP formation, and contamination of the water system.

Maintaining the water quality to the actual point of use is the responsibility of the Utility, except under conditions outside of the Utility's control, such as private system conditions that contribute to water quality degradation in the customer's system.

Cross Connection Control

The Utility shall administer a cross connection control program that protects the City's public water supply and users of the public water supply from backflow contamination, in accordance with federal, state, and local requirements.

The DOH requires that public water utilities implement a cross connection control program to prevent water system contamination due to backflow. The City's cross connection control program requires installation of approved backflow prevention assemblies on, or disconnection of, identified cross connections. The program identifies potential cross connections through both the City's plan and permit review process, and site inspections of high-risk properties. The program also requires testing of all backflow prevention assemblies within the water system at the time of installation and annually thereafter. The City will continue to implement all aspects of this program, and to amend the program as industry standards change.

2.6 Regional Policies

These policies discuss regional policy development, the Utility's contractual commitment with Cascade, conservation as it affects supply, and the Utility's response during water supply shortages. The City coordinates regional water supply efforts with Cascade as appropriate.

Regional Policy Development

The Utilities Department shall seek to:

- **Accomplish the City's environmental goals to promote a healthy environment, public safety, and a strong economy, essential to maintaining the City's and the region's quality of life.**
- **Ensure reasonable and prudent fiscal policies on behalf of ratepayers.**

- **Ensure regional, state and federal requirements are fiscally prudent and achievable.**
- **Maintain local control and flexibility in policy/program implementation.**

The Utility's role is to develop proposed guiding principles/interests for City Council approval. Pursuant to Council direction, the Utility's role in monitoring, influencing, developing and implementing regional, state, and federal water utility requirements, policies, and programs may include:

- **Influencing legislation through lobbying and written/verbal testimony**
- **Participating in rule-making**
- **Reviewing technical documents**
- **Serving on regional forums and coalitions, advisory committees, and work groups**
- **Providing technical and staff support for Council members serving on regional, state, or federal water utility committees.**

The Utility has participated in the development and implementation of regional, state, and federal water utility requirements, policies, and programs for a number of reasons.

- The City has a direct interest in helping shape regional, state, and federal water utility mandates because they affect utility costs, can result in rigid programs that preclude more creative or effective local ones, or can result in requirements that are impossible to meet.
- The City has been looked to as a significant stakeholder with regard to the updating and revision of regional and state water utility requirements and therefore has had an opportunity to serve as a technical resource and participant in shaping requirements, policy, and programs to benefit the City.
- The City benefits from learning about the experiences and technical expertise of others.

The Utility's role in developing regional, state, and federal requirements, policies and programs varies from influencing legislation, rules, and policy to sharing technical information and participating in technical peer review groups, advisory panels, and joint studies. Through its involvement, the Utility seeks to achieve the City's goals while keeping costs low for utility rate payers and maintaining local control and flexibility.

Water Supply Source

The Utility will continue to partner with regional water suppliers. The Utility will work cooperatively with Cascade Water Alliance, other purveyors, and other water supply agencies to assure a safe, reliable water supply at the lowest environmental and economic and social cost.

Originally, the area's source water was from ground water wells and lake water intakes operated by local water districts. In the mid-1960s the area began transitioning from local water as a primary source to purchased water from Seattle Water Department. The City continued to purchase water directly from Seattle until 2004, when Cascade was formed. The City now purchases Seattle water indirectly through a contract with Cascade.

The current agreement provides the City and other Cascade members with a greater role in determining future water supply decisions. The water supply system is a regional resource that must be managed for the benefit of all current and potential new users.

Efficient Water Use

The Utility will partner with regional suppliers to promote the wise and efficient use of water. The Utility will implement programs consistent with the DOH water use efficiency requirements, and intends to achieve conservation goals established cooperatively with regional water suppliers.

Per WAC 246-290-810, water utilities are required to establish water use efficiency (WUE) programs. WUE benefits the Utility's ratepayers by potentially reducing future capital needs and by preserving water supplies for future economic growth. The efficient and wise use of water extends and makes the best use of existing water supplies before developing new sources.

It is cost-efficient and effective to work cooperatively with the regional water supplier to develop common goals that meet DOH water use efficiency requirements. The Utility will support programs that help the City achieve those goals.

Reclaimed Water Use

Bellevue will consider supporting the use of reclaimed water where there is a demand for it, and where it provides an appropriate and cost effective alternative to the City's potable water supply.

Cascade evaluated the potential sources and users of reclaimed water as part of its TSP. This evaluation identified King County's Brightwater Treatment Plant and South Treatment Plant as potential suppliers, and several large irrigation systems as potential customers. The cost of reclaimed water distribution piping was identified as the primary obstacle to reclaimed water use. The City will continue to consider regional efforts to develop reclaimed water supplies, where appropriate.

Emerging technologies such as on-site water recycling and zero discharge facilities are not precluded or discouraged by this policy. Such facilities operating independently from the City's water and/or sewer systems may be subject to the jurisdiction of plumbing codes, King County Public Health Department, and/or the DOH.

Water Shortage Response

The Utility will maintain a local response plan for water supply shortages caused by a drought or supply interruption as part of its Emergency Management Plan for emergency preparedness.

The Emergency Management Plan will be consistent with other regional purveyors' planned response(s), and with contractual agreements. The Emergency Management Plan's objectives will include ensuring that the essential needs of its customers are met to the greatest extent possible.

The City's supply agreement with Cascade includes provisions for users of the regional water supply system to respond to water shortages caused by unforeseen events in a manner that ensures water is available for essential uses. Cascade and SPU worked cooperatively to develop a water shortage response plan that coordinates regional response among Cascade members.

Emergencies can disrupt service to localized areas of the City service area. For such events, the Utility will notify the City Manager of the emergency and provide a recommended plan of action. The City Manager is empowered to take the necessary steps to ensure that all essential uses are met to the greatest extent possible.

Water Rights

The Utility should optimize use of existing water rights when it is in the best interest of rate payers and consistent with existing water supply agreements. Water rights should be used to provide resiliency in the event of a water supply emergency.

The City's active water rights are used for emergencies and municipal use. The Utility will continue to develop additional emergency supply sources to meet Level of Service goals consistent with its Emergency Water Supply Master Plan.

2.7 Financial Policies

The Utility's Waterworks Utility Financial Policies govern rate setting, development charges, capital improvement financing, and reserves. These Financial Policies apply to all three utilities (water, wastewater, and storm drainage) and are updated separately from the WSP.

2023-2024 Budget

Waterworks Utility

Financial Policies

2023-2024 Administrative Updates

The Waterworks Utility Financial Policies reflect the following proposed updates as part of the 2023-2024 Budget process:

III. System Expansion and Connection Policies

Section C. Use of Revenues

No change is made to the Council-adopted policy. In January 2022 City Council adopted Ordinances 6640, 6641, and 6642 relating to waiver of connection charges for affordable housing. These ordinances added the option for property owners to, at their discretion, pay the amount of Capital Recovery Charges in full. Discussion is updated to reflect this change.

Section D. Affordable Housing Consideration

In January 2022 City Council adopted Ordinances 6640, 6641, and 6642 relating to waiver of connection charges for affordable housing. The newly adopted policy described in the ordinances replaces the prior language in this section.

IV. RATE POLICIES

Section F. Rate Structures - Water

No change is made to the Council-adopted policy. Discussion is updated to reflect current practices.

Section H. Rate Uniformity

No change is made to the Council-adopted policy. Discussion is updated to reflect current state law.

V. OPERATING RESERVE POLICIES

Section A. Operating Reserve Levels

No change is made to the Council-adopted policy. Summary of Recommended Reserve Levels is updated to reflect proposed 2023-2024 budget.

Section B. Management of Operating Reserves

No change is made to the Council-adopted policy. Discussion is updated to clarify definitions of target and minimum reserves.

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2023-2024 Transmittal Letter

Introduction

The Waterworks Utility is the financial consolidation of the Sewer, Storm & Surface Water and Water Utilities of the City of Bellevue for debt rating and coverage purposes as established in Ordinance No.'s 2169, 2845, 3158 and 4568. It pledges the strengths and revenues of the three separate Utilities for the common financial good while keeping each Utility financially separate for budgeting, rate-setting, revenues, expenditures, debt and accounting.

These "Financial Policies" apply uniformly to the Sewer, Storm & Surface Water and Water Utilities with few, unique exceptions which are identified separately. This update reflects changes consistent with current long-range financial planning, particularly with regard to renewal and replacement funding, the use of debt and rate policies. They supersede the Financial Policies, which were adopted under Resolution No. 5967 in 1995.

These policies do not stand-alone. They must be taken in context with the other major City and Utilities documents and processes. For instance, each Utility has its own System Plan, which documents its unique objectives, planning, operations and capital needs. These System Plans have historically had a 20-year planning horizon. Future System Plans will need to evaluate long term renewal and replacement of aging facilities, much of which were constructed in the 1950's and 1960's during periods of high growth rates and are approaching the end of their useful life. Life cycle costs should be considered in planning the future capital facilities and infrastructure needs.

The Utility has a seven-year Capital Investment Program (CIP) Plan which is updated with each biennial budget cycle. These CIP programs include specific near-term capital projects that are consistent with each Utility System Plan and are developed in response to system needs for renewal and rehabilitation, system capacity to accommodate growth, and other system needs. Generally, capital projects are described as over $100,000, involving development of new physical infrastructure, reconstruction of existing infrastructure, acquisition of land or existing facilities, and involving City funding or other agency funding when project implementation is the responsibility of the City.

I. General Policies

A. Fiscal Stewardship

The Waterworks Utility funds and resources shall be managed in a professional manner in accordance with applicable laws, standards, City financial practices and these Financial Policies.

Discussion:
It is incumbent on Utility management to provide professional fiscal management of utility funds and resources. This requires thorough knowledge of and conformance with

the City financial management processes and systems as well as applicable laws and standards. It also requires on-going monitoring of revenues and expenses in order to make decisions and report to City officials, as needed, regarding the status of Utilities financing. Independent financial review, analysis and recommendations should be undertaken as needed.

B. Self-sufficient Funding

Each Utility shall remain a self-supporting enterprise fund.

Discussion:

The revenues to each Utility primarily come from customer charges dependent on established rates. State law requires that utility funds be used only for utility purposes. Since each Utility has somewhat differing service areas, it is essential for ratepayer equity that they be kept financially separate and accountable. The City's General Fund can legally contribute to the Utility funds but does not. The City budgeting process includes a balanced and controlled biennial Utility budget. This requires careful preparation of expense and revenue projections that will be reviewed by City management, the Environmental Services Commission, the general public and the City Council prior to approval of any change in Utility rates.

C. Comprehensive Planning Policies

The Water Utility System Plan shall be updated every ten years as required by state statute; the Wastewater and Storm & Surface Water System Plans shall be updated as required by changed conditions or regulatory requirements, between every six to ten years. All Utility system plans shall use a 20-year planning horizon or greater, and shall consider life cycle costs to identify funding needs. Studies to analyze specific geographic areas or issues, such as Storm & Surface Water sub-basin plans, Wastewater capacity and flow studies, or Water pressure zone studies and seismic impact will be completed as required using similar criteria for planning infrastructure needs.

Discussion

Substantial portions of the City utility systems were constructed in the 1950's and 1960's. These systems are approaching the end of their useful life as illustrated on the following Exhibit 1 - Watermain Replacement Spending and Exhibit 2 - Sewermain Replacement Spending. The storm & surface water infrastructure is of similar age but has not yet been graphed. It most likely has a relatively shorter expected life span. Asset assessment for all utility systems is an ongoing work priority. The Utility is implementing an asset management strategy that results in an infrastructure replacement schedule based upon age, condition, and the risk and consequence of failure, rather than a replacement schedule based on age alone. Assumptions for survivor curves and useful lives are revisited periodically. These were assessed in 2004 and updated for the most recent engineering and financial findings. Significant changes include the adjustment of replacement costs to current price levels, categorization of pipe assets based on expected useful lives, and replacement of major non-pipe Utility assets such as pump stations and reservoirs. The Exhibits illustrate an example survival replacement curve based on preliminary estimates only. As real needs are determined, they will replace the estimated curves. Renewal and/or replacement will require substantial reinvestment in the future and have major rate impacts if large portions of the systems have to be replaced in relatively short periods of time. The actual useful life of underground utilities is difficult to determine and the best available data is needed to be able to plan for the orderly and timely renewal and/or replacement. For this purpose, the comprehensive plans need to have at least 20 year planning horizons and must address the aging of the Utility systems.

Long term system planning for the Utility systems is required in order to assure that future financial needs are anticipated and equitable funding plans can be developed. In order to keep funding plans current, utility system plans need to be updated between six and ten years. State law requires ten years for water system plans. Wastewater system plans are not mandated to be updated on a prescribed cycle, however updating them between six and ten years is the common standard of practice. Stormwater system plans similarly have no state or federal mandate for updating, however with the implementation of the NPDES General Permit, it is reasonable to expect significant changes within two 5-year permit terms to warrant a system plan update. Depending on the significance of the changes, the Storm system plan may require updating sooner than after two 5-year permit cycles. These Financial Policies will be reviewed and updated as needed.

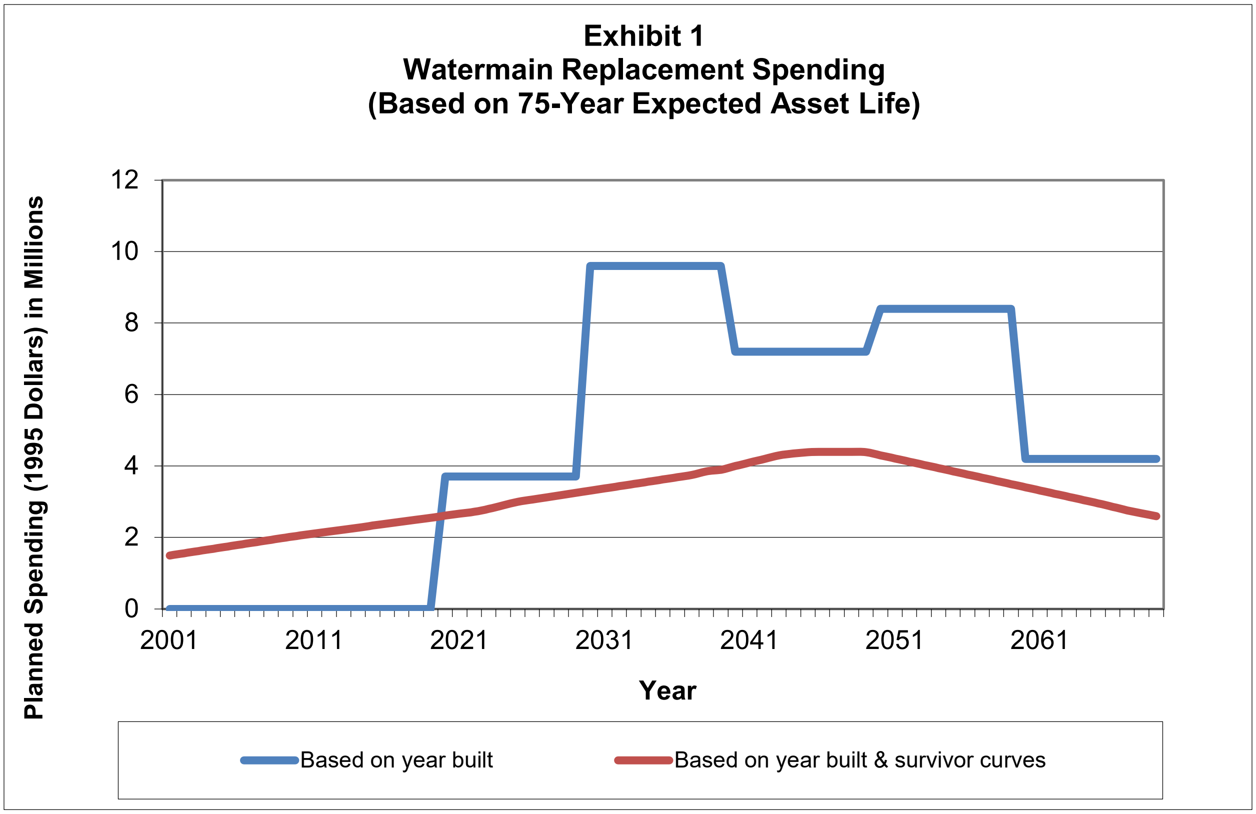
Exhibit 1
Watermain Replacement Spending
(Based on 75-Year Expected Asset Life)
Planned Spending (1995 Dollars) in Millions
12
10
8
6
4
2
0
2001
2011
2021
2031
2041
2051
2061
Year
Based on year built
Based on year built & survivor curves

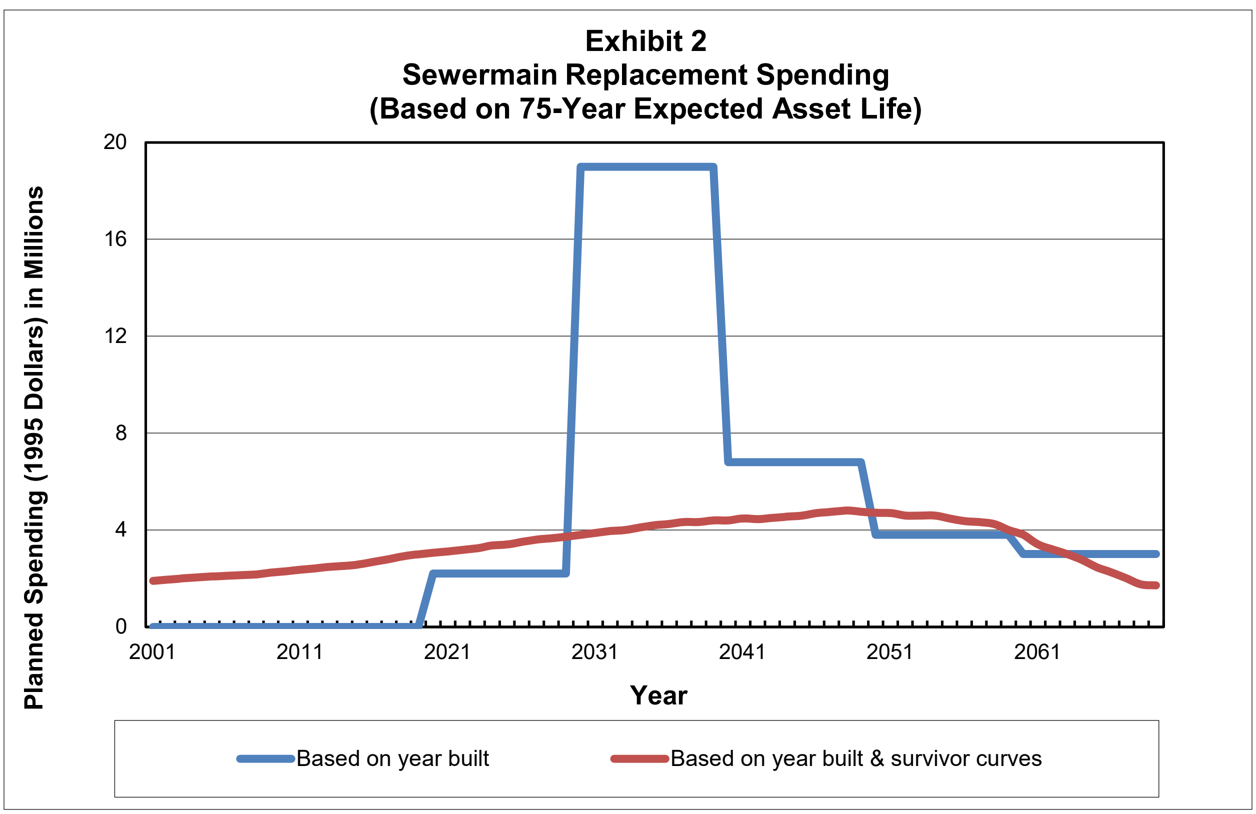
Exhibit 2
Sewermain Replacement Spending
(Based on 75-Year Expected Asset Life)
Planned Spending (1995 Dollars) in Millions
20
16
12
8
4
0
2001
2011
2021
2031
2041
2051
2061
Year
Based on year built
Based on year built & survivor curves

II. CAPITAL INVESTMENT PROGRAM POLICIES

A. General Scope

The Utilities Capital Investment Program (CIP) will provide sufficient funds from a variety of sources for implementation of both short- and long-term capital projects identified in each Utility System Plan and the City-wide Capital Investment Program as approved by the City Council.

Financial planning for long-term capital investment shall be based on principles that result in smooth rate transitions, maintain high credit ratings, provide for financial flexibility and achieve inter-generational equity.

Discussion:
These near-term capital projects are supported by each Utility system plan which provides guidance for prioritizing which projects to include in the 7-year CIP. Several programs of general scope are also included to allow for on-going projects that are less specifically identified due to their consistent scope within the program.

In addition to these near-term projects, funding should be provided for long-term capital reinvestment in the system to help minimize large rate impacts as the systems near the end of their useful life and have to be renewed or replaced. Ordinance No. 4783 (Attachment A) established a Capital Facilities Renewal & Replacement (R&R) Account for each Utility to provide a funding source for this purpose. Other policies describe how this Account is to be funded and expended.

A reinvestment policy by itself, without some form of planned and needed expenditure, could lead to excessive or unneeded expenditures, or conversely unnecessary accumulations of cash reserves. The reinvestment policy needs to tie the planned expenditures over time with a solid, long-term financial plan that is consistent with these policies.

The actual needs for the renewal/replacement expenditures should relate to the on-going need to minimize system maintenance and operating costs consistent with providing safe and reliable service, the age and condition of the system components, and any regulatory or technical drivers. In essence, infrastructure should be replaced when it is needed and before it fails. As such, the goal setting measure of how much is an appropriate annual or periodic reinvestment in renewals and replacement of existing assets should be compatible with the age and condition of the infrastructure and its particular circumstances.

B. Funding Levels

Funding for capital investments shall be sustained at a level sufficient to meet the

projected 20 year (or longer) capital program costs.

Funding from rate revenues shall fund current construction and engineering costs, contributions to the Capital Facilities Renewal and Replacement (R&R) Account, and debt service, if any.

Inter-generational equity will be assured by making contributions to and withdrawals from the R&R Account in a manner which produces smooth rate transitions over a 20 year (or longer) planning period.

On an annual basis, funding should not fall below the current depreciation of assets expressed in terms of historical costs less any debt principal payments.

Discussion:
These policies are based on the experience gained by developing a long-term Capital Replacement Funding Plan. In absence of such a plan, the range of capital investment funding should fall between the following minimum and maximum levels:

The minimum annual rate funding level would be based on the current depreciation of assets expressed in terms of historical costs, less any debt principal payments.

The maximum annual rate funding level would be based on the current depreciation of assets expressed in terms of today's replacement costs, less any debt principal payments.

The minimum level based on historical cost depreciation approximates the depletion of asset value. Some of the cost may already be in the rates in the form of debt service. Depreciation less debt principal repayment provides a minimum estimate of the cost of assets used. Any funding level below this amount defers costs to future rate payers and erodes the Utility’s equity position, which puts the Utility’s financial strength and viability at risk.

The maximum level based on replacement cost depreciation represents full compensation to the utility, in terms of today's value, for the depletion of assets. The replacement cost depreciation, again less debt principal repayment, provides a ceiling to an equitable definition of "cost of service".

The purpose of long-term capital reinvestment planning is to establish a target funding level which is based on need and to assure that funds will be available for projected capital costs in an equitable manner. The best projection of the needed capital reinvestment is based on a "survival curve" approach, approximating the timing and cost of replacing the entire system. This defines the projected financial needs and allows determination of equitable rate levels, funding levels for current capital construction and engineering, contributions to and withdrawals from the R&R Account, and the use of debt, if any. It also provides a means to project depreciation on both historical cost and replacement cost basis which are used to calculate minimum and maximum funding levels, debt to fixed asset ratios, and debt coverage levels, if debt is used. These later measures can be used to assure that the financial plan meets conventional standards.

C. Use of Debt

The Utilities should fund capital investment from rates and other revenue sources and should not plan to use debt except to provide rate stability in the event of significantly changed circumstances, such as disasters or external mandates.

Resolution No. 5759 (Attachment B) states that the City Council will establish utility rates/charges and appropriations in a manner intended to achieve a debt service coverage ratio (adjusted by including City taxes as an expense item) of approximately 2.00. Please note that the Moody's Investor Services rating should be Aa2 (not Aa as stated in Resolution No. 5759).

Discussion:
The Utilities are in a strong financial position and have been funding the Utility Capital Investment Program from current revenues for a number of years. The current 20 year and 75 year capital funding plans conclude that the entire long-term renewal and replacement program can be funded without the use of debt if rates are planned and implemented uniformly over a sufficient period. Customers will pay less over the long-term if debt is avoided, unless it becomes truly necessary due to unforeseen circumstances such as a disaster or due to changes in external mandates. Having long-term rate stability also assures inter-generational equity without the use of debt because the rate pattern is similar to that achieved by debt service.

Use of low interest rate debt such as the Public Works Trust Fund loans, by offering repayment terms below market rates, investment earnings or even inflation, should be viewed as a form of grant funding. When available or approved, such sources should be preferred over other forms of rate or debt funding, including use of available resources. Since such reserves would generate more interest earnings than the cost of the loan, the City's customers would be assured to benefit from incurring such debt.

D. Capital Facilities Renewal & Replacement (R&R) Account

1. Sources of Funds

Revenues to the R&R Account may include planned and one-time transfers from the operating funds, transfers from the CIP Funds above current capital needs,

unplanned revenues from other sources, Capital Recovery Charges, Direct Facility Connection Charges and interest earned on the R&R Account.

2. Use of Funds

Funds from the R&R Account shall be used for system renewal and replacement as identified in the CIP. Because these funds are invested, they may be loaned for other purposes provided repayment is made consistent with the need for these funds and at appropriate interest rates. Under favorable conditions, these funds may be loaned to call or decrease outstanding debt.

3. Accumulation of Funds

The R&R Account will accumulate high levels of funds in advance of major expenses. These funds will provide rate stability over the long-term when used for this purpose and <u>should not be used for rate relief</u>.

Discussion:

Revenues from Capital Recovery Charges, Direct Facility Connection Charges and interest earned on the R&R Account are deposited directly into the R&R Account. Other transfers are dependent on the long-term financial forecast, current revenues and expenses, and CIP cash flows. The long-term financial forecast projects a certain funding level for the transfers to the CIP and the R&R Accounts. Rates should be established consistent with this long-term financial plan and will generate the funds for such transfers. Setting rates at lower levels may result in current rate payers contributing less than their fair share for long-term equity.

R&R Account funds must only be used for the purpose intended; that is, the long-term renewal and replacement of the utility systems. They may be used for other purposes if it is treated as a loan, which is repaid with appropriate interest in time for actual R&R needs for those funds.

These accounts are each projected to accumulate tens of millions of dollars in order to meet the anticipated costs for the actual projects at the time of construction. It is the intent of these policies that these reserve funds will not be used for other purposes or to provide rate relief because that would defeat the long-term equity and could lead to the need for the use of debt to fund the actual needs when they occur.

III. System Expansion and Connection Policies

A. Responsibilities

Those seeking or who are required to have Utility service are responsible for extending and/or upgrading the existing Utility systems prior to connecting.

Discussion:
It is the responsibility of the party seeking Utility service to make and pay for any extensions and/or upgrades to the Utility systems that are needed to provide service to their property. The extensions or upgrades must be constructed to City standards and requirements. This is typically accomplished through a Developer Extension Agreement with the City wherein requirements are documented, standards are established, plans are reviewed and construction is inspected and approved. Service will not be provided until these requirements are met.

The philosophical underpinning of this policy is that “growth pays for growth”. Historically, developers constructed much of the City’s utility infrastructure. If the infrastructure eventually would benefit more than the initial developer, the Utility signed a Latecomer Agreement to reimburse the original financier from charges to those connecting and receiving benefit at a later point in time. When the cost to extend and/or upgrade the system to accommodate development or redevelopment is beyond the means of a single developer, the Utility has employed a variety of methods to assist in the construction of the necessary infrastructure. Local Improvement Districts (LID’s) historically have been used to provide financing for infrastructure for new development, with the debt paid over time by the property owners. Most of the older Utilities infrastructure was financed by this method.

The Utility has in some cases up-fronted the infrastructure construction for new development or redevelopment from rate revenues which are later reimbursed with interest, in whole or in part, by subsequent development through direct facility connection charges (see Cost Recovery Policy). Examples are the water and sewer infrastructure for Cougar Mountain housing development and Central Business District (CBD) redevelopment. Another example is the use of the Utility’s debt capacity to provide for development infrastructure whereby the City sells bonds at lower interest rates than can private development, constructs the infrastructure, and collects a rate surcharge from the benefited area to pay off the bonds. Examples of this type of financing include the Lakemont development drainage infrastructure and the Meydenbauer Drainage Pipeline in the CBD.

B. Cost Recovery

The Utility shall establish fees and charges to recover Utility costs related to: (1) development services, and (2) capital facilities that provide services to the

property.

The Utility may enter into Latecomer Agreements with developers for recovery of their costs for capital improvements, which benefit other properties in accordance with State law. The Utility will add an administrative charge for this service.

Discussion:
In general, Utility costs related to development services are recovered through a variety of fees and charges. There are fixed rates for some routine services based on historical costs and inflation. There are fixed plus direct cost charges and applicable overhead for developer extension projects to cover the lengthy but variable level of development review and inspection typically required to implement these projects. These rates are reviewed periodically to ensure that the cost recovery is appropriate.

When the means of providing the infrastructure to serve a new development or redevelopment are beyond the means of a single developer, the Utility may elect to assist the developer by using: LID's, Latecomer Agreements, special debt (to be paid by special rate surcharges), up-fronting the costs from Utility rate revenues (to be reimbursed by future developers with interest through direct facility connection charges), or other lawful means. It is the intent of this policy to fully recover these costs, including interest, so as to reimburse the general rate payer.

Latecomer charges allow cost recovery for developers and private parties, for facilities constructed at their own expense and transferred to the Utility for general operation. Properties subsequently connecting to those systems will pay a connection charge that will be forwarded to the original individual or developer or the current owner depending on the terms of the Latecomer Agreement. The Utility collects an overhead fee on this charge for processing the agreements and repayments.

C. Use of Revenues

All capital-related revenues such as Capital Recovery Charges and Direct Facility Connection Charges should be deposited in the Capital Facilities Renewal & Replacement Accounts.

Discussion:
Capital Recovery Charges are collected from all newly developed properties in the form of monthly rate surcharges over a ten year period to reimburse the Utility for historical costs that have been incurred by the general rate base to provide the necessary facilities throughout the service area. Pursuant to Ordinances 6640, 6641, and 6642, Capital Recovery Charges may also be paid in full at the discretion of the affected property

owner. These Capital Recovery Charges should be deposited in the Capital Facilities Renewal & Replacement Accounts.

Direct Facility Connection Charges are collected for capital improvements funded by the City as described above in Section 2 under Cost Recovery. The total cost of the improvement is allocated to the area of benefit and distributed on an equitable basis such as per residential equivalent unit. Interest is collected in accordance with State law.

D. Affordable Housing Consideration

The Utility may waive capital recovery charges with respect to construction of shelters or affordable housing projects as found by the director, provided there is non-utility revenue available to reimburse the city for the charges waived.

Discussion:
The City has adopted Ordinances 6640, 6641, and 6642 relating to connection charges for sewer, water, and storm and surface water, respectively. Revised Code of Washington (RCW) 35.92.380 provides for the waiver or delay of connection charges for low-income households. Utility connection charges are fees paid by all development so that each connecting property bears its proportional share of the cost of public sewer, water, and stormwater systems.
Waived fees should not be made up by increased rate pressure on existing ratepayers. While there is a public benefit in incentivising the development of shelters or affordable housing projects, City policy requires that growth pay for growth, and that existing customers not be burdened by the cost of growth. The adopted City ordinances ensure that, if a waiver is granted, it will be accompanied by non-utility revenue such as grants or other funds.

IV. Rate Policies

A. Rate Levels

Rates shall be set at a level sufficient to cover current and future expenses and maintain reserves consistent with these policies and long-term financial forecasts.

Changes in rate levels should be gradual and uniform to the extent that costs (including CIP and R&R transfers) can be forecast.

Cost increases or decreases for wholesale services shall be passed directly through to Bellevue customers.

Local and/or national inflation indices such as the Consumer Price Index (CPI) shall be used as a basis for evaluating rate increases.

At the end of the budget cycle, fund balances that are greater than anticipated and other one-time revenues should be transferred to the R&R account until it is shown that projected R&R account funds will be adequate to meet long-term needs, and only then used for rate relief.

Discussion:
A variety of factors including rate stability, revenue stability, the encouragement of practices consistent with Utility objectives and these Waterworks Utility Financial Policies are considered in developing Utility rates. The general goal is to set rates as low as possible to accomplish the on-going operations, maintenance, repair, long-term renewal and replacement, capital improvements, debt obligations, reserves and the general business of the Utility.

Long-range financial forecast models have been developed for each of the Utilities, which include estimated operating, capital and renewal/replacement costs for a 75 year period in order to plan for funding long-term costs. Operating costs are assumed to remain at the same level of service and don't include impacts of potential changes due to internal, regional or federal requirements. Capital costs, including renewal/replacement, are projected based on existing CIP costs and approximated survival curves for the infrastructure. The models are used to project rate levels that will support the long-term costs and to spread rate increases uniformly over the period. This is consistent with the above policy that changes in rate levels should be gradual and uniform. Uniform rate increases help ensure that each generation of customers bears their fair share of costs for the long-term use and renewal/replacement of the systems.

The biennial budget process provides an opportunity to add to or cut current service levels and programs. The final budget, with the total authorized expenses including transfers to the CIP Fund and the R&R Account, establishes the amount of revenue required to balance the expenses. A balanced budget is required. The budgeted customer service revenue determines the level of new rates. For example, if the current rates do not provide sufficient revenues to meet the projected expenses, the costs have to be reduced or the rates are increased to make up the shortfall.

For purposes of these policies, wholesale costs are defined as costs to the Utilities from other regional agencies such as the Seattle Public Utilities and/or the Cascade Water Alliance (CWA), and King County Department of Natural Resources for sewer treatment and any agreed upon Storm & Surface Water programs. Costs which are directly based on the Utilities' revenues or budgets such as taxes, franchise fees and reserve levels that increase proportionally to the wholesale increases are included within the definition of wholesale costs.

B. Debt Coverage Requirements

Utility rates shall be maintained at a level necessary to meet minimum debt coverage levels established in the bond covenants and to comply with Resolution No. 5759 which establishes a target coverage ratio of 2.00.

Discussion:
In 1994, Council adopted Resolution No. 5759 that established a policy, which mandates the Utilities to maintain a target combined debt coverage ratio of approximately 2.00, to further protect the City's historically favorable Utility revenue bond ratings.

C. Frequency of Rate Increases

Utility rates shall be evaluated annually and adjusted as necessary to meet budgeted expenses including wholesale cost increases and to achieve financial policy objectives.

Discussion:
In 1996, the City changed to a biennial budget process and adopted a two-year Utilities budget including separate rates for 1997 and 1998. This practice will continue on a biennial basis. However, Utility rates will be evaluated on an annual basis and adjusted as necessary to ensure that they are effectively managed to achieve current and future financial policy objectives. Annual rate reviews will include preparation of forecasts covering a twenty-year period for Utility revenues, expenditures, reserve balances and analysis of the impact of various budgetary elements (i.e. CIP transfers, R&R Account transfers, debt service costs, debt coverage levels, operating expenses, and reserves) on both current and future rate requirements.

D. Rate Structure - Sewer

The Sewer Utility rate structure will be based on a financial analysis considering cost-of-service and other policy objectives, and will provide for equity between customers based on use of the system and services provided.

Discussion:
In 1993, a Sewer Rate Study was performed that resulted in Council approval of a two-step, volume-based rate structure for single-family customers based on winter average metered water volumes instead of the traditional flat rate structure. Flat rate structures were seen as inequitable to low-volume customers who paid the same amount as high volume customers. Rates are based on the level of service used, rather than the availability of service.
The revenue requirements are based on the "average" single-family winter average volume calculated annually from the billing database. The charge for an individual customer is based on their winter average and then charged at that level each bill for the entire year to avoid charging for irrigation use. The customer's winter average is

based upon the prior year's three winter bills because the current year's bills include winter months, which would result in the average constantly changing. Customers without prior winter averages to use for a basis are charged at the "average" volume until they establish a "winter-average" or sufficient evidence that their use is significantly different than the "average".

E. Rate Structure - Storm & Surface Water

The Storm & Surface Water Utility rate structure will be based on a financial analysis considering cost-of-service and other policy objectives, and will provide adjustments for actions taken under approved City standards to reduce related service impacts.

Discussion:
In the existing Storm & Surface Water rate structure, customer classes are defined by categories of development intensity, i.e., undeveloped, lightly developed, moderately developed, heavily developed and very heavily developed. Based on theoretical run-off coefficients for each of these categories, higher rates are charged for increasing degrees of development to reflect higher run-off resulting from that development. Under this structure, billings for both residential and non-residential customers are determined by total property area and rates assigned to applicable categories of development intensity. Customers providing on-site detention to mitigate the quantity of run-off from their property receive a credit equal to a reduction of one rate level from their actual development intensity. Property classified as "wetlands" is exempt from Storm & Surface Water service charges.

Large properties, over 35,000 square feet, with significantly different levels of intensity of development may be subdivided for rate purposes in accordance with Ordinance No. 4947. In addition, properties with no more than 35,000 square feet of developed area in the light and moderate intensity categories may, at the option of the owner, defer charges for that portion of the property in excess of 66,000 square feet. The property owner may apply for a credit against the Storm & Surface Water charge when they can demonstrate that the hydrologic response of the property is further mitigated through natural conditions, on-site facilities, or actions of the property owner that reduce the City's costs in providing Storm & Surface Water quantity or quality services.

Future design of a water quality rate component will also use cost-of-service principles to assign defined water quality costs to customer classes, according to their proportionate contribution to Utility service demand. It is anticipated that these rate structure revisions will also provide financial incentives to customers taking approved actions to mitigate related water quality impacts.

F. Rate Structures - Water

The water rate structure will be based on a financial analysis considering cost-of service and other policy objectives, and shall support water conservation and wise use of water resources.

Discussion:
The water rate structure consists of fixed monthly charges based on the size of the customer's water meter and volume charges, which vary according to customer class and the actual amount of water that the customer uses. There are three different meter rate classifications: domestic, irrigation and fire standby. The different charges are based on a cost-of-service study.

State law and the wholesale water supply contract require the Utility to encourage water conservation and wise use of water resources. Seattle first established a seasonal water volume rate structure for this purpose in 1989 with higher rates in the summer than in the winter. In 1990, based on a water rate study and the desire to provide a conservation-pricing signal to our customers, the City adopted an increasing block rate structure for local volume rates. The rate structure was revised in 1991 to pass through an increase in wholesale water costs, which also included a higher seasonal water rate for summer periods. The block water rate structure was revised again in 1997 and in 2015, to incorporate new cost-of-service results.

An increasing block rate structure, charges higher unit rates for successively higher water volumes used by the customer. The current rate structure has four rate steps for single-family customers, based on metered water volumes. All irrigation-metered water is charged at a separate, higher rate. Because multi-family and commercial classes do not fit well in an increasing block rate approach due to wide variations in their size and typical water use requirements, seasonal rates, with and without irrigation, were established for these customers. This rate structure will be thoroughly reviewed, as more historical information is available on the effect of the increasing block and seasonal rate structure.

G. Rate Equity

The rate structure shall fairly allocate costs between the different customer classes. Funding of the long-term Capital Investment Program also provides for rates that fairly spread costs over current and future customers.

Discussion:
As required under State law, Utility rates will provide equity in the rates charged to different customer classes. In general, rates by customer class are designed to reflect the contribution by a customer group to system-wide service demand, as determined by cost-of-service analysis. The RCW also authorizes utility rates to be designed to

accomplish "any other matters, which present a reasonable difference as a ground for distinction". For example, increasing water rates for irrigation and higher levels of use is allowed to encourage the wise use and conservation of a valuable resource. Formal rate studies are periodically conducted to assure ongoing rate equity between customer classes and guide any future rate modifications necessary to support changing Utility program or policy objectives.

Contributions from current rates to the R&R Account also provide equity between generations of rate payers by assuring that each user pays their fair share of capital improvements, including renewal and replacement, over the long-term. (See sections B and D under the Capital Investment Program Policies).

H. Rate Uniformity

Rates shall be uniform for all utility customers of the same class and level of service throughout the service area. However, special rates or surcharges may be established for specific areas, which require extraordinary capital investments and/or maintenance costs. Revenues from such special rates or surcharges and expenses from capital investments and/or extraordinary maintenance shall be accounted for in a manner to assure that they are used for the intended purposes.

Discussion:
The City Water and Sewer Utilities originally formed by assuming ownership of three separate operating water districts and two sewer districts. In the assumption agreements, each included a provision that requires the Utility to uniformly charge all customers of the same class throughout the entire service area. The basic rates are set for all customers, inside and outside of the City, except for local utility taxes in Bellevue and Medina, and franchise fees in Clyde Hill, Hunts Point, Medina, and Yarrow Point. Unlike the Water and Sewer Utilities, the Storm & Surface Water Utility only serves areas within the City limits.

Under state law, Utilities are required to charge uniform rates to all customers in a given customer class. The only exception permitted is for certain low-income customers (see below).

However, RCW 35.92.010 authorizes utilities to consider differences in the cost of service to various customers, location of customers within the service area, and other such factors that present a reasonable basis for distinction. When conditions in particular service areas require extraordinary capital improvement or maintenance costs to be incurred, special rates or surcharges may be adopted to recover those costs directly from properties contributing to the specific service demand, instead of assigning that cost burden to the general Utility rate base. This will only apply for costs above and beyond normal operations, maintenance and capital improvements. For example, rate surcharges were used to recover debt service costs for capital facilities in Lakemont and the CBD. An additional rate surcharge for Lakemont properties was collected for extraordinary maintenance costs of the storm water treatment facility.

I. Rate Assistance

Rate assistance programs shall be provided for specific low-income customers as permitted by State law.

Discussion:

Continual increases in all utility rates have had a significant impact on low-income customers. The City has adopted a rate discount or rebate program for disabled customers and senior citizens over 62 years old and with income below certain levels as permitted under State law and defined in Ordinance No. 6451. It discounts Utility rates by 70 percent, with the discount capped at a basic service level. Customers that indirectly pay for Utility charges through their rent can obtain a rebate for the prior year's Utility charges on the same criteria. The City also has an Emergency Assistance Program for low-income, direct-billed customers experiencing a financial shock and who are not otherwise qualified for the discount program offered to disabled customers and senior citizens. The cost of these programs is absorbed in the overall Utility expenses and is recovered through the rate base. The City also offers a Utility Occupation Tax rebate, provided by the General Fund, to all low-income citizens who live in the Bellevue Utilities service area.

V. Operating Reserve Policies

A. Operating Reserve Levels

The Utilities' biennial budget and rate recommendations shall provide funding for working capital, operating contingency, and plant emergency reserve components on a consolidated basis in accordance with the attached Summary of Recommended Consolidated Reserve Levels table and as subsequently updated.

Discussion:

Utility resources not spent for operations remain in the fund and are referred to as reserves. At the end of each year, these funds are carried forward to the next year's budget and become a revenue source for funding future programs and operations. Under the terms of this policy, the Utility budget is targeted to include a balance of funds for the specific purposes stated above. While included in the total operating budget, these reserves will only be available for use pursuant to these reserve policies. Setting aside these budget resources in the reserve balance will help to ensure continued financial rate stability in future Utility operations and protect Utility customers from service disruptions that might otherwise result from unforeseen economic or emergency events.

The working capital reserve is maintained to accommodate normal cyclical fluctuations within the two month billing cycle and during the budget year. These are higher for Water than for Sewer and Storm & Surface Water due to more variable revenues and expenditures. They are described in terms of a number of days of working capital as a percentage of a full-year's budget.

The operating contingency reserve protects against adverse financial performance or budget performance due to variations in revenues or expenses. Again, the Water Utility is most susceptible to year-to-year variations in water demand. They are described in terms of percentages of budgeted wholesale costs and operations and maintenance (O&M) costs.

The plant emergency contingency reserve provides protection against a system failure at some reasonable level. The Storm & Surface Water Utility requires the largest reserve due to the risk of major flood damage to Utility facilities. Water and Sewer Utilities protect against the cost of a major main break or failure. These do not protect against the loss of facilities that are covered by the City's Self-Insurance to which the Utilities pay annual premiums nor are they sufficient to respond to a major disaster, such as a major earthquake.

The reserves of the three utilities have historically been treated separately. This protects against cross-subsidy, thereby retaining rate equity for each utility, each of which has different customers. However, it results in higher reserve targets, with more funds retained than otherwise may be needed. Sharing risks among utilities can reduce reserves. This does not require that reserves actually be consolidated into a single fund, but simply that individual reserve targets reflect the strength provided by the availability of cross-utility support. Under the "consolidated" scenario, cash shortfalls in one reserve could be funded through inter-utility loans, to be repaid from future rates. The likelihood that a serious shortfall would occur in more than one fund at the same time is slight and the benefits of lower overall reserve levels will benefit rate payers. Also, the rate policies and the debt coverage policy will ensure that there will be a strong financial response to any significant shortfall. The risk is considered a prudent financial policy.

City of Bellevue

Summary of Recommended Consolidated Reserve Levels*

	Water		Wastewater		Storm Drainage	
Type of Reserve	**Basis**	**Level**	**Basis**	**Level**	**Basis**	**Level**
Working Capital – Reserves against revenue and expense fluctuations within the 2 month billing cycle and during the budget year.	48 days of budgeted O&M costs (excludes debt service, capital funding).	$6,514,400	30 days of Metro costs and 20 days of City O&M costs (excludes debt service, capital funding).	$4,239,800	29 days of budgeted O&M costs (excludes debt service, capital funding).	$1,192,300
Operating Contingency – Reserves against annual budget shortfalls due to poor financial performance.	7.5% of water purchase costs and 11.0% of other water O&M costs.	$4,640,400	2.0% of Metro costs and 5.0% of other wastewater O&M costs.	$1,671,500	2.5% of O&M costs.	$375,200
Plant Emergency Contingency – Reserves against failure of a major facility or piece of equipment.	Cost for repair of water main break.	$100,000	Cost of repair for wastewater main break.	$100,000	Based on potential net cost of flood damage.	$500,000
Less: Allowance for duplicating or offsetting reserves	None.	$0	Working Capital and Operating Contingency include offsetting reserves equal to 2.0% of all O&M.	($1,148,000)	None.	$0
Less: Allowance for consolidating reserves	2.5% of O&M expenses for interfund charges between utilities.	($660,800)	1.0% City O&M for interfund charges between utilities.	($174,500)	1.0% of City O&M for interfund charges between utilities.	($150,100)
	Share of reduced plant emergency reserve.	($15,000)	Share of reduced plant emergency reserve.	($15,000)	Share of reduced plant emergency reserve.	($70,000)
	Lesser of min. working capital or plant emergency reserves.	($85,000)	Lesser of min. working capital or plant emergency reserves.	($85,000)	Lesser of min. working capital or plant emergency reserves.	($220,000)
Total		**$10,494,000**		**$4,588,800**		**$1,627,400**

* - Reserve levels based on proposed 2023 Utility budgets.

For this purpose, O&M costs are the entire annual operating budget of the Utility less the annual debt service, Capital Investment Program transfers and R&R Account transfers. Independent reserve levels are the levels that would be required by an individual Utility Fund (Water, Sewer and Storm & Surface Water) at any point in time to cover financial obligations if any one of the three reserve components where called for; i.e., working capital, operating contingency or plant emergency. At any single time, the full independent reserve levels should be available for the individual stated purpose, again because it is unlikely that all three components would be called for at once. For example, the Water Utility needs $100,000 available for an emergency repair but it is not likely that the Sewer Utility will need $100,000 and the Storm & Surface Water Utility will need $500,000 all at the same point in time.

The consolidated basis is for budget and rate setting purposes only, to reduce the total revenue requirement by considering the reserve risk shared between the three utilities. The dual reserve levels should be considered as circumstances evolve.

In 2004, the Financial Consulting Solution Group (FCSG) performed an analysis of recommended changes to the Water Utility's working capital and operating contingency reserves to reflect the new wholesale water contract with CWA and to update reserve levels for current conditions. Under the new contract, billing practices for wholesale costs have changed as follows:

CWA payment occurs before the associated revenues are collected, resulting in a greater lag between wholesale expense and when revenues are collected.

CWA payments are distributed over the whole year based on predetermined percentages and not based on actual consumption during the year. Due to seasonal revenue variation, there is an accumulative deficit in revenues prior to the peak revenue period.

In addition, the total costs to Bellevue are now largely fixed for the year due to the "take or pay" nature of the contract between CWA and Seattle Public Utilities. This shifts the risk during a poor water sales year to the City since there will not be a corresponding reduction in water purchase costs when water sales are down.

Changes in both billing practices as well as the fixed nature of the wholesale costs will result in an increase in required reserves for working capital and operating contingency for the Water Fund.

As part of their 2004 analysis, FCSG recommended increasing working capital operating reserve requirements for the Water fund from 48 days of budgeted O&M costs (excluding debt service and capital funding) to 70 days. The change was primarily related to an expected increase in seasonal revenue variation resulting from Cascade's fixed monthly billing percentages. However, our experience has been that since implementing the change in 2005 there has been essentially no increase in seasonal revenue variation. As a result, beginning in 2011, working capital operating reserve requirements for the Water fund will be reduced from 70 days of budgeted O&M costs (excluding debt service and capital funding) to the original level of 48 days.

B. Management of Operating Reserves

Related to the recommended target reserve levels, a working range of reserves is established with minimum and target levels. Management of reserves will be based on the level of reserves with respect to these thresholds, as follows:

Above target - Reserve levels will be reduced back to the target level by transferring excess funds to the R&R Accounts in a manner consistent with the long-range financial plan.

Between Minimum and Target - Rate increases would be imposed sufficient to ensure that: 1) reserves would not fall below the minimum in an adverse year; and 2) reserves would recover 50% of the shortfall from target levels in a normal year. Depending on the specific circumstances, either of these may be the constraint, which defines the rate increase needed.

Below Minimum - Rate increases would be imposed sufficient to ensure that even with adverse financial performance, reserves would return at least to the minimum at the end of the following year. To meet this "worst case" standard, a year of normal performance would be likely to recover reserve levels rapidly toward target levels.

Negative Balance - Reserves would be borrowed from another utility to meet working capital needs. Similar to the "below minimum" scenario, rate increases would be imposed sufficient to ensure that even with adverse financial performance, reserves would return from the negative balance to at least the minimum target at the end of the following year, which would allow for loan repayment within that time frame.

Discussion:
Target and minimum reserves are established as part of each fund's long-range financial plan. Management to target reserve levels reflects the recommended reserve levels summarized in section V.A, plus consideration of additional reserves necessary to accommodate one-time costs and planned rate smoothing.

"Adverse financial performance" or "worst case" are defined by the 95% confidence interval based on historical patterns. The worst case year is currently defined as a year with sales volumes 15% below the sales volume for a normal year. This was determined by using statistical measurements of sales volumes for 18 years with a 95% confidence interval. That is, in any given year there is only a 5% chance that the worst case year would be more than 15% below the normal year. Another way to say the same thing is that in 19 out of 20 years the worst case year would not be more than 15% below the normal year.

Maintaining the 95% confidence interval, as more and more data becomes available, a worst case year could change upward or downward from the 15% variation from a normal year.

The recommended reserve policies are premised on the vital expectation that reserves are to be used and reserve-levels will fluctuate. Although budget and rate planning are expected to use the target reserve number, reserve levels planned to remain static are by definition unnecessary. It is therefore important to plan for managing the reserves within a working range between the minimum and target levels as stated in the above policies. There may be situations in short-range financial planning where reserves are maintained above target levels to overcome peaks in actual expenses.

In the event of an inter-utility loan, the balance for the borrowing utility would essentially be any cash balance less the amount owed. The lending utility would count the note as a part of its reserves, so that it does not unnecessarily increase rates to replenish reserves that are loaned.

In this management approach, there is still a risk that a major plant emergency could exceed the amount reserved. Such a major shortfall would require rate action to assure a certain level of replenishment in one year. To avoid rate spikes due to this type of action, they should be considered on a case-by-case basis. This will provide the flexibility to use debt or capital reserves in lieu of operating reserves to cover the cost and allow a moderated approach to replenishing reserves out of rates.

C. Asset Replacement Reserves

Utility funds will maintain separate Asset Replacement Accounts to provide a source of funding for future replacement of operating equipment and systems.

Anticipated replacement costs by year for the upcoming 20-year period, for all Utility asset and equipment items, will be developed as a part of each biennial budget preparation process. Budgeted contribution to the Asset Replacement

Account will be based on the annual amount needed to maintain a positive cash flow balance in the Asset Replacement Account over the 20-year forecast period. At a minimum, the ending Asset Replacement Account balance in each Utility will equal, on average, the next year's projected replacement costs for that fund.

The Utilities Department will observe adopted Equipment Rental Fund (ERF) and Information Services budget policies and procedures in formulating recommendations regarding specific equipment items to be replaced.

Discussion:
Providing reserves for equipment and information technology systems replacement allows monies to be set aside over the service life of these items to pay for their eventual replacement and alleviate one-time rate impacts that these purchases might otherwise require. Annual revenues set aside for this purpose will be based on aggregate Utility asset replacement cash flow needs over the long-term forecast period, instead of individual asset replacement amounts. This strategy will allow Utilities to minimize the progressive build-up of excess Asset Replacement Account balances that would result from creating and funding separate reserve accounts for individual Utility asset and equipment items.

Attachment A
Ordinance 4783

WP0459C-ORD
06/27/95

ORIGINAL

CITY OF BELLEVUE, WASHINGTON

ORDINANCE NO. 4783

AN ORDINANCE creating utility capital replacement accounts for the Water, Sewer and Storm and Surface Water Utilities within the Utility Capital Investment Fund for the purpose of accumulating funding for long term replacement of utility facilities.

WHEREAS, the Utilities 1995 Cost Containment Study prepared by Financial Consulting Solutions Group, Inc. (FCSG) recommends that current utility rates recover from the ratepayers amounts which at a minimum are equal to the depreciated value of the original cost of utility facilities and at a maximum are amounts equal to the replacement value of utility infrastructure; and

WHEREAS, FCSG recommends that utility funds not needed for current expenditure be placed in a replacement account to be used in the future in combination with current revenues and/or debt financing to replace capital facilities nearing the end of their useful life; and

WHEREAS, implementation of FCSG's recommendations would promote intergenerational rate equity and provide more stable rates to customers over the long term; and

WHEREAS, the Council desires to make an initial, 1995 deposit of $600,000 in savings from the Water Fund into the new capital replacement account for the Water Utility; now, therefore,

THE CITY COUNCIL OF THE CITY OF BELLEVUE, WASHINGTON, DOES ORDAIN AS FOLLOWS:

Section 1. The purpose of this ordinance is to establish capital facilities replacement accounts within the Utility Capital Investment Fund in order to assure a future funding source for replacement of utility facilities nearing the end of their useful life. The City Council will determine each year, as part of the adoption of the utilities operating budgets, how much, if any, utility revenue during the upcoming year shall be designated for transfer to a replacement account. The City Council may also authorize the receipt of other funds directly into these capital facility replacement accounts. Once deposited the funds will accumulate with interest. The decision regarding when and how to utilize such accumulated funds for the replacement of utility facilities will be made as part of the Utility Comprehensive Plans and Utility Capital Investment Program approval process.

ORIGINAL

WP0459C-ORD
06/27/95

Section 2. The following new accounts are established in the Utility Capital Investment Fund:

Capital Facilities Replacement Account - Sewer
Capital Facilities Replacement Account - Water
Capital Facilities Replacement Account - Storm and Surface Water

Section 3. There is hereby authorized the 1995 transfer from the Water Utility Operating Fund to the Capital Facilities Replacement Account - Water the amount of $600,000.

Section 4. This ordinance shall take effect and be in force five days after its passage and legal publication.

PASSED by the City Council this 24th day of July, 1995, and signed in authentication of its passage this 24th day of July, 1995.

(SEAL)

Donald S. Davidson, DDS, Mayor

Approved as to form:

Richard L. Andrews, City Attorney

Richard L. Kirkby, Assistant City Attorney

Attest:

Myrna L. Basich, City Clerk

Published July 28, 1995

Attachment B
Resolution 5759

WP0254C-RES
03/03/94

CITY OF BELLEVUE, WASHINGTON

RESOLUTION NO. 5759

A RESOLUTION relating to financial policy for the Waterworks Utility and adopting a debt service coverage policy for the Waterworks Utility

WHEREAS, the City of Bellevue is consistently recognized for its prudent financial management; and

WHEREAS, the City of Bellevue's Water and Sewer Bonds are currently rated Aa by Moody's Investor Services and AA- by Standard & Poor's Corporation, which are considered to be excellent ratings; and

WHEREAS, these excellent ratings result in lower interest costs on the City's Water and Sewer bonds, which, in turn, may result in lower water, sewer and storm drainage costs; and

WHEREAS, it is important to the rating agencies and to the financial community that the City articulate its financial goals for its Waterworks Utility; and

WHEREAS, a desirable debt service coverage ratio, the ratio of revenues available for debt service to the annual debt service requirement, positively affects the Utility's bond ratings; and

WHEREAS, the City Council deems it in the City's best interest to establish a debt service coverage policy target for the purpose of protecting its current bond rating and to allow for the development of financial projections, NOW, THEREFORE,

THE CITY COUNCIL OF THE CITY OF BELLEVUE, WASHINGTON, DOES RESOLVE AS FOLLOWS:

Section 1. The City Council hereby adopts the following debt service coverage policy for the bonds issued by the City's Waterworks Utility.

The City Council will establish utility rates/charges and appropriations in a manner intended to achieve a debt service coverage ratio (adjusted by including City taxes as an expense item) of approximately 2.00. The City Council authorizes the Waterworks Utility to utilize this policy in development of pro

WP0254C-RES
03/03/94

forma projections which will be disseminated to the bond rating agencies and to the financial community generally.

PASSED by the City Council this 7th day of March, 1994, and signed in authentication of its passage this 8th day of March, 1994.

(SEAL)

Donald S. Davidson, DDS, Mayor

Attest:

Myrna L. Basich, City Clerk

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Chapter 3 Basic Planning Data

The City's water service area experienced significant population growth throughout the 2010s and 2020s, particularly in the downtown area. The service area population has continued to expand and is projected to approach 247,000 by 2046. Most of the growth is anticipated to occur in the Downtown, Wilburton, and BelRed Neighborhoods.

This chapter summarizes recent trends in population and water usage, establishes criteria for per capita and seasonal demands, and projects future population and water demands over the 10-year and 20-year planning periods.

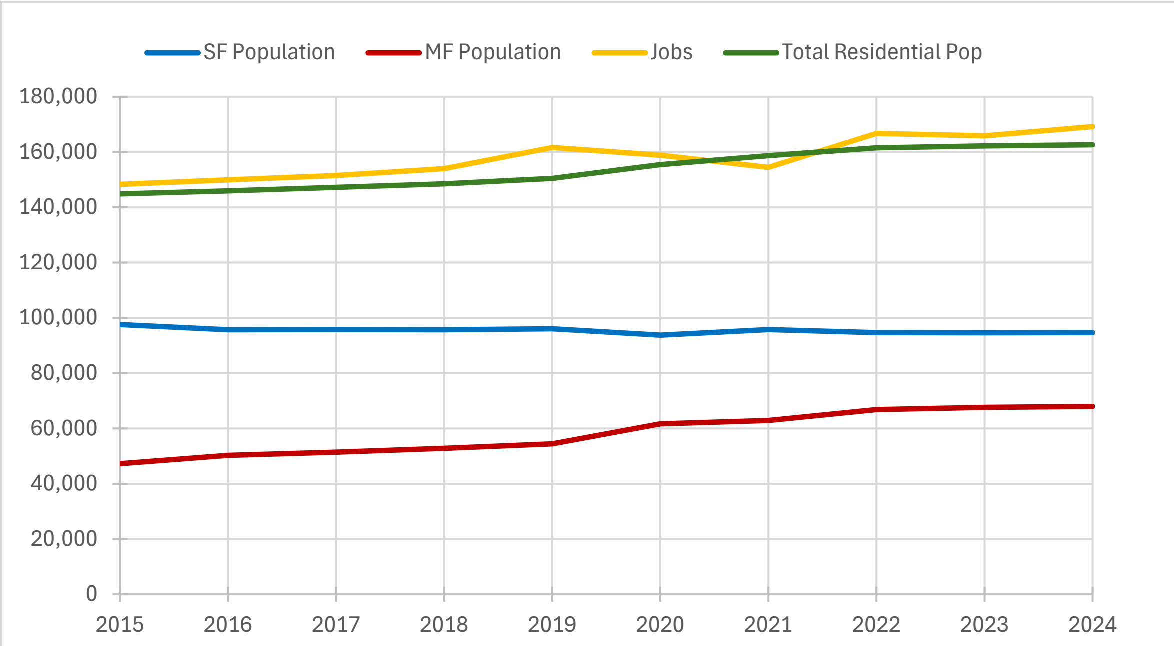
3.1 Current Population

Recent historical population and employment estimates for the City's retail water service area are provided in Table 3-1 and Figure 3-1. This data is provided by the City's Community Development Department (CDD). "SF" and "MF" refer to populations living in single-family and multi-family housing units, respectively. "Jobs" refers to employment.

Table 3-1: Recent Water Service Area Population and Employment

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
SF Population	97,586	95,716	95,789	95,691	96,043	93,759	95,768	94,666	94,590	94,647
MF Population	47,266	50,256	51,448	52,804	54,438	61,658	62,908	66,844	67,645	67,968
Total Population	144,852	145,972	147,237	148,495	150,481	155,417	158,676	161,510	162,235	162,615
Jobs	148,313	149,956	151,488	153,989	161,656	158,872	154,469	166,697	165,881	169,183

Figure 3-1: Historical Population



Multi-family population has grown seven percent from 2015-2024, and employment has grown 2.5 percent in that time. Meanwhile, the single-family population slightly decreased by one percent between 2015 and 2024.

Table 3-2 shows current estimates of average household size and employee density throughout the City, as provided by CDD. It is assumed that similar household size is also applicable in water service areas outside the City (Clyde Hill, Medina, Hunts Point, Yarrow Point, and unincorporated King County). These figures are used for overall system planning only; localized variations in household size and density should be considered for design purposes.

Table 3-2: Average Household Size and Employee Density

	Current CDD Estimate	2016 Water System Plan Estimate
Population Per Household		
Single Family	2.9	2.8
Multi Family	1.9	1.9
Employees per 1,000 Square Feet		
Downtown Office	3.8	3.7
Downtown Retail	2.6	3.0
Office (Outside Downtown)	3.2	3.1
Retail (Outside Downtown)	1.9	2.6
Industrial	1.7	1.6

1. Densities provided by the CDD – for planning purposes and not the same as historical values in Table 3-4.

Household sizes and employee densities have remained relatively stable since the 2016 WSP, except for retail employee density, which has dropped. It is assumed that average household size and employee density will remain stable for the purposes of water demand projections later in this chapter.

Service Connections

Table 3-3 and Figure 3-2 show the number of active retail customer accounts in the City's water service area during January of each year from 2015 through 2024. For the purposes of this WSP:

- "Retail" refers to direct water sales to customers within the City's service area. Retail volumes do not include water wheeled to other utilities or non-revenue demands.
- "Wheeled" refers to water that passes through one utility to another. Some amount of water originating in SPU's supply pipelines is wheeled both into and out of the City. The CCUD and Kirkland wheel water to the City, while the City wheels water to Redmond and Issaquah (also WD22 and/or WD117 during emergencies). Most wheeled water is metered through interties, however, there are a few locations where wheeled water is measured by direct service meter reads. This is due to the overlap of municipal boundaries with historic pressure zones and distribution systems like WD99, which served residents in both Redmond and the City.
- "Wholesale" refers to the total amount of water flowing into the City's water distribution system from the regional supply. This includes retail and non-revenue demands, plus any water wheeled by the City to adjacent utilities.

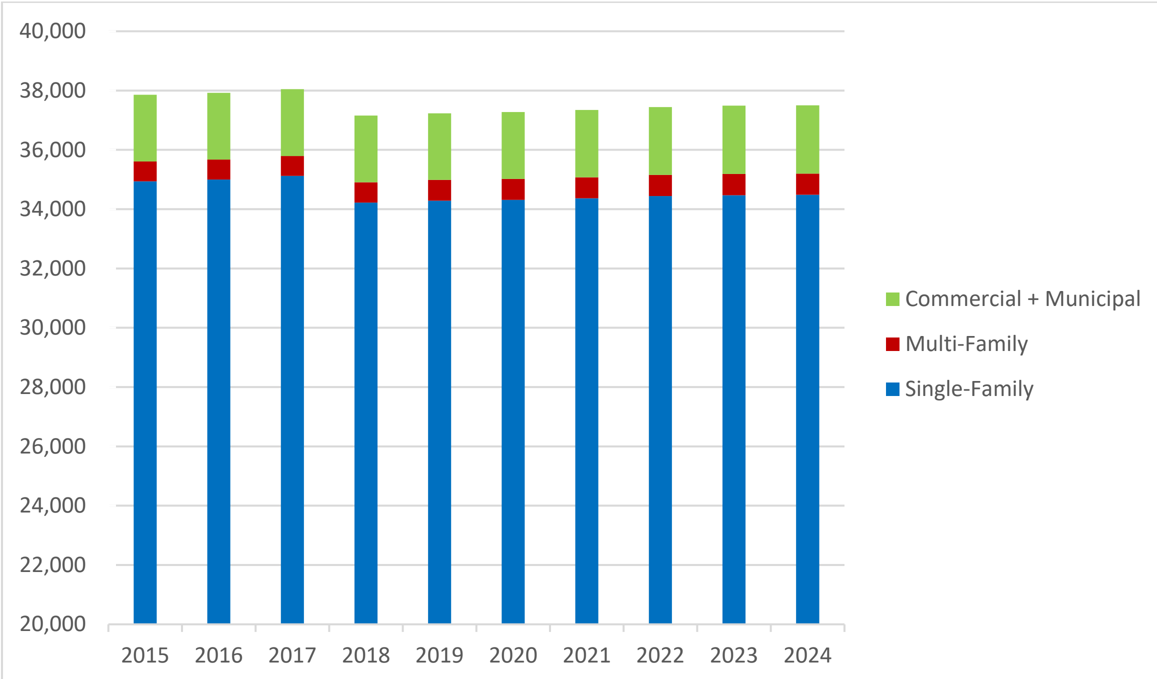
Table 3-3: Number of Retail Customer Accounts

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Single Family Residential	34,941	35,001	35,122	34,222	34,284	34,312	34,365	34,443	34,471	34,484
Multi-Family Residential	668	673	672	684	705	711	710	714	718	717
Commercial & Municipal	2,247	2,249	2,253	2,253	2,246	2,251	2,272	2,288	2,302	2,303
Total	37,856	37,923	38,047	37,159	37,235	37,274	37,347	37,445	37,491	37,504

The number of accounts shown is less than the actual number of meter connections, because many commercial and multi-family customer accounts have multiple meters (e.g. for multiple buildings, separate domestic/irrigation, etc.). More information on meters is provided in Chapter 6 and the WFI Form in Appendix B.

Most customer accounts are for single-family residences because each water service connection serves one residential dwelling unit (household). The number of multi-family and commercial accounts are small (compared to single-family). However, multi-family and commercial use accounts have large variation in both the type and amount of water used and people served.

Figure 3-2: Number of Retail Customer Accounts



Multi-family accounts have grown at a rate of approximately seven percent per year while single-family and commercial accounts have remained relatively stable. This is likely due to changes in land use zoning (described in the City's Comprehensive Plan) that encourage multi-family development.

3.2 Current Water Demand

Table 3-4 shows the annual volume of wholesale water delivered to the City from 2015-2024. This "wholesale" volume represents all water flowing into the City's water distribution system from the regional supply, including water that is subsequently sold to retail customers, water wheeled to Issaquah, Kirkland, Redmond, and non-revenue demand.

Table 3-4: Wholesale Water Supply Volumes (MG)

	2015[1]	2016[1]	2017	2018	2019	2020	2021	2022	2023	2024
SPU	-	-	6,019	5,753	5,571	5,390	5,800	5,658	5,911	5,571
Kirkland[2]	16	15	13	33	11	11	13	12	11	7
CCUD[2]	-	-	189	156	145	161	186	132	157	156
Total	6,048	5,921	6,221	5,941	5,727	5,562	6,000	5,802	6,078	5,735

1. Inlet totals for Coal Creek master meters were not available for 2015 or 2016, so SPU total could not be calculated.
2. Wheeled water from SPU

Water Demand by Customer Class

Table 3-5 shows annual retail water and irrigation usage trends by customer class from 2015-2024. The "Commercial & Municipal" category includes all non-residential customers. This data includes total domestic and irrigation usage billed to each class of customer.

Table 3-5: Billed Retail Usage (MG)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
SF Residential Water	2,492	2,386	2,375	2,365	2,195	2,329	2,452	2,280	2,287	2,190
SF Residential Irrigation	29	26	25	25	20	20	24	23	25	23
MF Residential Water	1,109	1,127	1,115	1,117	1,097	1,177	1,177	1,164	1,149	1,144
MF Residential Irrigation	76	77	78	78	75	69	81	69	87	70
Commercial & Municipal Water	1,200	1,188	1,179	1,180	1,147	899	929	1,035	1,065	1,078
Commercial + Municipal Irrigation	347	294	308	293	255	240	317	293	344	307
Total	5,254	5,098	5,080	5,058	4,789	4,733	4,980	4,864	4,957	4,812

Table 3-6 summarizes historical per capita water usage trends by customer class (including domestic and irrigation usage). Per capita and per job demands are calculated by dividing total billed usage (Table 3-5) by the total estimated population and jobs, respectively, (Table 3-1) provided by CDD.

Table 3-6: Daily Water Usage (gal/day)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
SF Per Capita	70.8	68.8	68.6	68.4	63.2	68.5	70.8	66.6	67.0	63.9
MF Per Capita	68.7	65.5	63.5	62.0	59.0	55.2	55.4	50.5	50.0	48.8
Commercial & Municipal Per Job	28.6	27.0	26.9	26.2	23.8	19.6	21.9	21.8	23.3	22.4

Figure 3-3 shows a continued decline in per capita usage. Historically, single-family per capita usage was consistently higher than multi-family per capita usage, and this trend continues through 2024. These values are lower than the maximum and minimum per capita use rates from the 2016 WSP, which were calculated using values from 2005-2014, showing that this overall decline in per capita use is consistent with the trend shown in the 2016 plan. The overall decline in per capita water usage is discussed further in Chapter 5.

Figure 3-3: 2015-2024 Per Capita Retail Usage

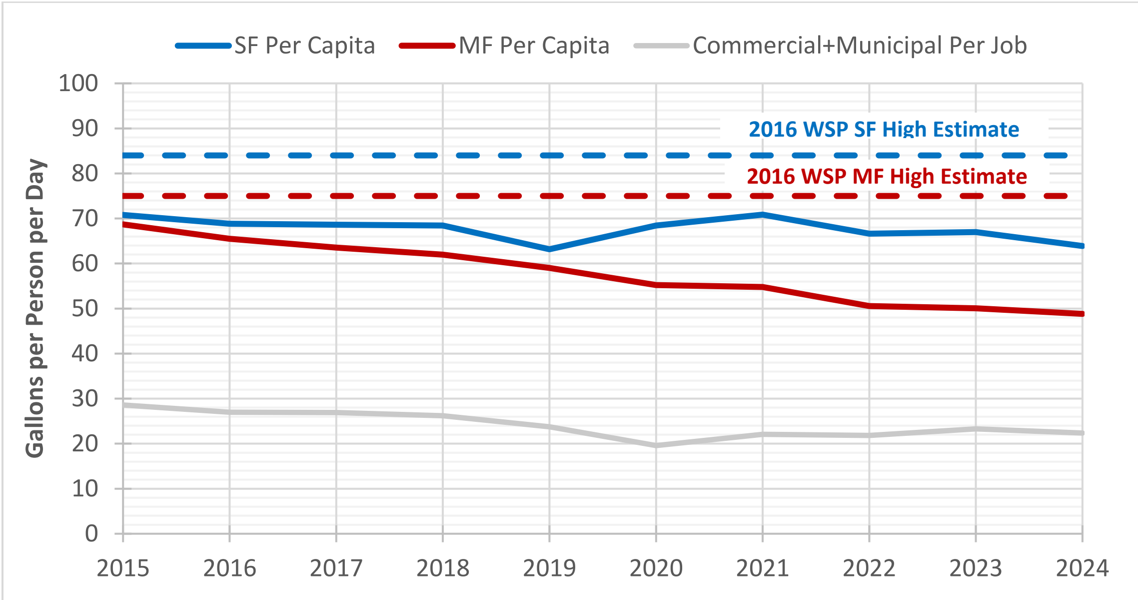
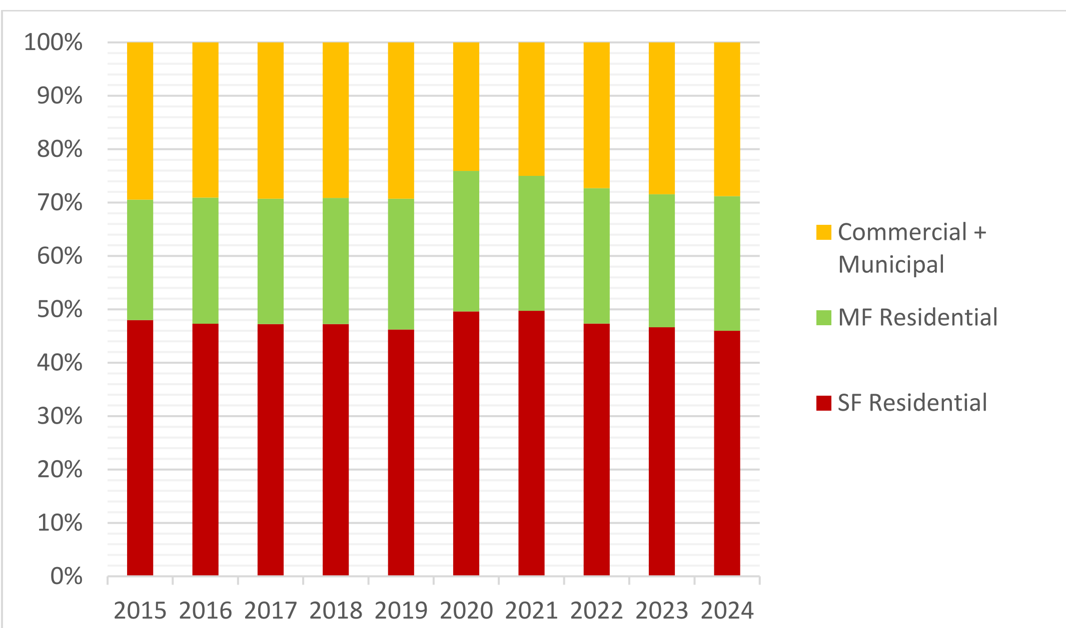


Figure 3-4 shows the percentages of retail water usage by customer class. The historical data indicates a relatively consistent portion of usage by customer class, with single-family residential accounting for almost half of the usage on an annual basis. The fluctuations in 2020 and 2021 are likely due to the COVID Pandemic when people were working from home and students were taking classes online.

Figure 3-4: Percent of Retail Water Usage by Customer Class



Equivalent Residential Units

An ERU is a system-specific unit of measure used to express the amount of water consumed by a typical full-time single-family residence (WAC 246-290-010). ERUs allow varying types of water use to be compared for design and evaluation of water systems.

An ERU is derived by comparing the total annual amount of water consumed by single-family service types to the total number of occupied homes. Single-family services are utilized for ERUs because they are the most common type of service and have relatively uniform water use patterns. ERUs can inform total system demand for a diverse customer base and facilitate forecasting of water supply needs.

Values for ERUs are time and population-dependent and will vary based on the duration and population data being considered. ERU planning values can be established for average day demand (ADD), typically the average daily amount for a year's worth of consumption, and for MDD for the peak day of consumption occurring during a calendar year using historical single-family usage records; these planning values are referred to as ERU_{ADD} and ERU_{MDD}, respectively.

Table 3-7 shows single-family housing statistics for the 2015-2024 period, which is necessary to calculate ERUs, along with the historical ERU_{ADD} values based upon the per capita water usage in Table 3-6.

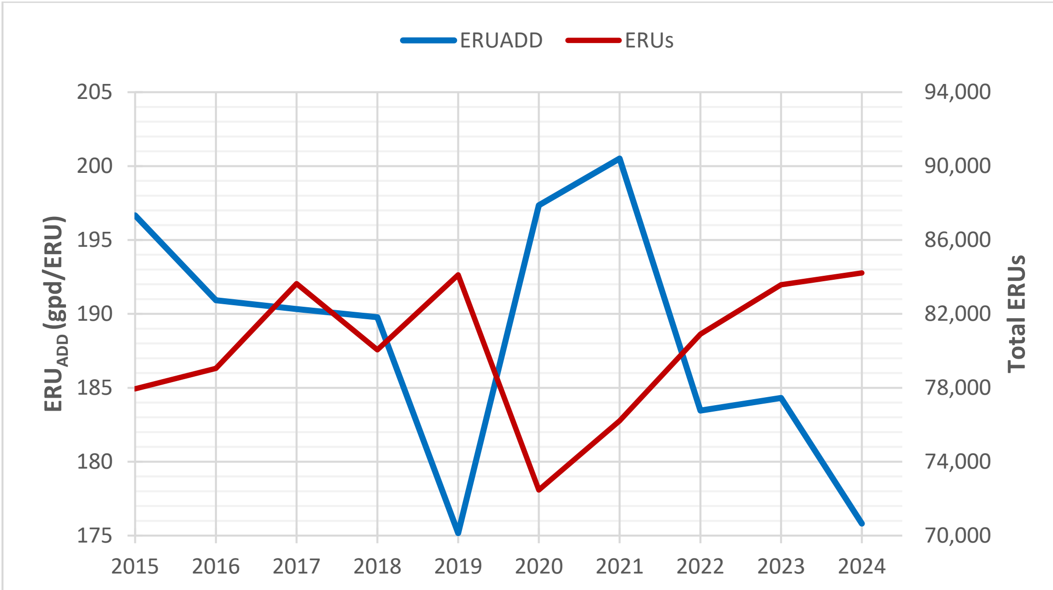
Table 3-7: Single-Family Housing and Occupancy

	2015	2016	2017	2018	2019	2020	2021[1]	2022	2023	2024
Singe Family Units	36,325	35,388	35,416	35,490	35,615	33,445	33,879	35,684	35,745	35,754
Occupied SF Units	35,131	34,515	34,542	34,506	34,632	32,522	N/A[1]	34,386	34,371	34,385
Vacant Single-Family Units	1,194	873	874	984	983	923	N/A[1]	1,298	1,374	1,369
SF Occupancy %	97%	98%	98%	97%	97%	97%	N/A[1]	96%	96%	96%
Pop/SF Household	2.78	2.77	2.77	2.77	2.77	2.88	2.83	2.75	2.75	2.75
Equivalent Residential Unit (ERU_{ADD})	197	191	190	190	175	197	200	183	184	176

1. 2021 occupancy data is unavailable.

Figure 3-5 illustrates the historical annual ERU_{ADD} in gallons per day (gpd) per occupied single-family household within the City's service area, and the total amount of water supplied to the City (ERU), including the water wheeled to adjacent utilities and unaccounted water.

Figure 3-5: Historical ERUs and ERU_{ADD}



Total ERUs can fluctuate over time due to changes in consumption patterns by single family households. The total number of ERUs will vary inversely to some extent with the relative usage of single-family residential accounts, i.e. the less water consumed by single-family households (compared to other types of accounts) if other usage classifications remain stable, as shown by the generally inverse shape of the lines in Figure 3-5. This occurs because as the ERU_{ADD} increases, multi-family and commercial accounts with stable water demand will consume fewer ERUs, and vice versa (despite consuming the same volume of water).

Figure 3-6 shows the total number of ERUs broken down by wholesale usage, including retail sales (in the City's service area), sales of water "wheeled" to other utilities, and non-revenue volume. Figure 3-7 shows the total number of retail-only ERUs (ERUs for billed usage in the City's water service area) broken down by customer categories.

Figure 3-6: Equivalent Residential Units by Wholesale Category

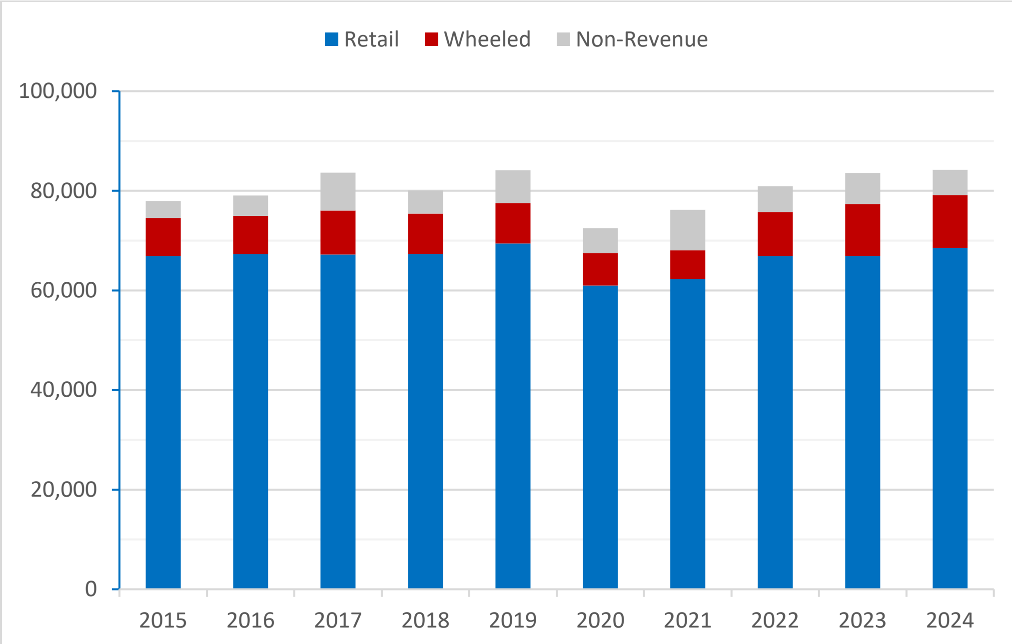
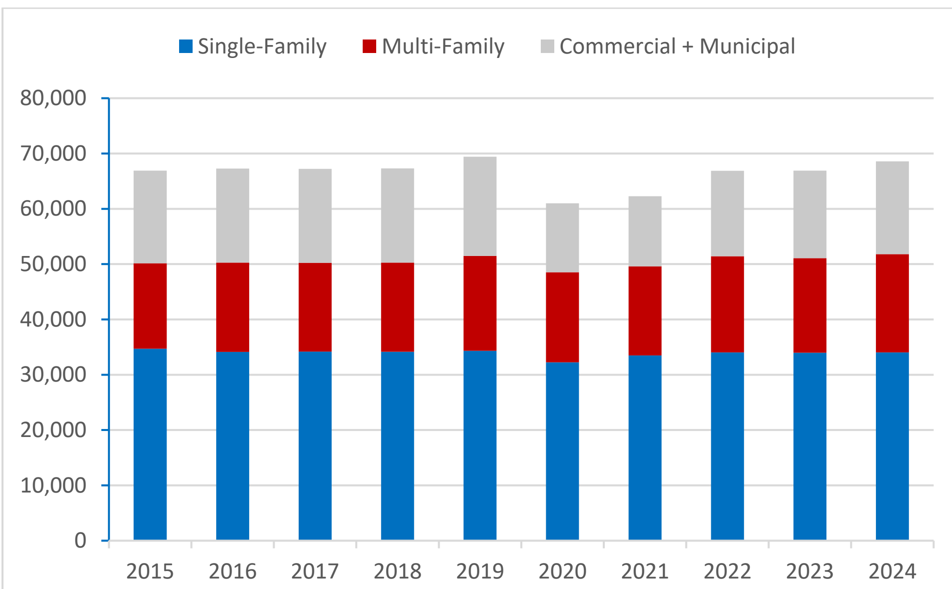


Figure 3-7: Equivalent Residential Units by Retail Classification



Demands from Adjacent Utilities

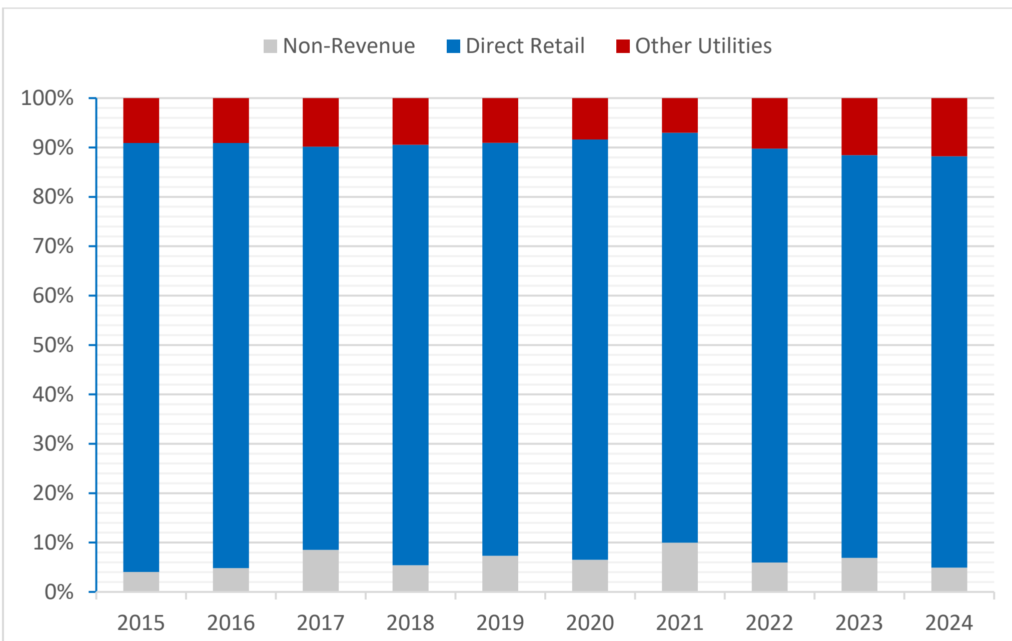
Table 3-8 summarizes recent demands (retail and wheeled) and non-revenue usage—authorized unmetered usage and distribution system leakage (DSL). The South Cove area of Issaquah is included with direct retail sales in this table until 2017, when it transitioned from direct retail sales in the City's service area to being metered separately as wheeled water, following Issaquah's assumption.

Table 3-8: Water Sales and Usage (MG)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Direct Retail	5,254	5,098	5,080	5,058	4,789	4,733	4,980	4,864	4,957	4,812
Redmond	507	499	494	444	410	351	304	476	587	574
Issaquah	42	39	118	117	109	115	117	116	115	107
Authorized Unmetered Usage	14	16	16	18	14	13	19	22	29	22
DSL	230	269	513	304	406	350	580	324	390	219
Total	6,048	5,921	6,221	5,941	5,727	5,562	6,000	5,802	6,078	5,735

Figure 3-8 shows the percentage of total usage by retail, wheeled and non-revenue demands. Wholesale demand wheeled to adjacent utilities is consistently 9 to 12 percent of total demand, other than a small dip in 2020 and 2021.

Figure 3-8: Percent of Total Usage by Category



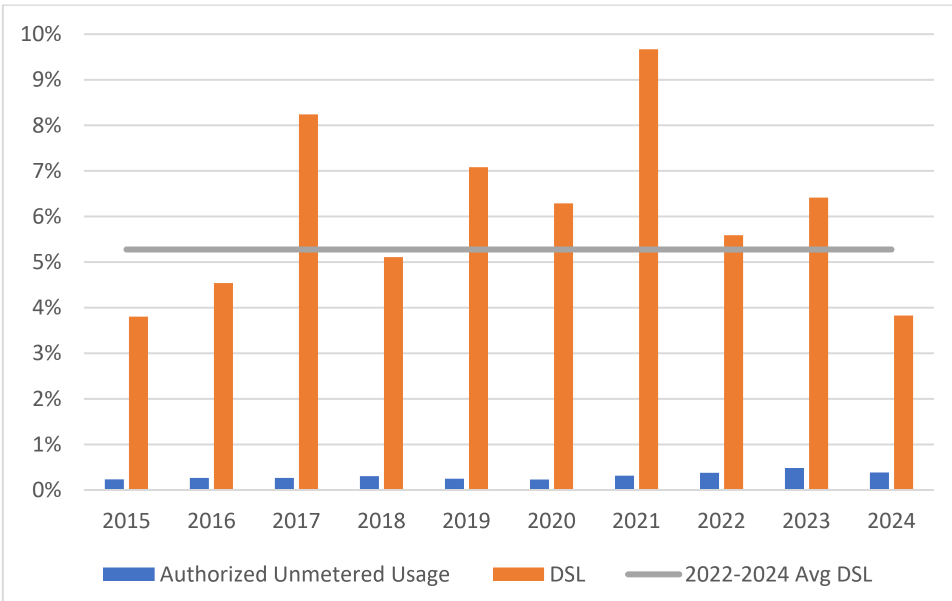
Non-Revenue Demand

Non-revenue demand includes authorized unmetered consumption and DSL. Authorized and unmetered consumption includes operations like flushing, tank draining and cleaning, and firefighting. DSL includes apparent losses like meter inaccuracies and real losses like unauthorized usage (theft), water main breaks, reservoir overflows, or general distribution system leakage.

Consumption by unmetered customers/connections to the water system, like unmetered emergency interties to neighboring systems is counted as DSL until a meter is installed[11].

Figure 3-9 illustrates the City's historical DSL with respect to their most recent three-year average. The City's DSL ranged from five percent to less than eight percent of overall supply to the system between 2015-2024. The most recent three-year historical average non-revenue demand used for planning purposes is 5.28, which is below the mandated threshold of 10 percent that requires implementation of a Water Loss Control Action Plan in accordance with WAC 246-290-820. There is no national standard, but the guidance given by various states for maximum non-revenue demand is typically between 10 and 15 percent[13].

Figure 3-9: Non-Revenue Water Volume (% of Total)



For future planning purposes, the three-year average non-revenue demands which equal 5.7 percent is used to estimate future flows for the City's system. Although higher non-revenue flows (up to 10 percent) did occur in 2017, 2019-2021, and 2023, the DOH recommends using a three-year rolling average as a most recent example DSL. For system-wide forecasting of water supply needs, application of non-revenue flows higher than seven percent to a high-demand year would be overly conservative. However, for localized analysis, nine percent non-revenue demands may be appropriate to account for potential localized variations, since the sources of these demands are not well understood.

Additional detailed information on non-revenue flow is provided in Chapter 5.

[11] Water Use Efficiency Guidebook Fourth Edition, DOH Publication 331-375, May 2025

[13] EPA, *Control and Mitigation of Drinking Water Losses in Distribution Systems*, EPA 816-R-10-019, November 2010.

3.3 Seasonal Variations in Demand

Figure 3-10 shows the total volume of water purchased by the City for each month during the 2015-2024 period, including non-revenue demands and water wheeled to adjacent utilities. This chart demonstrates the typical pattern of seasonal demand changes. Figure 3-11 shows the same data in a line graph format and overlays the average monthly historical volume (thick black line) during the same period.

Figure 3-10: 2015-2024 Monthly Total Supplied Water

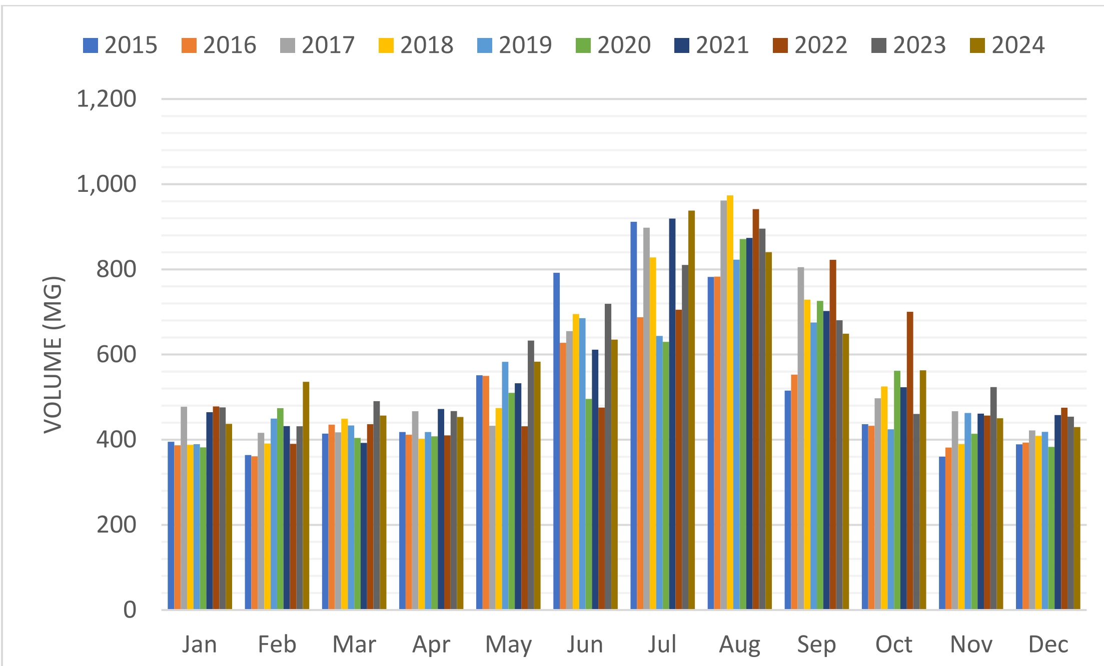


Figure 3-11: 2005-2013 Average Monthly Supplied Water

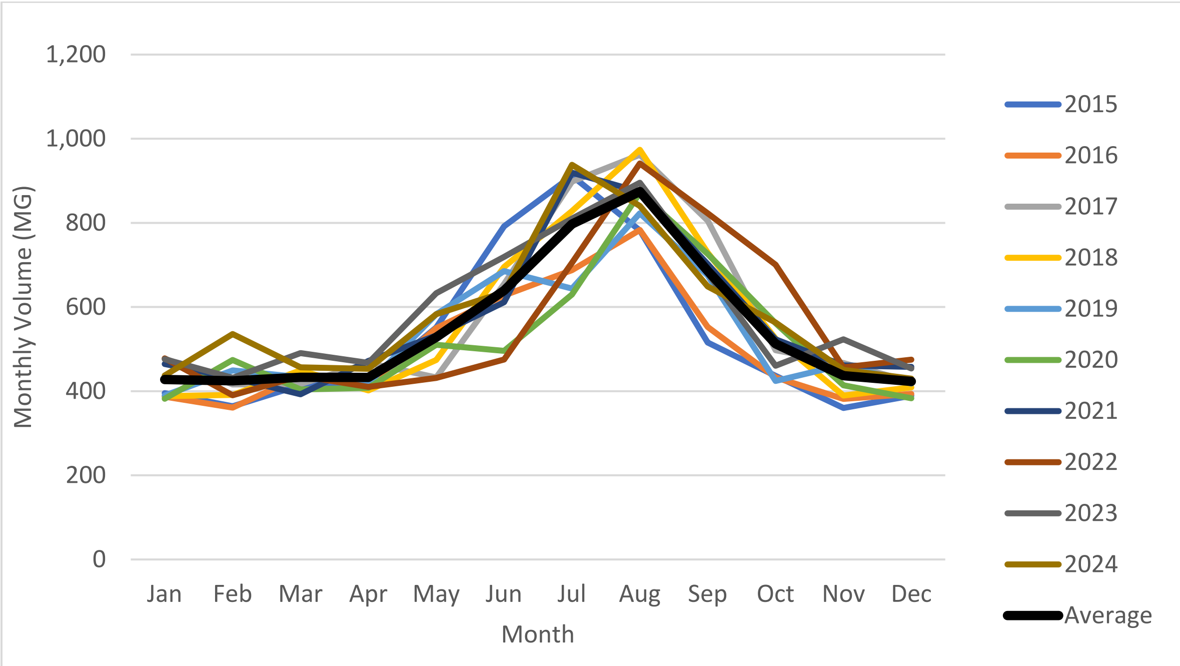
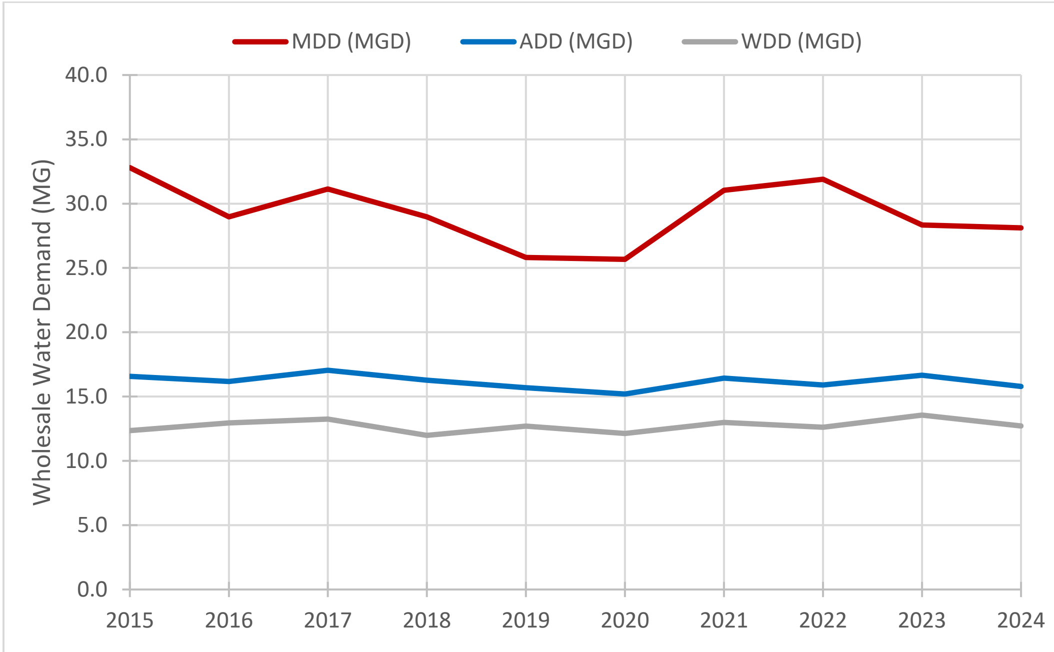


Table 3-9 and Figure 3-12 show the total system ADD, average monthly demand (AMD), MDD, max month demand (MMD) and average winter day demand (WDD) from 2015 to 2024. This data includes all water purchased by the City which is retail, wheeled, and non-revenue water. The City established WDD to represent the average demand each year from November through April, when demand is typically stable and minimal in the local service area (as evident in Figure 3-10). WDD is also useful in estimating domestic sewage flows.

Table 3-9: Average Day, Maximum Day, and Winter Day Demands (MG)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
ADD (MGD)	16.6	16.2	17.0	16.3	15.7	15.2	16.4	15.9	16.7	15.7
AMD (MG/Month)	504	493	518	495	477	464	500	484	507	478
MDD (MGD)	32.8	29.0	31.1	29.0	25.8	25.7	31.0	31.9	28.3	28.1
Date	6-Jul	19-Aug	4-Aug	28-Jul	12-Jun	17-Aug	28-Jun	8-Aug	8-Aug	1-Jul
MMD (MG/Month)	911.9	783.1	807.7	762.1	762.1	839.5	898.3	892.2	773.8	762.1
WDD	12.4	13.0	13.3	12.0	12.7	12.1	13.0	12.6	13.6	12.7
MDD/ADD	1.98	1.79	1.83	1.78	1.65	1.69	1.89	2.01	1.70	1.78
MMD/AMD	1.81	1.59	1.56	1.54	1.60	1.81	1.80	1.85	1.53	1.58
WDD/ADD	0.75	0.80	0.78	0.74	0.81	0.80	0.79	0.79	0.81	0.81

Figure 3-12: Historical Max Day, Average Day, and Winter Day Demand



Despite significant, sustained population growth every year from 2015-2024 and a general trend of increasing employment (employment dipped temporarily in 2021), total ADD in the City's system remained generally stable during this period.

Figure 3-12 shows that WDD is increasing at an average rate of 0.4 percent per year, which is likely a result of increasing population. ADD has a slightly negative trend, with an average decrease of about 0.5 percent per year. This trend is likely representative of changing trends in water use. It is assumed that these yearly demand variations occur due to relative summer weather patterns and irrigation demand.

Figure 3-13 and Figure 3-14 compare wholesale water purchases to observed temperature data. Max temperature and cooling degree days are as recorded by the National Oceanic and Atmospheric Administration's SEA-TAC Airport measuring station. Figure 3-13 shows a loose correlation between the maximum temperature on the hottest day of each year and the City's MDD, the day of highest water demand, though this correlation was less apparent through the COVID pandemic where population behavior changed.

Figure 3-14 compares the City's ADD to cooling degree days, a measure of relative heat intensity of the entire summer season. This figure suggests that ADD and cooling degree days are usually well correlated, although this correlation broke down somewhat in 2021 and 2022. Cooling degree days is a metric used to estimate power usage to cool buildings. Total cooling degree days equals the cumulative sum of average daily temperature minus 65° F for each day with average temperature above 65°F. Cooling degree days seems more appropriate than average temperature for comparison with ADD because it is not skewed by other seasons with stable, temperature-independent water demands, but includes hot days that may occur in other seasons. Cooling degree days only reflects hot weather periods when water demand appears to be correlated to temperature.

Figure 3-13: MDD vs. Max Temp

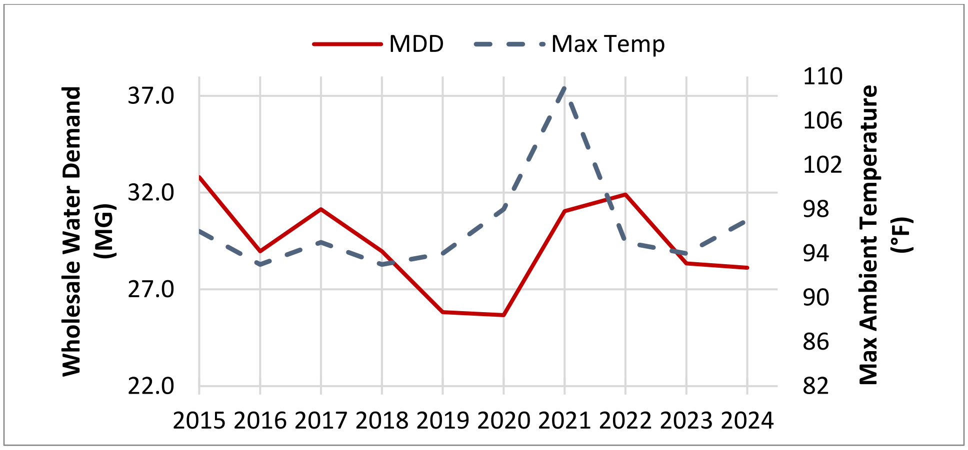
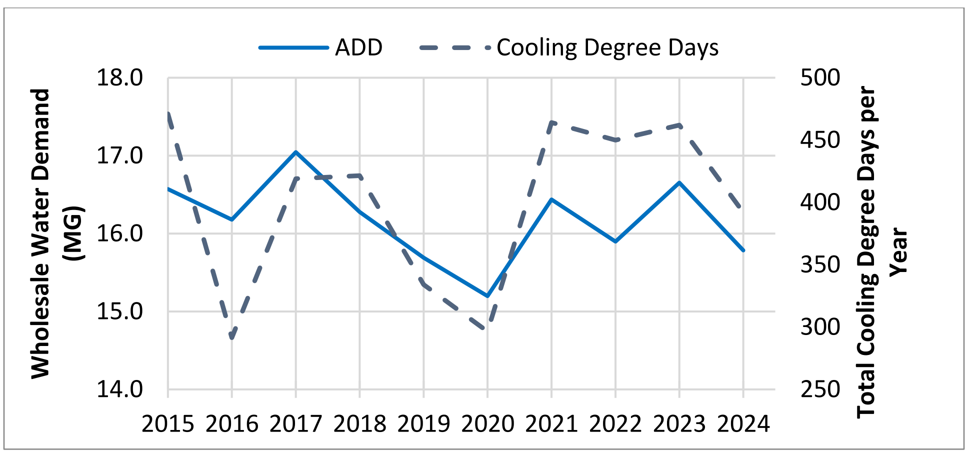


Figure 3-14: ADD and Cooling Degree Days



Seasonal demand data presented above has been incorporated into analysis of water supply and storage needs, as described in Chapter 4.

3.4 Diurnal Variations in Demand

Water customers have a normally predictable and repeatable pattern of water usage throughout a typical day. This is referred to as a diurnal pattern. Diurnal patterns vary according to the season and type of customer (commercial, residential, etc.). But for large sample sizes, diurnal patterns tend to be generally similar among water users in the same customer class on the same day.

It is important to understand diurnal patterns in any water system, to plan for adequate supply, storage capacity, and pipe sizing to accommodate the peak flows in the system. Diurnal patterns also affect water quality parameters such as water age and reservoir turnover. Water industry standards, such as American

Water Works Association (AWWA) Manuals of Practice M22, M31, and M32, and the DOH Water System Design Manual (WSDM) all require that diurnal patterns be considered in water system planning.

Diurnal patterns are typically graphed as a unitless "Peaking Factor" (PF). PF is the ratio of actual instantaneous demand to the average demand for the same set of data on the same day.

The 2016 WSP included calculations for diurnal patterns per water use classification based on hourly meter data. For the purposes of this WSP, it is assumed that the calculated diurnal patterns have not changed. In addition to a system-wide MDD diurnal evaluation, the 2016 WSP also included two diurnal studies to understand typical customer-specific demand patterns in low and high-demand seasons. The customer-specific studies had a limited sample set (hotel, office, retail, school, and multi-family housing accounts equipped with Sensus Omni Meters; single-family customers located in Clyde Hill 500 pressure zone), but comprised the best currently available information and reflected actual customer demands. Prior to installation of Omni Meters (beginning in 2009), the City did not have the capability to directly record hourly water usage for specific customer types.

Since the previous WSP, the City has made significant progress in deploying Advanced Metering Infrastructure (AMI) across its water system. As of June 2025, approximately 95 percent of water services are equipped with AMI capable of recording hourly consumption. As of the publishing of this WSP, installation efforts are ongoing for the remaining services, along with work to improve read rates and ensure more complete hourly data collection. Once a more complete dataset of hourly consumption data spanning multiple years is available, the City plans to conduct an updated diurnal demand analysis to reflect current customer usage patterns more accurately. A description of the methodology for calculating the diurnal patterns from the previous WSP is included from this point through the end of Section 3.4.

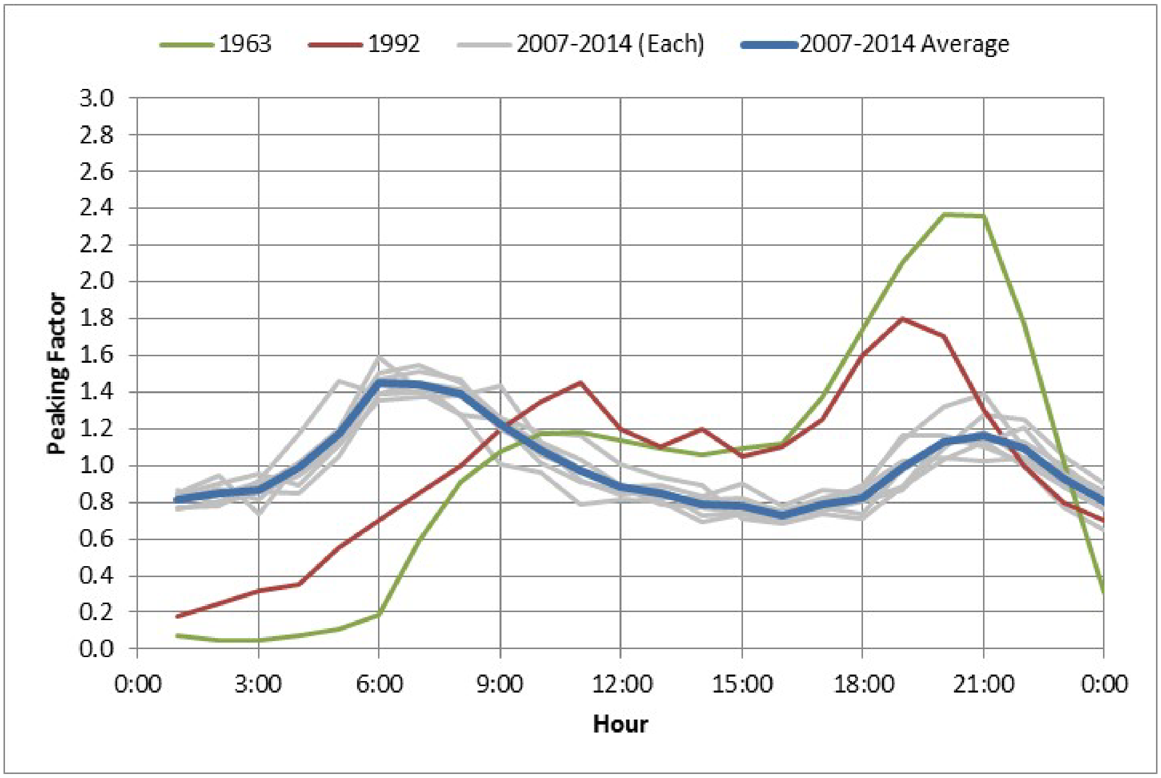
System-Wide Maximum Day Demand Diurnal Evaluation

Hourly system-wide water demands were observed for each MDD from 2007 to 2014, as shown in Figure 3-15. Individual patterns for each year (grey lines) are relatively consistent and well-correlated; the average pattern during this period is shown in blue. Observed patterns from 1963[14] and 1992[15] are also added to provide historical context, and to contrast the significant changes in demand patterns over multiple decades.

[14] Plan and Program for Water System Development. King County Water District No. 97 (Lake Hills Water District), February 1963.

[15] Water Comprehensive Plan. City of Bellevue, 1992.

Figure 3-15: Historical Maximum Demand Day Diurnal Patterns



System-wide demand patterns may be useful for analysis of overall water supply needs but do not account for localized differences that affect smaller areas of the system. To plan for infrastructure serving smaller areas, it is necessary to account for localized, specific variations in demand patterns.

Customer-Specific Summer Diurnal Demand Study

Diurnal water demand patterns of a limited number of customers were observed for the period of June 30 through August 27, 2014, to assist in hydraulic modeling of summer demands based on type of customer. Detailed results are provided in the 2016 WSP.

Figure 3-16 shows the aggregate PFs for all user classes studied on the MDD (July 16, 2014). These PFs are based on a limited sample set across locations throughout the City's water service area and should not be used for design purposes or for facility sizing, because they may not reflect localized demand patterns. These PFs are recommended only for general system-wide modeling of MDD inside the City's service area and may not reflect other utilities' customer demands.

Figure 3-16: Observed 2014 MDD Diurnal Patterns

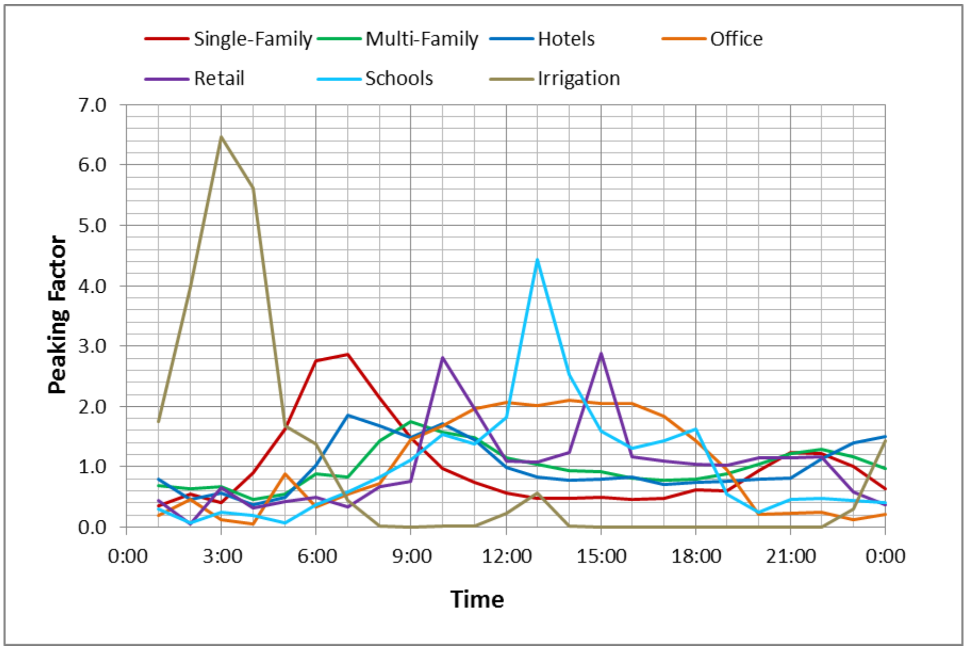
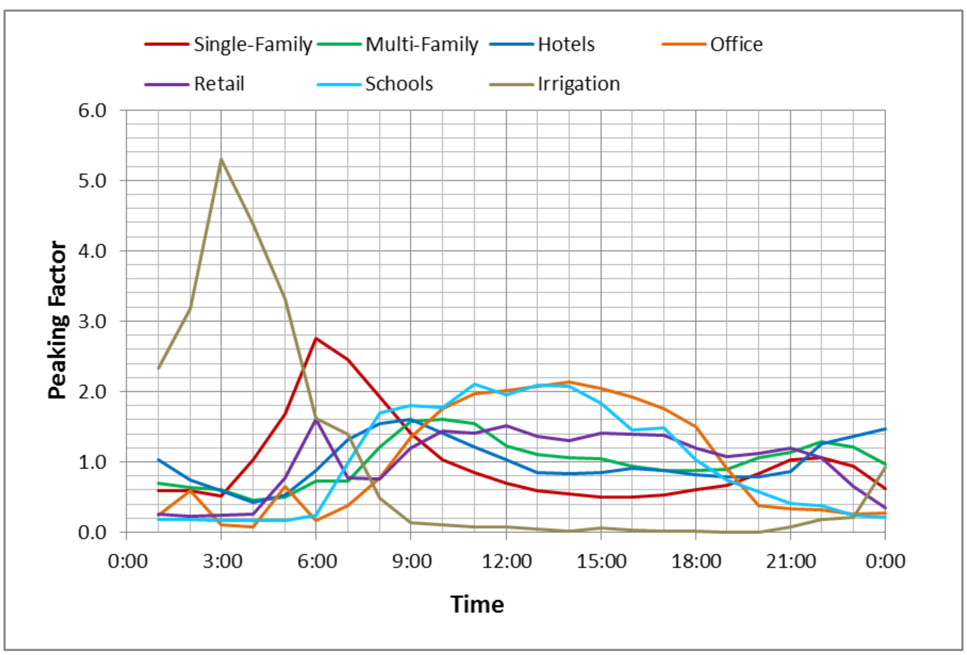


Figure 3-17 shows the aggregate PFs for an average day over the entire study period, for several customer classes. These PFs are recommended for general system-wide summer extended period simulation (EPS) modeling of the City's service area, but not for design or facility sizing.

Figure 3-17: Average Observed Summer Diurnal Patterns (All Days)



The summer diurnal demand study demonstrated that large, commercial irrigation accounts operate primarily on programmable irrigation controllers, typically in the early morning (2:00-4:00

am). Compared to winter demands, single-family accounts had a much sharper morning peak, presumably related to irrigation patterns (single-family meters typically record domestic and irrigation demands). Multi-family and office domestic diurnal patterns are relatively consistent between winter and summer, which may be due to separate metering for irrigation demands. For hotels, the observed summer PFs were higher during holidays and weekends (compared to weekdays), whereas the opposite occurred in winter, suggesting more leisure travel in summer versus more business travel during winter.

Table 3-10 shows observed maximum summer weekday PFs by customer class. The aggregate data is based on the total flow for all meters. Individual meters are also shown to demonstrate that significant localized variation exists even within the same customer class, as sample sizes get smaller.

Table 3-10: Maximum Observed Summer Peaking Factors

	Aggregate (Entire Sample)		Individual Meters	
Customer Class	**Maximum Observed PF**	**Peak Time at Hour Ending**	**Highest Peak PF**	**Lowest Peak PF**
Irrigation	6.67	3:00 AM	16.3	3.90
Single-Family	3.12	6:00 AM	N/A	N/A
Multi-Family	1.75	9:00 AM	7.27	1.64
Hotels	1.92	7:00 AM	3.43	2.17
Office	2.17	2:00 PM	3.10	2.12
Retail	4.65	6:00 AM	4.95	3.22
Schools	4.44	1:00 PM	7.38	2.85

Although total system irrigation is combined into general system-wide PFs (MDD shown in Table 3-9 and peak hour shown in Figure 3-15), the data in Table 3-10 assists in peak demand forecasting for individual irrigation systems.

Customer-Specific Winter Diurnal Demand Study

Diurnal water demand patterns of a limited number of customers were observed for the period of December 15, 2013, through January 19, 2014, to assist in hydraulic modeling of winter demands based on type of customer. Detailed results are provided in the 2016 WSP.

Figure 3-18 shows the aggregate winter weekday PFs for all user classes studied, during non-holiday weeks (weekdays adjacent to Christmas and New Year's Day are excluded). These PFs are higher than for average winter days and are recommended for calibrating winter weekday hydrant test data and for winter EPS modeling scenarios lasting less than 7 days.

Figure 3-18: Observed Winter Weekday Diurnal Patterns

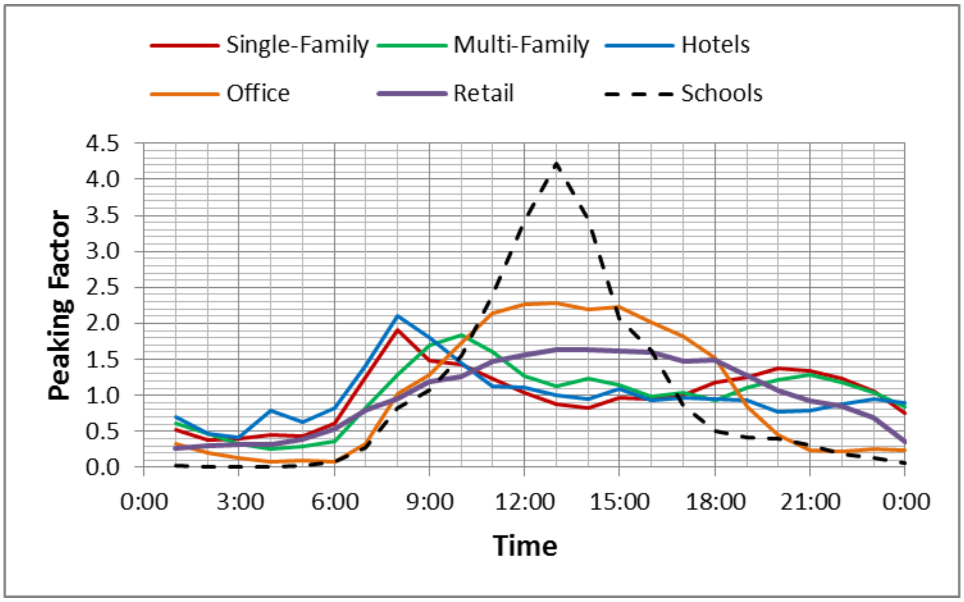
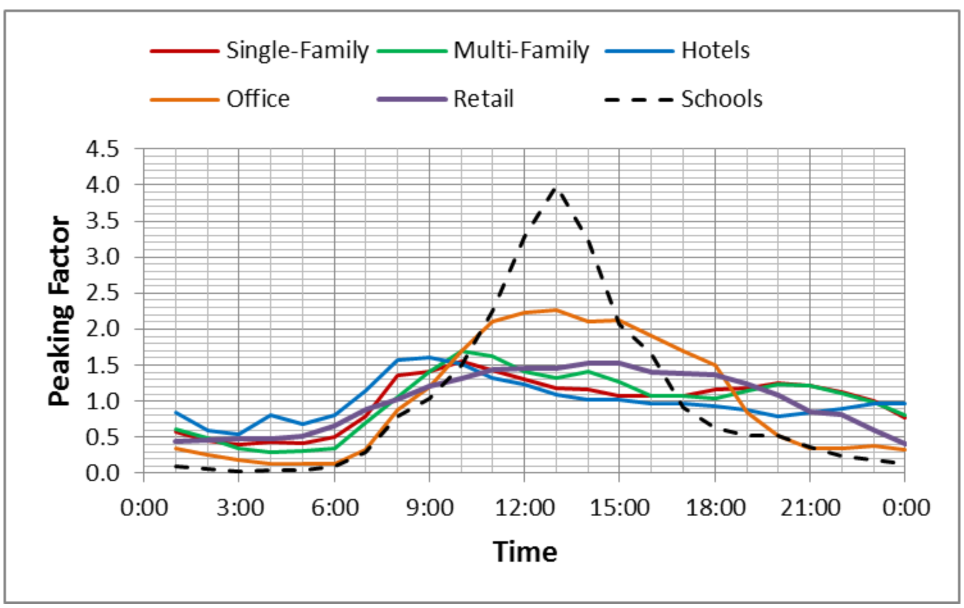


Figure 3-19 shows the aggregate PFs for an average day over the entire study period (including weekends and holidays), for several customer classes. These PFs are recommended only for use in Winter EPS modeling scenarios lasting 7 days or longer, because they average all days (holidays, weekends, and weekdays).

Figure 3-19: Average Observed Winter Diurnal Patterns (All Days)



Winter diurnal patterns are useful for calibration, water quality analysis and EPS modeling scenarios, but should not be used for water system design purposes or for facility sizing, since they do not reflect peak, warm-weather demand periods.

Table 3-11 shows observed maximum winter weekday PFs by customer class. The aggregate data is based on the total flow for all meters. Individual meters are also shown to demonstrate that significant localized variation exists even within the same customer class, as sample sizes get smaller.

Table 3-11: Maximum Observed Winter Weekday Peaking Factors

	Aggregate (Entire Sample)		Individual Meters	
Customer Class	Maximum Observed PF	Peak Time at Hour Ending	Highest Peak PF	Lowest Peak PF
Single-Family	1.92	8:00 AM	N/A	N/A
Multi-Family	1.85	10:00 AM	2.74	1.57
Hotels	2.11	8:00 AM	2.60	1.75
Office	2.28	1:00 PM	3.59	2.20
Retail	1.64	2:00 PM	5.78(1)	1.66
Schools	4.22	1:00 PM	4.80	3.50

1. Retail peak PF occurred on Christmas. Peak flow *rate* occurred on Christmas Eve.

3.5 Water Demand Projection Criteria

Table 3-12 summarizes updated criteria for demand projections, based on the range of recent usage volumes shown previously in Table 3-7, Figure 3-9, and Table 3-9. On average, maximum and minimum per capita demands across use types has decreased since the 2016 WSP. This is consistent with industry wide trends of decreasing per capita usage due to increased WUE. These criteria are intended for system-wide modeling but are not appropriate in all cases. High demand and low demand year criteria are typically used for capacity and water quality analyses, respectively. For large customers with unusual demands, such as food & beverage production and hospital facilities, actual observed meter data should be used. For facilities with large non-employee populations, such as schools, separate class-specific criteria should be developed, or actual meter readings should be used. For design of localized utility infrastructure projects such as pump stations and reservoirs, design criteria should be designed based on location-specific water usage.

Table 3-12: Recommended Average Day Water Use Projection Criteria

	High Demand Year	Low Demand Year	High 2016 Water Comprehensive Plan Estimate	Low 2016 Water Comprehensive Plan Estimate
SF Residential (gpcd)	71	63	84	66
MF Residential (gpcd)	69	49	75	66
Employee (gpcd)	29	22	32	27
ERU_{ADD} (gpd/ERU)	201	180	232	185
Non-Revenue[1]	9%	4%	6%-9%	3%
MDD/ADD	2.0	1.6	2.2	1.7
WDD/ADD	0.81	0.74	N/A	0.75

1. For non-revenue water, 5.7 percent is recommended for system-wide demand projections as the 3-year average, 8.5 percent for localized analysis.

Recently observed high-demand year ADD is recommended as criteria for facility sizing and fire flow analysis, because facilities are required to meet minimum standards during peak hour and maximum day demand during peak years. The 2016 WSP projected future customer demands based on the peak demand year (2006) during the previous planning period (2005-2013). This same approach is recommended for this WSP for the purpose of sizing water distribution facilities, using the peak year from the period of 2015-2024. Due to long-term trends in water usage, it is assumed that older data (pre-2015) is obsolete for the purpose of future projections.

Minimum observed (low-demand year) ADD is recommended as criteria for water quality analysis, because these conditions cause minimal system turnover and maximum water age, the least-optimum scenario for water quality. Increasing water age is correlated with lower chlorine residual (greater potential for microbial contamination), and with higher concentrations of disinfection by-products.

The ratio of MDD/ADD and WDD/ADD are calculated based on the historical ratio of total wholesale water purchased by the City. This data reflects overall system-wide usage (City retail demands and non-revenue flows, plus sales to neighboring utilities), and therefore it is assumed that it can be applied to all customer classes. The criteria for MDD/ADD ratio, 2.0 and 1.6, are the maximum and minimum observed during the period 2015-2024, respectively.

3.6 Projected Population

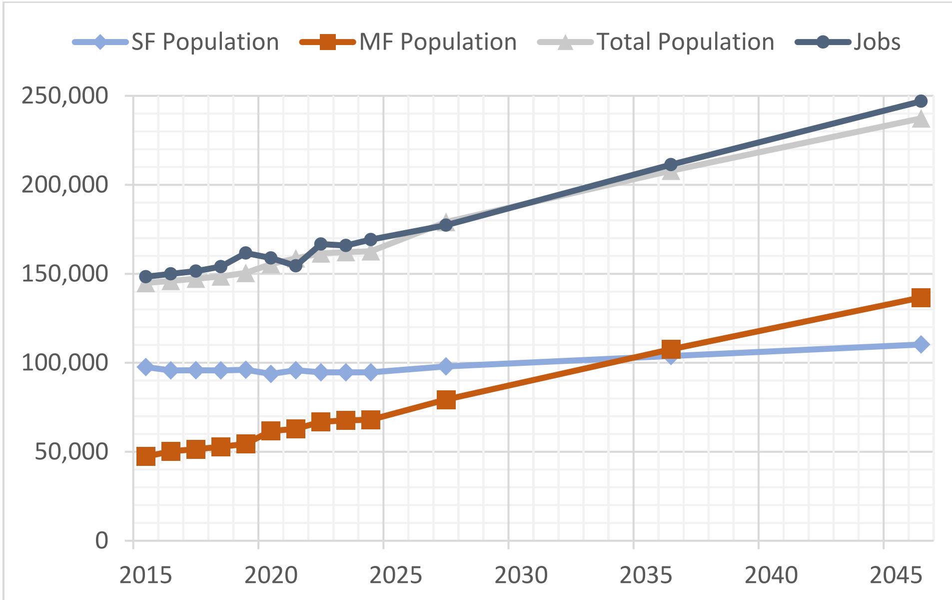
Table 3-13 shows projected population and employment in the City's retail water service area. The 2022 and 2044 populations are estimated by CDD, based on Puget Sound Regional Council estimates and land use data, corrected to correlate with the 2020 US Census, the 2024 City of Bellevue Comprehensive Plan, and Comprehensive Plans for other cities and towns within the service area. The CDD developed individual estimates for single-family population, multi-family population, and jobs for 2022 and 2044. These population projections were linearly interpolated/extrapolated to obtain estimates for each of the planning years for this WSP, as summarized in Table 3-13.

Table 3-13: Projected Water Service Area Population and Employment

	2027	2036	2046
Single-Family Population	97,920	103,778	110,403
Multi-Family Population	81,389	107,569	136,658
Total Residential Population	179,309	211,347	247,061
Jobs	181,399	207,893	237,332

Figure 3-20 shows historical and projected retail water service area population and employment. Future single-family population is expected to have a modest increase. Most of the future population growth will occur for multi-family housing units, as a result of the recent House Bill 1110 which aims to increase middle housing such as duplexes and townhomes in areas traditionally dedicated to single-family detached housing, and House Bill 1337, which aims to ease barriers to the construction and use of accessory dwelling units.

Figure 3-20: Projected Water Service Area Population and Employment



3.7 Projected Water Demand

Table 3-14 shows the projected ADD during both a high-demand year and a low-demand year (as defined in Table 3-12), not including non-revenue demands and without additional efficiency savings discussed in Chapter 5. Future residential, commercial, and municipal demand estimates are calculated as the product of the population and employment projections provided by CDD (Table 3-13) and the respective per-capita demand criteria shown in Table 3-12. Non-revenue demands are projected to be consistent with recent years percentage of total demand.

Table 3-14: Projected Total ADD (MGD)

	2027		2036		2046	
	High	Low	High	Low	High	Low
Single-Family Residential	6.93	6.18	7.35	6.55	7.81	6.97
Multi-Family Residential	5.59	3.97	7.39	5.25	9.39	6.67
Commercial & Municipal	5.19	3.96	5.94	4.54	6.78	5.18
Wheeled	1.96	1.96	2.01	2.01	2.30	2.30
Non-Revenue	1.07	0.85	1.25	0.99	1.45	1.14
Total	20.74	16.93	23.94	19.34	27.73	22.26

As described in Section 3.2, irrigation demands cannot be clearly distinguished from domestic for most single-family customers, nor for multi-family and commercial demands without a separate irrigation meter. Therefore, for system-wide demand projections, irrigation usage is included in the total demand per customer class and is reflected in seasonal and daily PFs. This should not have a major impact on the analysis, since the irrigation demands that were metered separately showed growth rates that were in line with the growth rates of domestic water use for each use type.

Wheeled demands include Redmond's Overlake neighborhood and Issaquah's Lakemont, Montreaux and South Cove neighborhoods. Projections for Overlake are based on projected ERUs from Redmond's 2023 WSP and past metering at the Bellevue-Redmond intertie. Projections for Issaquah's Lakemont (LH520 Pressure Zone), Montreaux (CM1150 Pressure Zone), and South Cove (SA270 Pressure Zone) areas are based on historic wheeled water meter data and the number of ERUs projected by Issaquah in their 2024 Updated Water Demand Forecast and Capacity Analysis Technical Memorandum, up to the contract limit (400 and 700 ERUs for Lakemont and Montreaux, respectively). In 2015, an amendment to the South Cove agreement (Resolution 2015-14) was executed, and billing responsibility for the region was assumed by Issaquah. This resulted in South Cove demands being billed as wheeled water. Issaquah anticipates constructing a new connection to Cascade's Bellevue-Issaquah Pipeline to serve the South Cove area directly sometime in the 2030s. Because of this, the South Cove area is included in the wheeled water amounts in Table 3-14 for the year 2027, but not for the years 2036 and 2046.

Figure 3-21 shows the projected range of total ADD, before and after additional conservation. Recent actual ADD is also shown for context. Projections without conservation correspond to the data in Table 3-14. Conservation criteria for reduced demands are described in Chapter 5. The "Baseline Projection" ADD shown in Figure 3-21 appears to increase at a higher rate than historic ADD due to an assumption that future per capita use will remain stable, where historically per capita use has decreased over time.

Figure 3-21: Projected Total ADD

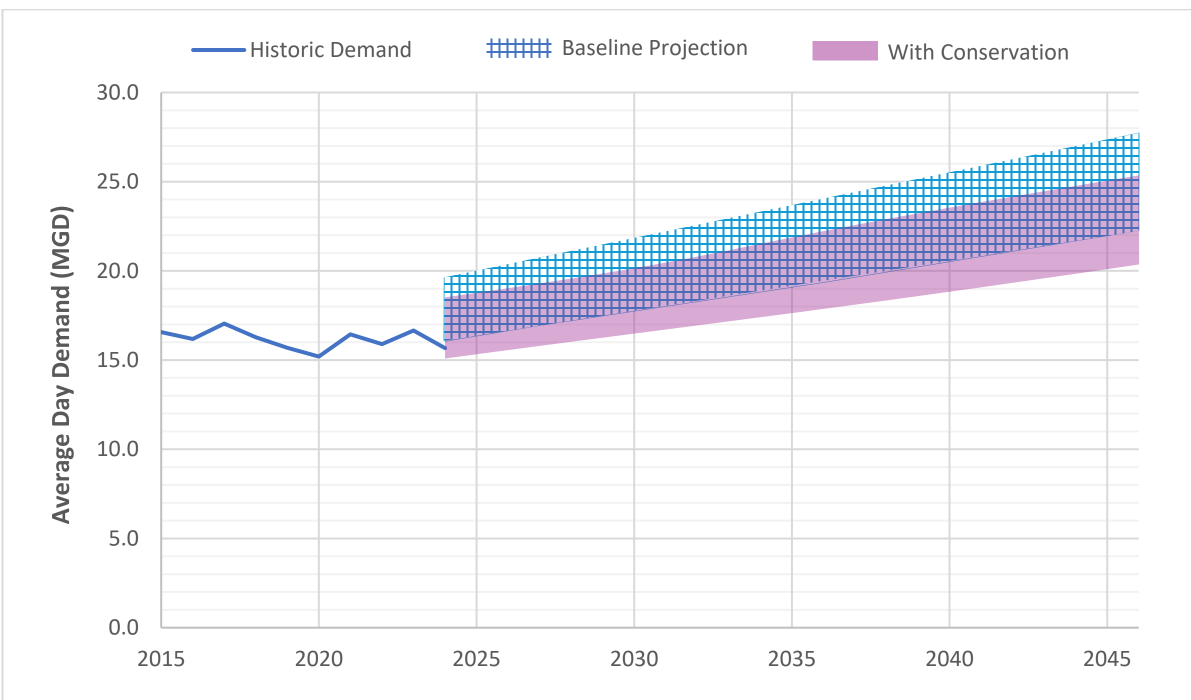


Table 3-15 shows projected MDD, calculated as ADD (Table 3-14) multiplied by the MDD/ADD ratios shown in Table 3-12.

Table 3-15: Projected Total MDD

	2027		2036		2046	
	High	Low	High	Low	High	Low
Single-Family Residential	13.91	10.18	14.74	10.79	15.68	11.47
Multi-Family Residential	11.22	6.54	14.83	8.64	18.84	10.98
Commercial & Municipal	10.41	6.51	11.93	7.47	13.61	8.52
Wheeled	3.94	3.23	4.04	3.31	4.61	3.78
Non-Revenue	2.14	1.40	2.50	1.62	2.90	1.87
Total	41.62	27.86	48.04	31.83	55.65	36.63

Figure 3-22 shows the projected range of total MDD, before and after additional conservation. Projections without conservation correspond to the data in Table 3-15. Recent historical MDD is also shown for context. Conservation criteria for reduced projected demands are described in Chapter 5.

Figure 3-22: Projected Total MDD

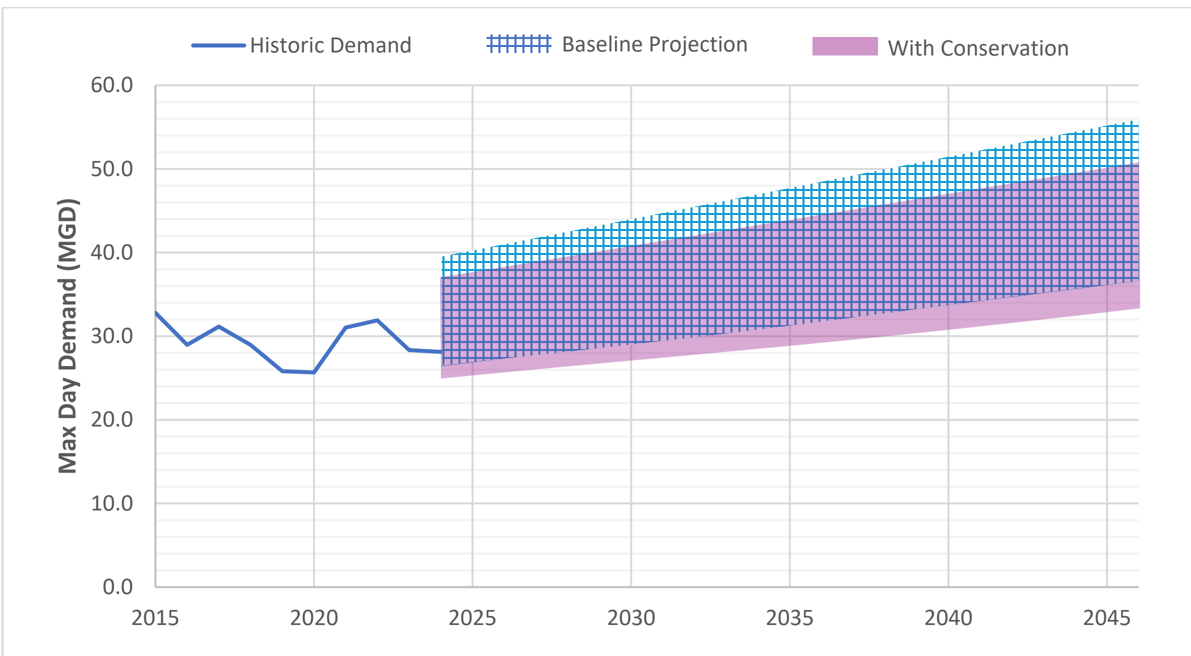


Table 3-17, Table 3-18, and Table 3-19 show projected plan year (2027), 10-year (2036), and 20-year (2046) population and employment, with the corresponding range of projected ADD and MDD for each pressure zone. The "High" and "Low" projected flows are based on the criteria in Table 3-12 and include the projected demands associated with each usage classification but exclude non-revenue usage shown in Table 3-14 and Table 3-15. For zones that wheel flow to Redmond and/or Issaquah, those demands are listed separately from the City's.

Data sources for population and employment are listed below. Source data was linearly interpolated or extrapolated to match water system planning years, 10 and 20-year planning dates (2027, 2036, and 2046):

- For areas in the City's existing service area, population and employment projections were provided by CDD and the communities served and are based on adjusted Puget Sound Regional Council projections. A population breakdown per neighborhood was also provided by CDD, which was used in the population allocation in Table 3-16 through Table 3-19.

- The ERU projections for Issaquah's Lakemont, Montreaux, and South Cove areas are estimated based on ERU projections provided by the City of Issaquah. Since there is no projected increase in ERUs, existing flow is assumed to be unchanged in future years except for the South Cove area being served directly by Issaquah in the future. Redmond flow projections are interpolated using metered wheeled water scaled for future years using ERU projections for the Overlake-Viewpoint service area in the 2023 Redmond Water System Plan update.

Distribution of planning year population per pressure zone were allocated using a combination of geographic information system (GIS) water meter locations and a per neighborhood population allocation provided by CDD, shown in Table 3-16. The allocation of future growth was based on a GIS analysis combining future land use data, neighborhood population distributions, and pressure zone boundaries. These boundaries are shown in Figure 3-23. The City service area was divided along the intersection of these three boundaries into land portions each with a single land use type, neighborhood, and pressure zone. Each neighborhood was assigned a population growth per area value for single-family, multi-family, and commercial land use types based on CDD data for the years 2022-2044 (Table 3-16). For mixed land use types, areas were scaled proportionally based on the percent breakdown of single-family, multi-family, and commercial provided by CDD. The projected growth per area / land use type for each neighborhood was then applied and added up for all land portions within each pressure zone. The resulting projections per pressure zone are shown in Table 3-17, Table 3-18, and Table 3-19.

Table 3-16: Population Projections by Neighborhood

Neighborhood	2022 Single Family Population	2022 Multi-Family Population	2022 Jobs	2044 Single Family Population	2044 Multi-Family Population	2044 Jobs
BelRed	0	4,640	24,624	0	19,853	43,000
Bridle Trails	3,957	6,399	4,004	4,137	7,938	4,300
Cougar Mountain/ Lakemont	10,139	2,008	500	10,524	2,473	600
Crossroads	1,537	9,894	3,704	1,754	13,392	5,200
Downtown	0	17,740	74,271	0	46,563	107,000
Eastgate	6,168	2,261	21,821	10,911	4,747	23,100
Factoria	430	2,185	8,808	538	3,248	9,800
Lake Hills	12,870	5,074	3,303	14,712	6,882	4,800
Newport	10,905	453	500	12,582	620	600

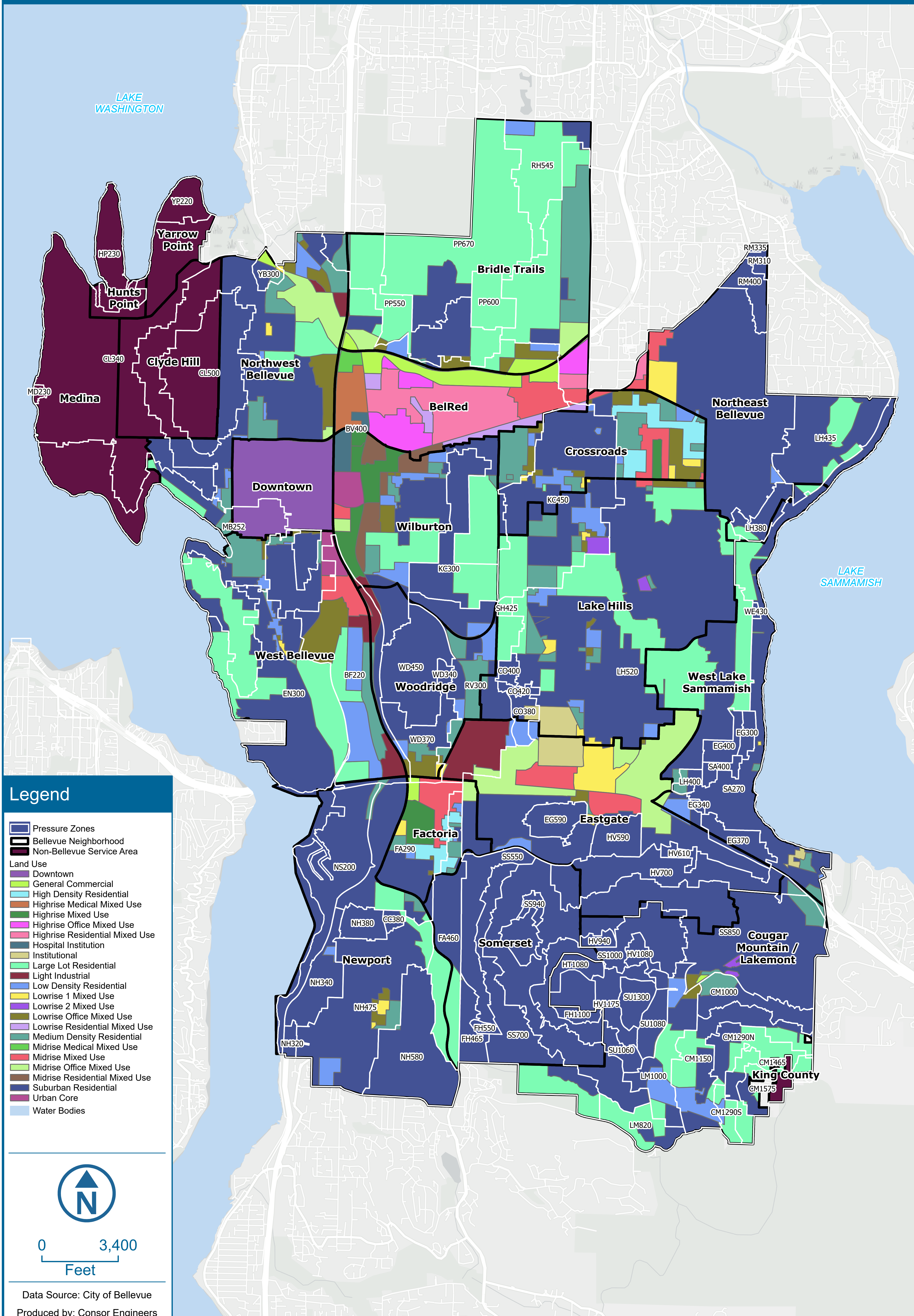
Northeast Bellevue	6,178	5,255	2,402	6,316	6,374	2,500
Northwest Bellevue	9,618	1,355	5,405	10,083	1,686	6,100
Somerset	9,067	0	300	9,415	0	400
West Bellevue	5,347	3,863	5,605	6,117	5,243	7,000
West Lake Sammamish	6,194	784	200	6,406	962	300
Wilburton	1,812	2,476	7,007	4,803	7,785	12,500
Woodridge	2,804	2,458	400	2,960	3,078	500
Clyde Hill	3,110	0	1,217	3,129	0	1,227
Medina	2,915	0	1,970	2,974	0	1,980
Hunts Point	460	0	290	463	0	290
King County	31	0	0	31	0	0
Yarrow Point	1,125	0	348	1,135	0	348

Projected flows in Table 3-17, Table 3-18, and Table 3-19 are estimated using system-wide average per capita ADD and MDD, and do not account for localized differences. Local per capita water usage volumes from the system-wide average and should be evaluated individually as part of facility design.

The numbers of ERUs shown in Table 3-17, Table 3-18, and Table 3-19 may vary based on factors not directly related to demands. The ERU unit quantity (gpd) is based on historic single-family household demand, but the number of ERUs is determined based on applying that unit quantity to all demands (including multi-family and commercial). Because of this, ERUs may vary substantially from zone to zone, and not vary from year to year as much as the total demand does. The relative magnitude of the single-family, multi-family and commercial customer base may vary substantially from zone to zone. For these reasons, the number of ERUs in a high-demand year may be equal to or less than the number of ERUs in a low-demand year in some instances. More information on how ERUs are calculated is provided in Section 3.2.

Neighborhoods and Future Land Use

Figure 3-23



Date: 4/7/2026 File Name: C:\Users\cory.owsen\Consor North America, Inc\City of Bellevue WSP - Plan Development\GIS Figures and Shapefiles\Chapter 4-9 Figures\Chapter 4-9 Figures.aprx

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community

Table 3-17: 2027 (Plan Year) Retail Demand Projections per Pressure Zone

Pressure Zone	SF Pop	MF Pop	Jobs	ADD (MGD)		MDD (MGD)		ERUS	
				High	Low	High	Low	High	Low
Total[1]:	**97,920**	**81,389**	**181,399**	**20.74**	**16.93**	**41.62**	**27.86**	**103,930**	**95,738**
BF220	33	1,197	2,738	0.173	0.127	0.346	0.210	861	728
BV400	10,279	31,138	118,732	6.639	5.048	13.321	8.307	33,109	28,818
CC380	190	0	0	0.014	0.013	0.029	0.021	71	73
CL340	4,572	0	1,887	0.400	0.350	0.803	0.576	1,997	1,997
CL500	3,378	0	1,046	0.285	0.250	0.572	0.412	1,423	1,430
CM1000	589	462	54	0.080	0.065	0.160	0.106	397	369
CM1150									
Bellevue	1,261	0	88	0.097	0.087	0.195	0.142	486	494
Issaquah[2]				0.065	0.065	0.129	0.106	415	415
CM1290N	495	0	25	0.038	0.034	0.076	0.056	189	193
CM1290S	158	0	5	0.012	0.011	0.024	0.018	60	61
CM1465	292	0	10	0.022	0.020	0.045	0.033	111	113
CM1575	153	0	0	0.011	0.010	0.023	0.017	57	58
CO380	247	279	47	0.040	0.032	0.081	0.053	201	183
CO400	200	0	15	0.015	0.014	0.031	0.023	77	78
CO420	42	0	0	0.003	0.003	0.006	0.005	16	16
EG300	272	0	0	0.020	0.018	0.041	0.030	102	104
EG340	51	0	0	0.004	0.003	0.008	0.006	19	19
EG370	507	0	0	0.038	0.034	0.076	0.056	190	194
EG400	433	0	0	0.033	0.029	0.065	0.048	162	166
EG590	789	0	158	0.064	0.057	0.128	0.093	319	323
EN300	3,114	285	1,285	0.293	0.253	0.589	0.416	1,464	1,445
FA290	985	1,451	7,889	0.419	0.324	0.840	0.533	2,088	1,848
FA460	949	948	512	0.156	0.124	0.313	0.205	777	710
FH1100	139	0	0	0.010	0.009	0.021	0.015	52	53
FH465	173	0	9	0.013	0.012	0.027	0.019	66	67
FH550	148	0	0	0.011	0.010	0.022	0.016	55	56
HP230	412	0	174	0.036	0.032	0.073	0.052	180	180
HT1080	215	0	0	0.016	0.014	0.032	0.024	80	82
HV1080	261	0	0	0.020	0.017	0.039	0.029	98	100
HV1175	438	0	5	0.033	0.029	0.066	0.048	165	168
HV590	813	0	79	0.063	0.056	0.127	0.093	316	321
HV610	183	0	0	0.014	0.012	0.028	0.020	69	70
HV700	1,542	397	430	0.158	0.134	0.316	0.220	787	764
HV940	225	0	0	0.017	0.015	0.034	0.025	84	86
KC300	1,193	5	235	0.097	0.086	0.195	0.141	484	489
KC450	2,667	2,827	2,227	0.474	0.376	0.950	0.620	2,362	2,149
LH380	417	0	234	0.038	0.033	0.077	0.055	192	190
LH400	58	114	0	0.013	0.010	0.025	0.016	63	56
LH435	1,221	0	176	0.097	0.086	0.195	0.141	484	490
LH520									
Bellevue	20,572	28,375	27,994	4.460	3.494	8.949	5.750	22,241	19,949
Issaquah[2]				0.040	0.040	0.080	0.066	258.00	258

Pressure Zone	SF Pop	MF Pop	Jobs	ADD (MGD)		MDD (MGD)		ERUS	
				High	Low	High	Low	High	Low
Redmond[2]				1.653	1.653	3.317	2.720	8,287	8,287
LM1000	561	1,548	91	0.158	0.120	0.316	0.197	786	684
LM820	0	0	0	0.000	0.000	0.000	0.000	0	0
MB252	2,164	8,725	6,666	1.000	0.751	2.007	1.236	4,987	4,286
MD230	35	0	58	0.004	0.004	0.009	0.006	22	21
NH320	75	0	7	0.006	0.005	0.012	0.009	29	30
NH340	385	0	7	0.029	0.026	0.058	0.043	145	148
NH380	394	0	0	0.030	0.026	0.059	0.043	148	151
NH475	4,035	430	356	0.345	0.301	0.692	0.495	1,721	1,717
NH580	3,713	10	28	0.280	0.250	0.562	0.411	1,398	1,426
NS200	1,724	38	111	0.136	0.120	0.272	0.198	676	685
PP550	1,424	157	413	0.131	0.113	0.263	0.186	653	645
PP600	226	0	63	0.019	0.017	0.038	0.027	94	95
PP670	1,390	0	126	0.108	0.096	0.217	0.158	539	548
RH545	321	0	221	0.031	0.027	0.062	0.044	154	152
RM310	114	0	0	0.009	0.008	0.017	0.013	43	44
RM335	34	0	29	0.003	0.003	0.007	0.005	17	17
RM400	381	0	0	0.029	0.025	0.057	0.042	143	146
RV300	716	1,765	5,386	0.346	0.264	0.694	0.434	1,724	1,507
SA270									
Bellevue	2,407	230	189	0.203	0.177	0.408	0.292	1,013	1,013
Issaquah[2]				0.206	0.206	0.412	0.338	1,322	1,322
SA400	259	0	0	0.019	0.017	0.039	0.029	97	99
SH425	47	0	0	0.003	0.003	0.007	0.005	17	18
SS1000	2,597	0	92	0.198	0.176	0.397	0.290	986	1,005
SS550	1,524	0	27	0.115	0.103	0.231	0.169	575	586
SS700	2,021	0	91	0.154	0.137	0.310	0.226	771	785
SS850	7,860	189	914	0.632	0.557	1.267	0.917	3,149	3,182
SS940	195	0	0	0.015	0.013	0.029	0.022	73	75
SU1060	188	0	15	0.015	0.013	0.029	0.021	72	74
SU1080	250	0	20	0.019	0.017	0.039	0.028	97	98
SU1300	431	0	15	0.033	0.029	0.066	0.048	163	167
WD430	137	0	0	0.010	0.009	0.021	0.015	51	52
WD370	703	821	129	0.116	0.093	0.234	0.152	581	528
WD450	1,382	0	53	0.105	0.094	0.211	0.154	526	535
WE430	54	0	0	0.004	0.004	0.008	0.006	20	21
YB300	109	0	66	0.010	0.009	0.020	0.015	51	50
YP220	399	0	174	0.035	0.031	0.071	0.051	176	176

1. Total ADD, MDD, and ERUs include non-revenue water as a 3-year average of 5.7%.
2. Consult City of Issaquah or City of Redmond planning departments for population and employment projections.

Table 3-18: 2036 (10-Year) Retail Demand Projections per Pressure Zone

Pressure Zone	SF Pop	MF Pop	Jobs	ADD (MGD) High	ADD (MGD) Low	MDD (MGD) High	MDD (MGD) Low	ERUS High	ERUS Low
Total[1]:	**103,778**	**107,569**	**207,893**	**23.94**	**19.34**	**48.04**	**31.83**	**119,727**	**109,303**
BF220	69	1,668	3,299	0.227	0.167	0.455	0.275	1,130	955
BV400	11,302	49,166	139,213	8.649	6.524	17.356	10.735	43,136	37,242
CC380	197	0	0	0.015	0.013	0.030	0.022	74	75
CL340	4,606	0	1,891	0.403	0.352	0.809	0.580	2,011	2,011
CL500	3,413	0	1,048	0.288	0.253	0.578	0.416	1,436	1,443
CM1000	599	462	55	0.080	0.065	0.161	0.107	401	373
CM1150									
Bellevue	1,282	0	88	0.099	0.088	0.198	0.145	493	502
Issaquah[2]				0.065	0.065	0.129	0.106	415	415
CM1290N	506	0	25	0.039	0.034	0.078	0.057	193	197
CM1290S	162	0	5	0.012	0.011	0.025	0.018	61	62
CM1465	300	0	10	0.023	0.020	0.046	0.033	114	116
CM1575	156	0	0	0.012	0.010	0.024	0.017	59	60
CO380	296	279	106	0.046	0.037	0.092	0.060	228	209
CO400	208	0	15	0.016	0.014	0.032	0.024	80	82
CO420	44	0	0	0.003	0.003	0.007	0.005	16	17
EG300	274	0	0	0.021	0.018	0.041	0.030	103	105
EG340	51	0	0	0.004	0.003	0.008	0.006	19	20
EG370	537	0	0	0.040	0.036	0.081	0.059	201	205
EG400	437	0	0	0.033	0.029	0.066	0.048	164	167
EG590	939	0	158	0.075	0.067	0.151	0.109	375	380
EN300	3,267	310	1,297	0.307	0.265	0.616	0.436	1,532	1,512
FA290	1,085	1,787	8,215	0.461	0.355	0.924	0.585	2,297	2,028
FA460	979	974	533	0.161	0.128	0.322	0.211	801	733
FH1100	141	0	0	0.011	0.009	0.021	0.016	53	54
FH465	176	0	9	0.013	0.012	0.027	0.020	67	68
FH550	150	0	0	0.011	0.010	0.023	0.016	56	57
HP230	413	0	174	0.036	0.032	0.073	0.052	181	181
HT1080	219	0	0	0.016	0.015	0.033	0.024	82	84
HV1080	264	0	0	0.020	0.018	0.040	0.029	99	101
HV1175	445	0	5	0.034	0.030	0.067	0.049	167	171
HV590	971	0	79	0.075	0.067	0.151	0.110	376	382
HV610	224	0	0	0.017	0.015	0.034	0.025	84	86
HV700	1,983	397	430	0.191	0.163	0.383	0.269	952	932
HV940	227	0	0	0.017	0.015	0.034	0.025	85	87
KC300	1,585	5	235	0.126	0.112	0.254	0.184	630	638
KC450	2,847	3,369	2,408	0.532	0.421	1.068	0.692	2,654	2,402
LH380	421	0	234	0.039	0.034	0.078	0.055	193	192
LH400	60	114	0	0.013	0.010	0.026	0.016	64	56
LH435	1,235	0	176	0.098	0.087	0.197	0.143	489	495
LH520									
Bellevue	21,906	32,657	30,270	4.941	3.858	9.914	6.349	24,640	22,025
Issaquah[2]				0.040	0.040	0.080	0.066	258	258

Pressure Zone	SF Pop	MF Pop	Jobs	ADD (MGD)		MDD (MGD)		ERUS	
				High	Low	High	Low	High	Low
Redmond[2]				1.910	1.910	3.832	3.142	9,698	9,698
LM1000	572	1,553	104	0.159	0.121	0.319	0.199	794	691
LM820	0	0	0	0.000	0.000	0.000	0.000	0	0
MB252	2,231	10,693	8,924	1.217	0.909	2.442	1.497	6,069	5,192
MD230	35	0	58	0.004	0.004	0.009	0.006	22	21
NH320	85	0	7	0.007	0.006	0.013	0.010	33	33
NH340	442	0	7	0.033	0.030	0.067	0.049	167	170
NH380	418	0	0	0.031	0.028	0.063	0.046	156	160
NH475	4,260	499	397	0.368	0.320	0.739	0.527	1,836	1,829
NH580	3,874	10	28	0.292	0.261	0.587	0.429	1,458	1,488
NS200	1,841	38	111	0.144	0.128	0.290	0.210	720	730
PP550	1,444	161	420	0.133	0.115	0.267	0.189	663	655
PP600	231	0	63	0.019	0.017	0.039	0.028	96	97
PP670	1,416	0	126	0.110	0.098	0.221	0.161	549	558
RH545	329	0	221	0.031	0.027	0.063	0.045	156	155
RM310	115	0	0	0.009	0.008	0.017	0.013	43	44
RM335	34	0	29	0.003	0.003	0.007	0.005	17	17
RM400	384	0	0	0.029	0.026	0.058	0.042	144	147
RV300	831	1,800	5,528	0.361	0.277	0.724	0.455	1,801	1,580
SA270									
Bellevue	2,447	238	218	0.208	0.181	0.417	0.298	1,035	1,035
Issaquah[2]				0.000	0.000	0.000	0.000	0	0
SA400	262	0	0	0.020	0.018	0.039	0.029	98	100
SH425	51	0	0	0.004	0.003	0.008	0.006	19	20
SS1000	2,644	0	92	0.201	0.179	0.404	0.295	1,004	1,023
SS550	1,545	0	27	0.117	0.104	0.234	0.171	583	595
SS700	2,050	0	91	0.157	0.139	0.314	0.229	781	796
SS850	8,354	374	941	0.683	0.601	1.370	0.988	3,406	3,429
SS940	198	0	0	0.015	0.013	0.030	0.022	74	76
SU1060	191	0	15	0.015	0.013	0.030	0.022	74	75
SU1080	254	0	20	0.020	0.017	0.039	0.029	98	100
SU1300	436	0	15	0.033	0.030	0.067	0.049	166	169
WD430	138	0	0	0.010	0.009	0.021	0.015	52	53
WD370	714	1,016	170	0.133	0.104	0.266	0.172	662	595
WD450	1,408	0	53	0.107	0.096	0.215	0.157	535	545
WE430	54	0	0	0.004	0.004	0.008	0.006	20	21
YB300	113	0	79	0.011	0.009	0.022	0.016	54	54
YP220	400	0	174	0.035	0.031	0.071	0.051	176	176

1. Total ADD, MDD, and ERUs include non-revenue water as a 3-year average of 5.7%.
2. Consult City of Issaquah or City of Redmond planning departments for population and employment projections. SA270 projections assume Issaquah directly serves the South Cove area prior to 2036.

Table 3-19: 2046 (20-Year) Retail Demand Projections per Pressure Zone

Pressure Zone	SF Pop	MF Pop	Jobs	ADD (MGD)		MDD (MGD)		ERUS	
				High	Low	High	Low	High	Low
Total[1]:	**110,403**	**136,658**	**237,332**	**27.73**	**22.26**	**55.65**	**36.63**	**138,790**	**125,890**
BF220	109	2,192	3,922	0.287	0.212	0.575	0.348	1,430	1,208
BV400	12,438	69,198	161,969	10.883	8.163	21.839	13.433	54,278	46,602
CC380	206	0	0	0.015	0.014	0.031	0.023	77	79
CL340	4,645	0	1,896	0.406	0.355	0.815	0.584	2,026	2,027
CL500	3,451	0	1,050	0.291	0.255	0.584	0.420	1,451	1,458
CM1000	610	463	56	0.081	0.066	0.163	0.109	405	377
CM1150									
Bellevue	1,304	0	88	0.101	0.089	0.202	0.147	501	510
Issaquah[2]				0.065	0.065	0.129	0.106	415.00	415.00
CM1290N	517	0	25	0.040	0.035	0.079	0.058	197	201
CM1290S	166	0	5	0.013	0.011	0.025	0.018	63	64
CM1465	309	0	10	0.023	0.021	0.047	0.034	117	119
CM1575	160	0	0	0.012	0.011	0.024	0.018	60	61
CO380	350	279	172	0.052	0.042	0.104	0.069	258	239
CO400	218	0	15	0.017	0.015	0.034	0.025	84	85
CO420	46	0	0	0.003	0.003	0.007	0.005	17	17
EG300	277	0	0	0.021	0.019	0.042	0.031	104	106
EG340	52	0	0	0.004	0.003	0.008	0.006	19	20
EG370	569	0	0	0.043	0.038	0.086	0.063	213	218
EG400	442	0	0	0.033	0.030	0.067	0.049	165	169
EG590	1,105	0	158	0.088	0.078	0.176	0.128	438	443
EN300	3,436	338	1,311	0.322	0.278	0.647	0.457	1,607	1,587
FA290	1,197	2,159	8,577	0.507	0.390	1.018	0.642	2,529	2,229
FA460	1,012	1,003	557	0.166	0.133	0.333	0.218	828	757
FH1100	143	0	0	0.011	0.010	0.022	0.016	54	55
FH465	179	0	9	0.014	0.012	0.027	0.020	68	69
FH550	151	0	0	0.011	0.010	0.023	0.017	57	58
HP230	414	0	174	0.036	0.032	0.073	0.052	181	181
HT1080	223	0	0	0.017	0.015	0.034	0.025	84	85
HV1080	267	0	0	0.020	0.018	0.040	0.029	100	102
HV1175	453	0	5	0.034	0.030	0.069	0.050	170	174
HV590	1,147	0	79	0.089	0.079	0.178	0.129	442	449
HV610	269	0	0	0.020	0.018	0.041	0.030	101	103
HV700	2,473	397	430	0.228	0.196	0.457	0.323	1,135	1,120
HV940	229	0	0	0.017	0.015	0.035	0.025	86	88
KC300	2,020	5	235	0.159	0.141	0.319	0.232	793	805
KC450	3,048	3,971	2,608	0.597	0.470	1.198	0.773	2,978	2,683
LH380	424	0	234	0.039	0.034	0.078	0.056	194	193
LH400	62	114	0	0.013	0.010	0.026	0.017	65	57
LH435	1,251	0	176	0.099	0.088	0.199	0.145	495	501
LH520									
Bellevue	23,388	37,414	32,800	5.475	4.262	10.986	7.014	27,306	24,332
Issaquah[2]				0.040	0.040	0.080	0.066	258	258

Pressure Zone	SF Pop	MF Pop	Jobs	ADD (MGD)		MDD (MGD)		ERUS	
				High	Low	High	Low	High	Low
Redmond[2]				2.195	2.195	4.404	3.611	11,266	11,266
LM1000	585	1,558	118	0.161	0.123	0.323	0.202	803	700
LM820	117	0	0	0.009	0.008	0.018	0.013	41	45
MB252	2,306	12,880	11,433	1.458	1.086	2.925	1.787	7,270	6,198
MD230	35	0	58	0.004	0.004	0.009	0.006	22	21
NH320	96	0	7	0.007	0.007	0.015	0.011	37	38
NH340	505	0	7	0.038	0.034	0.077	0.056	190	194
NH380	443	0	0	0.033	0.030	0.067	0.049	166	170
NH475	4,511	575	442	0.394	0.342	0.790	0.563	1,964	1,953
NH580	4,054	10	28	0.306	0.273	0.614	0.449	1,525	1,556
NS200	1,972	38	111	0.154	0.137	0.309	0.225	769	780
PP550	1,466	166	427	0.135	0.117	0.271	0.192	674	666
PP600	235	0	63	0.020	0.017	0.039	0.028	98	98
PP670	1,445	0	126	0.112	0.100	0.225	0.164	560	569
RH545	337	0	221	0.032	0.028	0.064	0.046	159	158
RM310	116	0	0	0.009	0.008	0.017	0.013	43	44
RM335	34	0	29	0.003	0.003	0.007	0.005	17	17
RM400	387	0	0	0.029	0.026	0.058	0.043	145	148
RV300	957	1,839	5,685	0.378	0.291	0.759	0.479	1,886	1,661
SA270									
Bellevue	2,491	247	251	0.213	0.185	0.427	0.305	1,060	1,059
Issaquah[2]				0.000	0.000	0.000	0.000	0	0
SA400	264	0	0	0.020	0.018	0.040	0.029	99	101
SH425	57	0	0	0.004	0.004	0.009	0.006	21	22
SS1000	2,697	0	92	0.205	0.183	0.412	0.301	1,024	1,043
SS550	1,570	0	27	0.119	0.106	0.238	0.174	592	604
SS700	2,083	0	91	0.159	0.142	0.319	0.233	794	808
SS850	8,903	580	970	0.740	0.649	1.485	1.068	3,691	3,704
SS940	202	0	0	0.015	0.013	0.030	0.022	75	77
SU1060	195	0	15	0.015	0.013	0.030	0.022	75	76
SU1080	259	0	20	0.020	0.018	0.040	0.029	100	102
SU1300	443	0	15	0.034	0.030	0.068	0.049	168	171
WD430	140	0	0	0.011	0.009	0.021	0.015	53	54
WD370	726	1,232	216	0.151	0.117	0.303	0.193	752	670
WD450	1,437	0	53	0.110	0.097	0.220	0.160	546	557
WE430	55	0	0	0.004	0.004	0.008	0.006	20	21
YB300	119	0	94	0.012	0.010	0.024	0.017	59	58
YP220	402	0	174	0.035	0.031	0.071	0.051	177	177

1. Total ADD, MDD, and ERUs include non-revenue water as a 3-year average of 5.7%.
2. Consult City of Issaquah or City of Redmond planning departments for population and employment projections. SA270 projections assume Issaquah directly serves the South Cove area prior to 2036.

Chapter 4 System Analysis

The City's water system has been evaluated based on the its policy criteria (Chapter 2), asset management program (Chapter 8), and applicable regulations in the following areas.

- Supply Inlet Capacity
- Treatment
- Metering & Billing
- Booster Pump Station Capacity
- Distribution System Capacity
- Storage Capacity
- Condition
- Emergency Preparedness
- Wells
- Property Management

4.1 System Analysis Evaluation Criteria

Table 4-1 summarizes the criteria used to evaluate the system's hydraulic performance. The criteria are based on WAC requirements, DOH guidelines, and City operational policies and practices. The criteria are categorized by system element, such as storage facilities or booster stations. Because the City does not use its own sources of supply, WAC criteria related to source pumping were omitted. Each criterion is assigned an abbreviation used throughout the remainder of the chapter to tie the analyses back to the table.

Table 4-1: System Analysis Evaluation Criteria

Evaluation Type		Criteria Abbreviation	Evaluation Criteria	Agency Reference
Water Supply	Multiple Source	SU-1[1]	2+ supply sources are available	DOH WSDM Section 3.10.5 WSDM Section 5.11.2
	Capacity	SU-2	MDD	WAC 246-290-222(4) DOH WSDM Section 4.4.2
Storage Facilities	Total Storage Capacity	ST-1	Sum of operational, equalizing, emergency, fire suppression, and dead storage.	WAC 246-290-235(3) DOH WSDM Section 7.1.1 COB
	Operating Storage	ST-2	The volume of water drained before sources turn on. (pump off elev. – pump on elev.) x gal/ft OR 2ft-3ft buffer for all tanks, whichever is greater	WAC 246-290-010 DOH, WSDM Section 7.1.1.1 COB, WSP Appendix K

Evaluation Type		Criteria Abbreviation	Evaluation Criteria	Agency Reference
	Equalizing Storage	ST-3	10% MDD for mixed land use 25% MDD for single-family areas Calculated based on actual water use diurnals	DOH, WAC 246-290-235(2) WSDM Section 7.1.1.2 COB, WSP Appendix K
	Emergency Storage (NOT nested with Fire Suppression)	ST-4[1,2]	Min emergency storage of 200 gallons per ERU	WAC 246-290-420 DOH, WSDM Section 7.1.1.3 COB
	Fire Suppression Storage	ST-5	= (required fire flow rate) x (duration in minutes) (Min pressure 20 psi)	WAC 246-290-221(5) DOH, WSDM Section 7.1.1.4 IFC Table B105.1
	Dead Storage	ST-6	Volume that cannot provide minimum design pressure (20 psi) to all customers or adequate suction pressure to downstream booster pumps.	WAC 246-290-230(5) & (6) DOH, WSDM Section 7.1.1.5
Pump Stations	Capacity - Open System (Sufficient Storage in zone)	P-1	MDD with largest pump out of service	WAC 246-290-230 COB, WSP 2.##
		P-2	Replenish fire suppression storage (FSS) within 72 hours while supplying MDD	DOH, WSDM Section 5.4
	Capacity - Closed System	P-3	PHD with largest pump out of service	WAC 246-290-230 (5) DOH, WSDM Section 8.1.2 COB WSP Section 2.1
		P-4	MDD + FF at no less than 20 psi	WAC 246-290-230(6)
		P-5	Onsite backup power generation or a receptacle to connect a portable generator should be provided at all pump stations.	WAC 246-290-420
Distribution System	Minimum Pressures	D-1	PHD at no less than 30 psi	WAC 246-290-230(5) DOH, WSDM Section 6.2.5 COB WSP Section 2.1
		D-2	MDD+FF at no less than 20 psi	DOH, WAC 246-290-230(6) COB WSP Section 2.1
	Maximum Pressures	D-3[3]	125 psi Maximum 80 psi Preferred	DOH, WSDM Section 6.2.7 & Section 6.4.8 COB, WES W3-01.3
	Maximum Velocity	D-4[4]	No more than 10 fps during fire flow	COB WSP Sect 2.3
	Fire Flow Availability	D-5	Minimum 1,000 gpm throughout the distribution system	COB WSP Sect 2.3
	Pipeline Redundancy	D-6	No more than 250 ERUs should be supplied water from a single pipeline	COB WSP Sect 2.3
	Minimum Pipe Size Diameter	D-7	8-inch diameter when serving hydrants	WAC 246-290-230(2) DOH, WSDM Section 6.2.2

Evaluation Type	Criteria Abbreviation	Evaluation Criteria	Agency Reference
		6 -inch if looped and subject to Utility approval	COB, WES W3-02

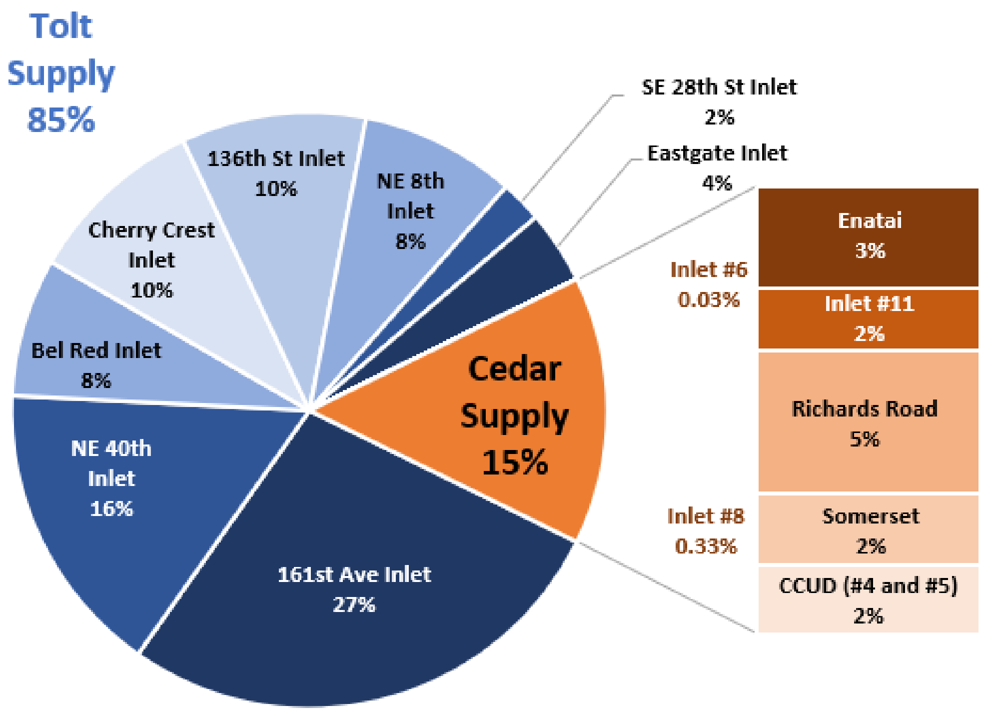
1. Coordination will be required with SPU and Cascade to maintain two water sources for emergency supply as Cascade transitions from SPU as a supply source.
2. The minimum standby storage requirement (per WSDM Section 7.1.1.3) was used due to supply redundancy.
3. Uniform Plumbing Code Section 608.2 requires customers to install individual pressure reducing Valves for plumbing systems when static pressure exceeds 80 psi.
4. DOH, WSDM 6.2.6 recommends conducting a hydraulic transient (water hammer) analysis for distribution piping designed to exceed 5 feet per second (fps) during peak hour demand (PHD) or fire-flow conditions. WAC 246-290-230(9) requires a hydraulic transient analysis when transmission main is designed to operate at 10 fps or more.

4.2 Supply Inlet Capacity

The City is one of several purveyors in the Seattle area that are members of Cascade. The City purchases its water from Cascade, and Cascade is responsible for planning and developing the long-term water supplies for all of its members, including the City.

Currently, the water supplied by Cascade is purchased from SPU and originates from SPU's Cedar and Tolt supplies. About 85 percent of the water supplied to the City comes from the Tolt supply, with the remaining roughly 15 percent from the Cedar supply. Figure 4-1 shows the average relative portion of supply received from each inlet and water source in 2024. Additional information on the Tolt and Cedar water supplies is available online in SPU's 2019 WSP.

Figure 4-1: Relative Proportion of Bellevue's Supply by Inlet Station and Source (2024)



Cascade's regional supply options are identified in their TSP and include supply from one or more of the following:

- Lake Tapps
- SPU's Cedar River Supply
- SPU's Tolt River Supply
- Tacoma Water Division Second Green River Diversion Supply
- Snoqualmie River Aquifer (North Bend)
- Supplies Associated with reuse and reclaimed supply

To support regional supply objectives, the City participates in Cascade's regional water conservation program to supplement its local conservation program.

Cascade is responsible for securing adequate supply of water for its members. Cascade currently has a declining block contract with SPU for wholesale water supply through 2063. In 2025 Cascade entered into another contract with the City of Tacoma for additional long term water supply and will be constructing facilities to connect Cascade's system with Tacoma's system. Additional information is available in Cascade's TSP (Appendix F).

The Utility will continue to coordinate with Cascade and other utilities to provide adequate and reliable water supply. Although adequate quantities of water supply have been secured by Cascade for its members through the 20-year planning horizon, sufficient hydraulic capacity is needed at the City's supply inlets to deliver this water from regional transmission lines to the distribution system.

Table 4-2 shows the maximum flow at minimum contractually guaranteed HGL, estimated capacity, and peak observed flow during the period of 2015-2025. The contractually guaranteed flows are not based on capacity but represent allocation of the SPU-Cascade declining block contract, allocated proportionally to inlets based on actual supply allocation. SPU allows higher flows to occur, as demonstrated by the max observed flows. In the future, as the supply of water from SPU to Cascade declines based on the block contract, Cascade will supply additional water from another source. See Appendix F for additional information. Inlet station maximum flows were also evaluated as part of the Water Rights Self Assessment (Appendix C).

Table 4-2: Inlet Supply Capacities

Station Name	Receiving Zone	Maximum Flow up to which Hydraulic Gradient is Guaranteed[1,2] (GPM)	Contract Stipulations Min Guaranteed HGL[2] (FT)	Hydraulic Capacity @ Min Supply HGL[1,3] (GPM)	2015-2025 Max Flow Observed (GPM)	Operating Area
161st Ave Inlet	LH520	5,810	N/A[5]	3,500	4,979	East
NE 40th Inlet	LH520	15,500	500	6,000	7,568	East
Bel Red Inlet	BV400		470	11,000	8,185	West
Cherry Crest Inlet	BV400		455	6,000	5,583	West
136th St Inlet	BV400		460	8,800	5,433	West
NE 8th Inlet	LH520		460	4,720	5,527	East
SE 28th St Inlet	LH520	4,400	470	3,800	5,102	East
Eastgate Inlet	LH520		525	3,900	4,921	East
Enatai	EN300	2,200	420	3,700	4,701	West
Inlet #11	FA290		425	3,800	3,323	South
Richards Road	WD370 WD340 RV300 BV400	2,725	425	2,500	2,482	South South South West
Inlet #6[6]	NH475		440	0[7]	1,030	South
Inlet #8[8]	FA290		435	2,100[8]	998	South
Somerset[8]	SS700		435	2,400[8]	2,950	South
CCUD (#4 and #5)	CCUD580 CCUD475	1,700	445	[9]	[10]	South
Kirkland S1	PP670	469	[11]	[11]	[10]	West

1. Values are from the SPU & Cascade Management Agreement, Exhibit II (Updated 2020) and do not reflect operational limits.
2. The contractually guaranteed flows and HGLs listed do not imply hydraulic capacity. Actual HGL and hydraulic capacity are higher. See Volume 3 for agreements.
3. Hydraulic capacity is estimated at minimum observed HGL in the upstream supply pipeline (TESSL/CESSL) and normal pressure downstream of the inlet (or firm pump capacity where applicable). Actual capacity will be higher than shown when upstream TESSL/CESSL HGL is higher than minimum, or when all pumps are running (where applicable).
4. 161st Inlet shares the Bellevue-Issaquah Pipeline with Issaquah and SPWSD. Total guaranteed flow allocated to the Bellevue-Issaquah Pipeline is 5,810 gpm shared by all 3 utilities. City of Bellevue share is not stipulated by contract (assume capacity of available to Bellevue is 1,940 gpm)).
5. Minimum guaranteed HGL in the Bellevue-Issaquah Pipeline is 525 feet near Eastgate Inlet. HGL at 161st Avenue inlet is lower.

6. Inlet #6 is operated only as backup supply in case of fire or other emergency. No minimum flow is stipulated.
7. Minimum seasonal CESSL (upstream) HGL is less than the normal NH470 (downstream) HGL. Inlet #6 is not available for any service during these seasonal, high-demand conditions.
8. Inlet #8 and Somerset Inlet share common dual 8-inch connections to CESSL. Hydraulic capacity is adjusted to cumulative flow of approximately 4,500 gpm.
9. CCUD total inlet capacity is 4,285 gpm to serve both CCUD and wheeled water to Bellevue. Bellevue's agreement with CCUD does not stipulate a specific limit to Bellevue's share of inlet capacity.
10. CCUD and Kirkland master meters do not have live telemetry. Actual peak flows are unknown.
11. Per contract, Bellevue has a 13.4 percent share of Kirkland's Supply Station 1. Kirkland has estimated the inlet capacity at 3,500 gpm (City of Kirkland Comprehensive Water System Plan).

Inlet design capacity was analyzed in comparison to projected flows for each operating area, per DOH requirements to ensure a reliable supply that can meet system MDD. Table 4-3 shows the existing design supply capacity for each operating area, the projected MDD, and surplus or deficit by operating area for a high demand year. This information consolidates the projected demands by pressure zone into the larger operating areas that share common supply inlet stations. All wholesale users who regularly receive supply from the City are included in the demands for the supply capacity evaluation, including projected growth as tabulated in Chapter 3.

Table 4-3: Supply Capacity Evaluation

	Year	Operating Area			Total
		West	East	South	
Existing Capacity (gpm)		29,500	21,920	10,800	**62,220**
Projected MDD (gpm) (SU-2)	2027	13,199	10,578	5,125	**28,902**
	2036	16,469	11,430	5,463	**33,362**
	2046	20,101	12,695	5,852	**38,648**
Surplus or Deficit (gpm)	16,301	16,301	11,342	5,675	**33,318**
	13,031	13,031	10,490	5,337	**28,858**
	9,399	9,399	9,225	4,948	**23,572**
ERU Analysis					
Existing Capacity (ERUs)		105,580	65,099	38,850	**207,072**
Projected Retail System ERUs	2027	47,241	38,255	18,434	**103,930**
	2036	58,941	41,140	19,646	**119,727**
	2046	71,941	45,815	21,034	**138,790**
MDD/ERU (gpd/ERU)		402.35	484.88	400.31	**432.37**
ERU Capacity Surplus or Deficit (ERU)	2027	58,340	26,843	20,415	**103,294**
	2036	46,640	23,957	19,203	**87,497**
	2046	33,640	19,282	17,816	**68,434**

Table 4-3 shows that all operating areas are projected to have access to adequate supply through the planning period.

4.3 Treatment

All of the City's water is treated at either the Cedar Water Treatment Facility or the Tolt Water Treatment Facility. Information on these facilities is available in SPU's 2019 WSP.

The City coordinates demand projections with Cascade to ensure adequate current and future treatment capacity. More information on Cascade's supply and treatment portfolio is available in Cascade's TSP (Appendix F).

The City's drinking water quality meets applicable regulations, and the Utility does not normally provide additional treatment to water received through the regional supply inlets (from Cascade/SPU) or through interties with adjacent utilities (CCUD, Kirkland, Redmond). Supplemental chlorine may be added only if necessary to maintain chlorine residual in certain areas.

4.4 Metering & Billing

Small meters are installed, maintained, and, when necessary, replaced by O&M staff, as discussed in Chapter 6. Large commercial water meters (defined as 3-inch diameter and larger) are maintained by O&M staff and replaced by contractors when extensive site work is required. Due to larger volumes and higher consequence of metering inaccuracies, the City has prioritized large meters for more frequent testing by O&M (see Chapter 6) and established CIP program W-98 to replace aging commercial meters (see Chapter 9).

The City installed AMI in place of most customer meters between 2018 and 2023. AMI sends water usage data to the City's database via cellular data, eliminating the need for regular field meter readings. It also provides information to the City regarding leak detection, data on distribution system water losses, alerts on meter tampering and backflow, and increased efficiency and consistency with account closures and billing cycles. Customers can use the web-based MyUtilityBill system to manage their account online.

4.5 Distribution System Capacity

The City continually evaluates its water distribution system against DOH requirements and City level of service policies. Typically, hydraulic modeling is used for capital planning pre-design and to analyze fire flow availability for developers and homeowners. The City also uses hydraulic modeling to analyze water age, service reliability, and other system characteristics.

Hydraulic Modeling

The City continually updates its InfoWater Pro® (by AutoDesk) hydraulic model with new projects and operational changes. The model was calibrated in 2014 for both steady-state and EPS scenarios. Additional tests were done between 2018 and 2023 to support projects and validate model results. The City recently implemented system-wide AMI, as described in Section 4.4, so adequate diurnal demand curve data was not available to calibrate the model in time for this WSP analysis. A full model calibration will be scheduled before 2030 to incorporate this valuable data into the hydraulic model.

A model scenario review and validation were performed to prepare the model for the high-level fire flow availability and pressure analysis required by DOH. The model review included evaluation of pressure zone HGLs, fire flow critical nodes, updates to areas of new construction or operational changes, and run stability. Full documentation of the model review is included in Appendix G. Fire flow and available pressure were analyzed as a part of the WSP modeling effort. A future study of modeled transmission velocity is recommended after a full model calibration is completed.

Fire Flow

The Utility routinely analyzes the available fire flow (AFF) at fire hydrants and at private connections to the system (for fire suppression systems). This information is required for new building construction to comply with Fire Code and is frequently provided to the Fire Department and private developers.

The AFF is the maximum demand at a given location that meets the required minimum pressure (20 psi) criteria throughout the system. When evaluating new design or development proposals, the City also considers maximum velocity (10 fps) criteria in accordance with City Engineering Standards. AFF is not the actual flow that would occur during a fire event. Actual flow from a hydrant depends on numerous factors, including zone HGL and localized system demands at the time of the event, size and type of hydrant, length and orientation of the fire hose, elevation of the fire hose nozzle, etc.

The City’s policies pertaining to fire flow (found in Chapter 2) establish that developers are responsible for improvements needed to meet Fire Code requirements on their property. However, the Fire Flow Improvement Program policy establishes a goal to provide a minimum of 1,000 gpm AFF throughout the entire service area. Historically, the City has worked toward this goal over time primarily through CIP W-16 Water Main Replacement, which increases hydraulic capacity while also replacing aging mains. Approximately 98 percent of customer accounts now have at least 1,000 gpm AFF. Some areas have less than 1,000 gpm due to system settings or legacy pressure zone boundaries, rather than pipe size limitations. In these cases, the City’s hydraulic model is used to identify operational changes and other infrastructure improvements (in addition to aging water main replacement) that will achieve the minimum 1,000 gpm objective.

Results of the fire flow analysis of the City’s system are illustrated in Figure 4-2. The following pressure zones have areas that do not meet the minimum 1,000-gpm AFF criteria in 2027.

Lake Hills 520 Pressure Zone

Fire flows and domestic pressures in some portions of the LH520 pressure zone are extremely sensitive to the zone operations and demand. Further evaluation of this area is necessary as part of the recommended future hydraulic model calibration and should include extra field testing, including pressure logger installation at high-elevation hydrants.

The WSP analysis showed that most hydrants in the zone have at least 1,000 gpm available with the NE 8th Inlet Station PRV set at an HGL of 534 feet, except a small portion of hydrants located on 6-inch mains. The City, however, prefers to operate the zone at an HGL closer to 520 feet to decrease the operations workload needed to preserve water quality and excessive pump cycling. Further discussion of the HGL of this zone is included below, in Available Pressure.

Pikes Peak 550 Zone

Five hydrants in the PP550 zone have limited AFF due to a localized high point near the PP600 zone boundary on 134th Avenue NE and NE 27th Place that impacts AFF in modeling simulations. The pressure results are within a typical hydraulic modeling error of 10 psi during high flows and are sensitive to pipe roughness values, so this area should be reviewed as part of the planned hydraulic model calibration prior to incorporating any associated improvements into the CIP. If the results are confirmed, relocating the high point from the PP550 Zone to the PP600 Zone by adjusting the location of the Zone valve during future AC main replacement will likely resolve the issue. There are also a few hydrants in the PP550 zone located on 6-inch mains that need to be upsized.

Eastgate 300 Zone

The EG300 zone contains many 6-inch pipes serving fire hydrants. Fire flow deficiencies in this pressure zone will be reduced with the City's ongoing water main replacement CIP. A project in this zone to upsize the 6-inch pipes is currently scheduled within the W-16 Water Main Replacement program.

Sammamish 270 Zone

The SA270 zone is still hydraulically connected to the Sammamish Reservoir which was transferred to Issaquah with the South Cove Assumption in 2016. This zone is currently operating at an HGL fluctuating between 250 and 260 feet to maintain water quality and fill the Sammamish reservoir. At the lower HGL range there is limited AFF at higher elevations in the zone.

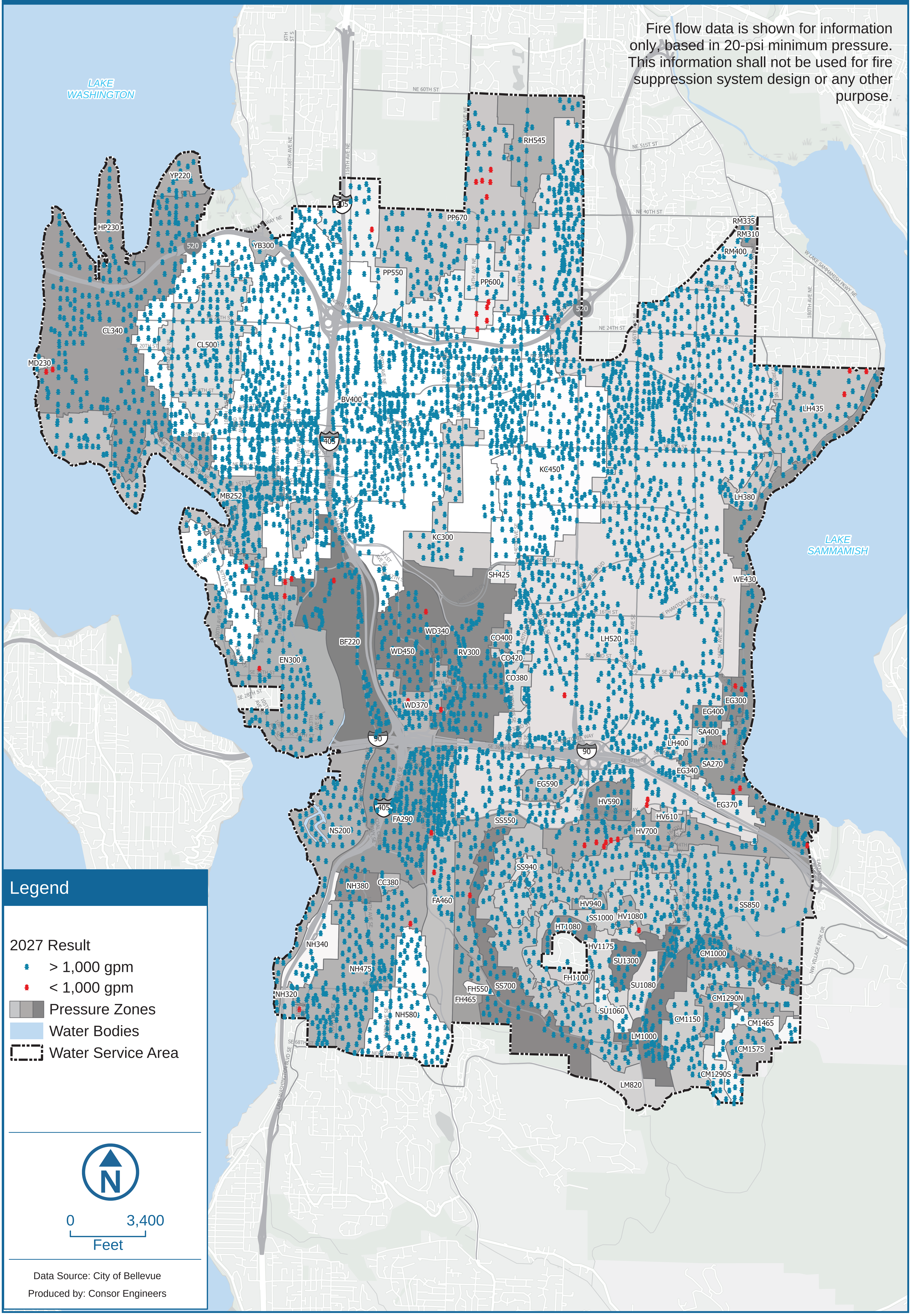
The City is currently coordinating with Issaquah to replace aging water mains and maintain water quality prior to increasing pressure. Many of the fire flow deficiencies could be resolved by raising the overall HGL of the pressure zone. However, raising pressure will require installation of individual service PRVs at some customer connections. The results in Figure 4-2 are based upon conditions without the zone hydraulically connected to the Sammamish Reservoir and fed via existing PRVs.

Somerset 1000 Pressure Zone

Prior WSP modeling analysis showed that fire flow is adequate within areas of this pressure zone. The City is currently evaluating whether flow can be improved through operational changes or if a new Somerset 1025 pressure zone needs to be created.

Available Fire Flow

Figure 4-2



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Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community

Available Pressure

The hydraulic analysis evaluated the required minimum HGL and recommended maximum HGL for each pressure zone under normal operating conditions (not during a fire) based on the maximum and minimum customer elevations. These static pressure calculations were compared to dynamic modeling pressure results for 2027. The hydraulic model's current EPS scenario was used with current and planning year demands to evaluate minimum pressures for PHD conditions. The model's customer classification-specific diurnal demand curves were used (see 2016 WSP) in lieu of static model scenarios and the PHD values calculated using the DOH Equation 3-1. The results of this analysis are illustrated in Figure 4-3 and presented in Table 4-4.

The City requires individual PRVs to be installed at all new connections where system pressure exceeds 80 psi, in conformance with Uniform Plumbing Code 608.2. Table 4-4 and Figure 4-3 show multiple pressure zones with low or high (or both) pressures.

Table 4-4: Pressure Zone HGL

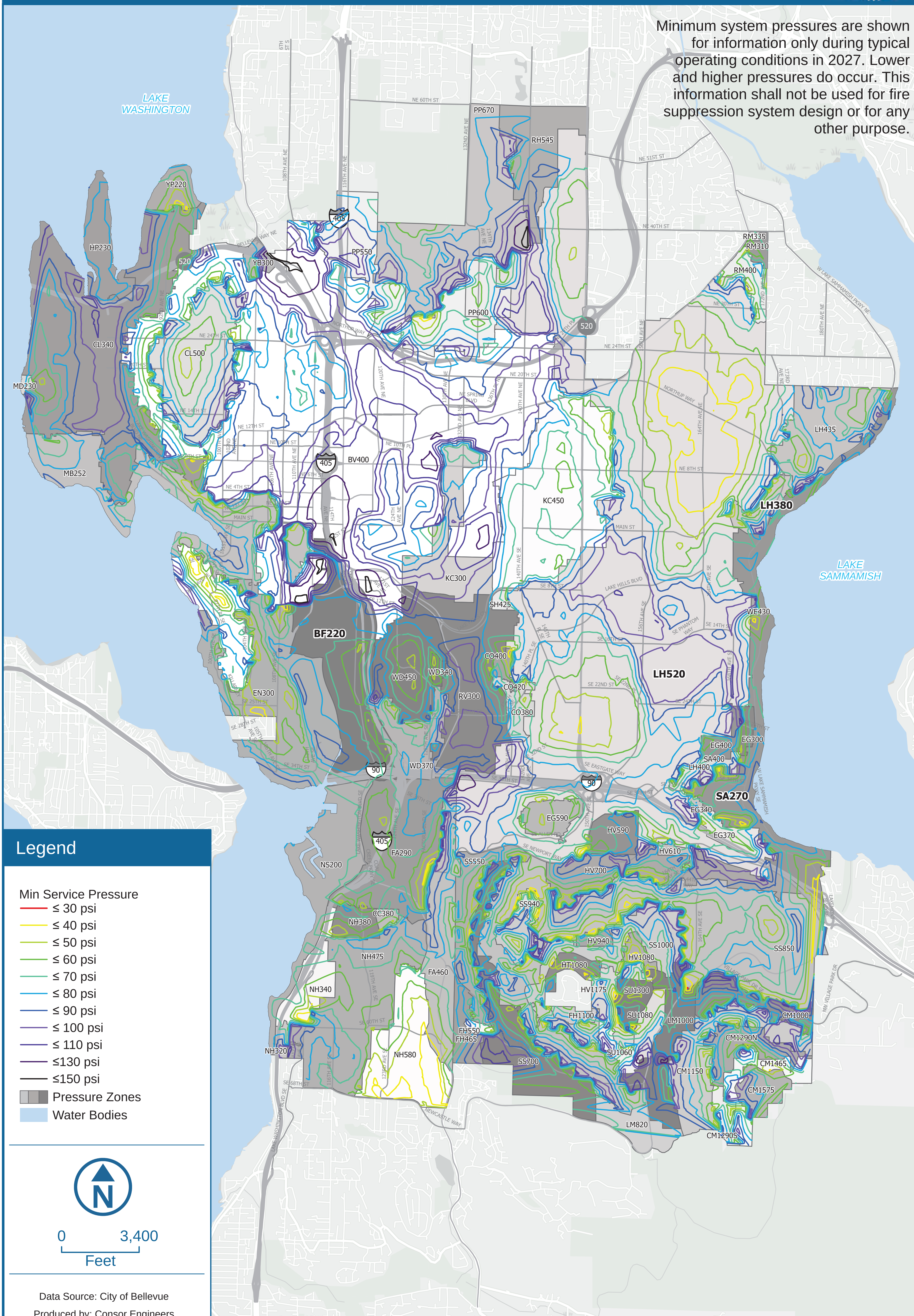
	Service Elevation			2027 Modeled Pressure (psi)	
Pressure Zone	**Min**	**Max**	**Min Req'd HGL at Max Elev (30 psi)**	**Min**	**Max**
BF220	17	128	198	38	85
BV400	32	318	388	32	172
CL340	27	228	298	39	126
CL500	210	390	460	43	124
CM1000	729	924	994	40	119
LM1000	700	884	954	53	120
CM1150	835	1,044	1,114	41	135
CM1290N	994	1,170	1,240	39	118
CM1290S	1,060	1,187	1,257	48	100
CM1465	1,191	1,365	1,435	39	117
CM1575	1,324	1,439	1,509	62	111
CO380	184	280	350	45	96
CO400	192	303	373	40	88
CO420	244	282	352	59	76
EG300	88	172	242	47	83
EG340	146	190	260	63	81
EG370	115	267	337	47	114
LH400	168	303	373	46	104
EG400	166	313	383	52	116
SA400	128	271	341	62	125
HV590	386	476	546	56	97
EG590	387	448	518	48	78
HV610	376	486	556	54	96
EN300	25	176	246	35	112
FA290	65	217	287	341	90
FA460	153	336	406	52	125
FH465	270	355	425	51	86
FH1100	889	983	1,053	56	97
HP230	20	64	134	70	91
HV700	390	631	701	32	139

Pressure Zone	Service Elevation Min	Service Elevation Max	Min Req'd HGL at Max Elev (30 psi)	2027 Modeled Pressure (psi) Min	2027 Modeled Pressure (psi) Max
HV940	738	813	883	54	87
HV1080	861	981	1,051	32	103
HT1080	876	986	1,056	39	89
HV1175	788	1,102	1,172	31	155
KC300	33	168	238	53	114
KC450	201	333	403	45	103
LH380	116	296	366	35	114
LH435	151	320	390	47	123
LH520	175	446	516	331	154
MB252	20	179	249	39	99
MD230	31	118	188	61	85
NH340	126	257	327	32	77
NH320	98	197	267	59	102
CC380	186	256	326	48	73
NH380	193	289	359	41	82
NH475	207	364	434	48	121
NH580	351	453	523	321	94
NS200	20	69	139	61	83
PP550	235	472	542	36	136
PP600	320	460	530	56	117
PP670	298	532	602	55	161
RH545	288	409	479	57	110
RM310	129	199	269	46	78
RM335	129	199	269	64	68
RM400	179	285	355	36	88
RV300	41	200	270	47	110
SA270	44	235	305	331	97
WE430	168	236	306	102	115
SH425	258	302	372	54	73
SS550	320	476	546	33	101
FH550	350	452	522	48	93
SS700	430	601	671	42	124
SS850	542	766	836	301	131
SS940	754	785	855	66	80
SS1000	703	910	980	39	129
SU1060	743	966	1,036	42	128
SU1080	803	972	1,042	44	118
SU1300	1,059	1,192	1,262	48	99
WD340	148	226	296	44	78
WD370	99	259	329	43	110
WD450	170	333	403	48	119
YB300	116	166	236	51	72
YP220	24	124	194	36	80

Notes: 1. Low pressures in FA290, LH520, NH580, SA270, and SS850 are discussed further in Section 4.5. While some are not below the 30 psi threshold in 2027, these areas are expecting demand increases according to projections in Chapter 3 which may cause pressures to drop below 30 psi in future years.

Minimum Pressure Evaluation

Figure 4-3



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Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community

Crossroads Area

The highest portion of the LH520 pressure zone, also known as the Crossroads Area, is projected to have declining domestic pressures dropping below 30 psi as demands increase over the 20-year planning period. Localized customer complaints about low pressure have been received over the years. The model results are extremely sensitive to the hydraulic assumptions made in the area (e.g. pipe roughness, demand, and nearby Redmond wholesale demands). Pressures are also sensitive to the operation of the Lake Hills Reservoirs and Booster Station and the NE 8th Street Inlet Station. It is recommended that the City conduct flow tests using pressure loggers and perform a detailed calibration of this area in the hydraulic model as part of their recommended system-wide model calibration included in their CIP.

In 2013, the City commissioned an evaluation by RH2 Engineering, Inc. (See 2016 WSP) to analyze creation of a new Crossroads 560 zone, which would operate at roughly 17.3 psi higher pressure than LH520 at that time. Three alternatives were identified, ranging in cost from $12.3M to $21.6M in 2013 dollars. Although the addition of some isolation valves, check valves, and PRV stations accounted for some costs, most of the estimated costs were driven by several miles of new water main that would be necessary to maintain existing fire flows in surrounding areas of LH520. The project was not implemented since domestic pressures at the time were above 30 psi.

In 2013, the City also changed operation of LH520 on a trial basis, to create a more moderate increase of roughly 5 to 8 psi. This involved raising PRV settings and pump operating setpoints. Although the pressure increase was slight, no immediate capital investments were required. The downsides of this strategy included:

- Energy-inefficient operation (more frequent pump operation, at higher total dynamic head).
- Risks of over-pressurizing customer connections at lower elevations (individual customer PRVs may be necessary.
- Problems associated with isolating the Newport and Parksite Reservoirs due to closed altitude valves to avoid overflowing tanks, older water age in south end of LH520 zone and the Cougar Mountain zones from lack of turnover, and hydraulic surges due to lack of open water surface.

In 2019, the City returned to operating the pressure zone at 520 feet to preserve water quality.

The City may revisit the proposal for the Crossroads 560 pressure zone or temporarily operate the zone at a 530 HGL during high demand periods to provide adequate pressure and fire flow availability.

Sammamish 270 Zone

This zone originally operated at an HGL near 270. Since the 1980s, when the reservoir was replaced, it has been operating at an HGL below 260 to address water quality concerns. This, however, has resulted in significant areas of low pressure and fire flow.

Historically this zone included the South Cove area located in Issaquah. In 2016, utilities in South Cove were assumed by Issaquah. The assumption agreement included a requirement to increase the HGL to the original 270-foot elevation. This has been delayed while aging AC water main is replaced to reduce risk of water main breaks due to high pressure.

The City and Issaquah are currently coordinating to determine a strategy for operating the south part of the SA270 zone to improve both water pressure and water quality. Part of this overall strategy may include complete separation of the water systems at the city boundaries. This could allow Issaquah to improve water pressure and system redundancy on in its system and the City to maintain its zone pressure at HGL 260 to limit areas of excess pressure in customers' plumbing systems. However, because of the grade changes in the zone, a few hydrants like the two on SE 39th Street would operate below 1,000 gpm. Flow at other hydrants like on 168th Place SE can be improved by upsizing the existing pipes to 8 inch.

Newport Hills 580 Zone

Anticipated system demand increases will cause water pressure to drop below 30 psi for a few customers on the east side of the NH580 pressure zone. Since this pressure zone receives flow via multiple metered connections to the neighboring CCUD, the City's upcoming hydraulic model calibration should include data collection in and coordination with CCUD to understand the state of their piping and operations. Larger-diameter mains may be required both in the CCUD and in the NH580 to maintain pressures.

Factoria 290 Zone

There are two customers located on a hill north of Southeast Newport Way and east of Factoria Boulevard Southeast who are projected to experience pressures just under 30 psi during summer demand conditions. These locations should be verified during the model calibration effort. If necessary, a longer service lateral could be constructed from the FA460 zone to the south, but this would cause routine service pressures over 80 psi and individual PRVs would be required.

Somerset 850 Pressure Zone

The hydraulic model indicates that pressures in the SS850 zone are sensitive to system operations of the three tanks and pump stations serving the zone and that service pressures may drop below 30 psi during summer operations. These pressures are also sensitive to flow through the Horizon View 2 Pump Station serving the HV1175 zone. During summer demands, City operations typically involve coordinating any pumping out of the SS850 Zone with simultaneous pumping into the SS850 Zone to mitigate the lower pressures observed in the model.

There is an aging 10-inch AC distribution main on 150th Avenue Southeast conveying large amounts of flow between the Horizon View 1 Pump Station and the Horizon View 2 Reservoir that experiences high pressure loss depending on how the zone is operated. It is recommended that the City schedule this main for replacement as part of their ongoing Water Main Replacement Program (CIP W-16). Further analysis should be conducted after the hydraulic model calibration to identify piping projects that would improve transmission capacity between pump stations and reservoirs in this pressure zone.

4.6 Booster Station Capacity Evaluation

The capacity of each of the City's booster pump stations was evaluated using the applicable criteria from Table 4-1. Per the WAC and DOH WSDM, the evaluation criteria vary based on whether the booster station serves an open or closed zone. For a closed zone, no storage is available to supply fire flow or emergency backup flow, so closed zones are evaluated using criteria P-3 (PHD with largest pump out of service) and P-4 (total capacity vs MDD plus fire flow). PHD values were estimated for each pressure zone using the DOH Equation 3-1. These PHD demands were used for the purposes of this booster station capacity evaluation only and should not be used for other planning purposes.

For open zones, storage is available for emergency supply, but the pump station must be able to meet MDD with the largest pump out of service (evaluation criteria P-1) and replenish emergency storage within 72 hours of pumping during MDD (evaluation criteria P-2).

Table 4-5 summarizes the results of the pump station capacity analysis, including both criteria corresponding to whether the station supplies an open or closed zone. The most conservative/limiting criterion is used to check total flow or ERU surplus/deficit for each pump station at the end of the table. Pump stations that serve zones which are primarily supplied by inlet stations were not included in this analysis. The analysis showed that Clyde Hill Booster Station is the only pump station that does not meet DOH requirements through 2046. Chapter 9 includes a CIP to address this deficiency.

Table 4-5: Booster Station Capacity Analysis

Pump Station	Cougar Mountain 3	Cougar Mountain 2	Cougar Mountain 1	Newport	Cherry Crest + 670[1]	Clyde Hill	Forest Hills
PS Served	***None***	***Cougar Mountain 3***	***Cougar Mountain 2***	***Cougar Mountain 1***	***None***	***None***	***Horizon View 3***
Zones Served	CM1575, CM1465	CM1465, CM1290N, CM1290S	CM1150, CM1000, LM1000,	SS850, HV700, HV610	PP670, PP600, PP550	CL500	HV940, SS940, HV1080, HV1175, HT1080, SU1060, SS1000
Open/ Closed Zone	Closed	Open	Open	Open	Closed	Closed	Open
Evaluation Criteria	**P-3**	**P-1**	**P-1**	**P-1**	**P-3**	**P-3**	**P-1**
Demand Criteria	PHD	MDD	MDD	MDD	PHD	PHD	MDD
2027 Demand (gpm)	65	117	1,022	1,316	595	717	436
2036 Demand (gpm)	66	119	1,038	1,356	604	723	443
2046 Demand (gpm)	67	122	1,068	1,412	613	729	451
Pump Capacity Criteria	Firm Capacity	Firm Capacity	Firm Capacity	Firm Capacity	Firm Capacity	Firm Capacity	Firm Capacity
Capacity (gpm)	852	1,090	1,500	2,000	4,097	1,748	1,200
2027 Surplus/ Deficit (gpm)	787	973	478	684	3,502	1,031	764
2036 Surplus/ Deficit (gpm)	786	971	462	644	3,493	1,025	757
2046 Surplus/ Deficit (gpm)	785	968	432	588	3,484	1,019	749
Evaluation Criteria	**P-4**	**P-2**	**P-2**	**P-2**	**P-4**	**P-4**	**P-2**
Demand Criteria	MDD + Fireflow	MDD plus Replenish FSS	MDD plus Replenish FSS	MDD plus Replenish FSS	MDD + Fireflow	MDD + Fireflow	MDD plus Replenish FSS
2027 Demand (gpm)	1,616	172	1,078	1,677	2,359	2,398	491
2036 Demand (gpm)	1,616	175	1,094	1,717	2,365	2,401	498
2046 Demand (gpm)	1,617	178	1,124	1,773	2,372	2,405	507
Pump Criteria	Total Capacity	Total Capacity	Total Capacity	Total Capacity	Total Capacity	Total Capacity	Total Capacity
Capacity (gpm)	2,488	2,040	2,250	3,200	7,091	2,150	2,260
2027 Surplus/ Deficit (gpm)	872	1,868	1,172	1,523	4,732	-248	1,769
2036 Surplus/ Deficit (gpm)	872	1,865	1,156	1,483	4,726	-251	1,762
2046 Surplus/ Deficit (gpm)	871	1,862	1,126	1,427	4,719	-255	1,753
Limiting Capacity	**Limited by Firm Capacity (P-3)**	**Limited by Firm Capacity (P-1)**	**Limited by Firm Capacity (P-1)**	**Limited by Firm Capacity (P-1)**	**Limited by Firm Capacity (P-3)**	**Limited By Total Capacity (P-4)**	**Limited by Firm Capacity (P-1)**
2027 Surplus/ Deficit (gpm)	787	973	478	684	3,502	**-248**	764
2036 Surplus/ Deficit (gpm)	786	971	462	644	3,493	**-251**	757
2046 Surplus/ Deficit (gpm)	785	968	432	588	3,484	**-255**	749

Pump Station	Cougar Mountain 3	Cougar Mountain 2	Cougar Mountain 1	Newport	Cherry Crest + 670[1]	Clyde Hill	Forest Hills
Total ERUs 2027	57	417	3,752	6,902	1,286	1,423	1,559
Total ERUs 2036	59	427	3,809	7,215	1,308	1,436	1,585
Total ERUs 2046	60	437	3,914	7,605	1,332	1,451	1,614
Surplus/ Deficit ERUs 2027	693	3,484	1,753	3,590	7,568	**-147**	2,736
Surplus/ Deficit ERUs 2036	699	3,484	1,752	3,643	7,588	**-150**	2,736
Surplus/ Deficit ERUs 2046	706	3,484	1,750	3,686	7,610	**-154**	2,736

Note: 1. Cherry Crest and 670 BPS were evaluated with combined capacities as they work together to serve the same closed zone.

Pump Station	Somerset 2	Somerset Inlet	Horizon View 3	Horizon View 2	Horizon View 1	Parksite	Woodridge
PS Served	***Forest Hills***	***Somerset 2***	***None***	***Horizon View 3***	***Horizon View 2***	***Horizon View 1***	***None***
Zones Served	SS850	SS550, FH465, FH550, SS700	SU1300	SU1080, FH1100	SS850	HV700, HV610, HV590, EG590	WD450, WD370
Open/ Closed Zone	Open	Open	Closed	Open	Open	Open	Open
Evaluation Criteria	**P-1**	**P-1**	**P-3**	**P-1**	**P-1**	**P-1**	**P-1**
Demand Criteria	MDD	MDD	PHD	MDD	MDD	MDD	MDD
2027 Demand (gpm)	729	1,139	130	87	380	797	147
2036 Demand (gpm)	760	1,176	131	88	406	905	150
2046 Demand (gpm)	795	1,217	133	90	434	1,025	153
Pump Capacity Criteria	Firm Capacity	Firm Capacity	Firm Capacity	Firm Capacity	Firm Capacity	Firm Capacity	Firm Capacity
Capacity (gpm)	2,193	3,987	852	1,200	1,800	1,511	3,300
2027 Surplus/ Deficit (gpm)	1,464	2,848	722	1,113	1,420	714	3,153
2036 Surplus/ Deficit (gpm)	1,433	2,811	721	1,112	1,394	606	3,150
2046 Surplus/ Deficit (gpm)	1,398	2,770	719	1,110	1,366	486	3,147
Evaluation Criteria	**P-2**	**P-2**	**P-4**	**P-2**	**P-2**	**P-2**	**P-2**
Demand Criteria	MDD plus Replenish FSS	MDD plus Replenish FSS	MDD + Fireflow	MDD plus Replenish FSS	MDD plus Replenish FSS	MDD plus Replenish FSS	MDD plus Replenish FSS
2027 Demand (gpm)	1,090	1,194	1,646	143	742	1,075	202
2036 Demand (gpm)	1,121	1,231	1,646	144	767	1,183	205
2046 Demand (gpm)	1,156	1,272	1,647	146	795	1,302	208
Pump Criteria	Total Capacity	Total Capacity	Total Capacity	Total Capacity	Total Capacity	Total Capacity	Total Capacity
Capacity (gpm)	3,488	5,320	2,622	2,400	3,600	2,818	5,120
2027 Surplus/ Deficit (gpm)	2,398	4,126	976	2,257	2,858	1,743	4,918
2036 Surplus/ Deficit (gpm)	2,367	4,089	976	2,256	2,833	1,635	4,915
2046 Surplus/ Deficit (gpm)	2,332	4,048	975	2,254	2,805	1,516	4,912

Limiting Capacity	Limited by Firm Capacity (P-1)	Limited by Firm Capacity (P-1)	Limited by Firm Capacity (P-3)	Limited by Firm Capacity (P-1)	Limited by Firm Capacity (P-1)	Limited by Firm Capacity (P-1)	Limited by Firm Capacity (P-1)
2027 Surplus/ Deficit (gpm)	**1,464**	**2,848**	**722**	**1,113**	**1,420**	**714**	**3,153**
2036 Surplus/ Deficit (gpm)	**1,433**	**2,811**	**721**	**1,112**	**1,394**	**606**	**3,150**
2046 Surplus/ Deficit (gpm)	**1,398**	**2,770**	**719**	**1,110**	**1,366**	**486**	**3,147**
Total ERUs 2027	4,708	6,175	163	312	3,461	4,952	526
Total ERUs 2036	4,991	6,478	166	316	3,722	5,509	535
Total ERUs 2046	5,305	6,815	168	321	4,012	6,127	546
Surplus/ Deficit ERUs 2027	**9,458**	**15,446**	**905**	**3,983**	**12,913**	**4,436**	**11,285**
Surplus/ deficit ERUs 2036	**9,614**	**15,696**	**909**	**3,983**	**13,026**	**4,347**	**11,285**
Surplus/ deficit ERUs 2046	**9,774**	**15,955**	**913**	**3,983**	**13,136**	**4,270**	**11,285**

4.7 Storage Capacity

Storage Regions

Storage volume was evaluated for various areas of the City delineated as "storage regions" (shown in Table 4-6 and Figure 4-4), in which storage can realistically be used to fight a fire throughout.

The 2016 WSP separated the Bellevue Storage Region from the pressure zones served by the Pikes Peak Reservoir (the Pikes Peak Storage Region) and the Clyde Hill 465 Reservoir (the Clyde Hill Storage Region). Since 2016, the Cherry Crest Pump Station has been upgraded with additional pumping and backup power, making BV400 storage available to the Pikes Peak pressure zones. The Clyde Hill Pump Station has been upgraded, allowing the CL500 zone to function as a closed zone. Also, a direct connection between the Clyde Hill 465 Reservoir and the BV400 zone has been constructed. Therefore, these two storage regions were merged with the Bellevue Storage Region for the 2027 WSP.

The 2016 WSP also identified the WD400 (now WD370), WD340, and RV300 pressure zones as an "SPU-Only Storage Region," or pressure zones that were deemed to lack access to storage at all. These three pressure zones have been included in connected storage regions for the purpose of planning adequate storage volume to serve them, even as improvements are planned to expand their access to that volume.

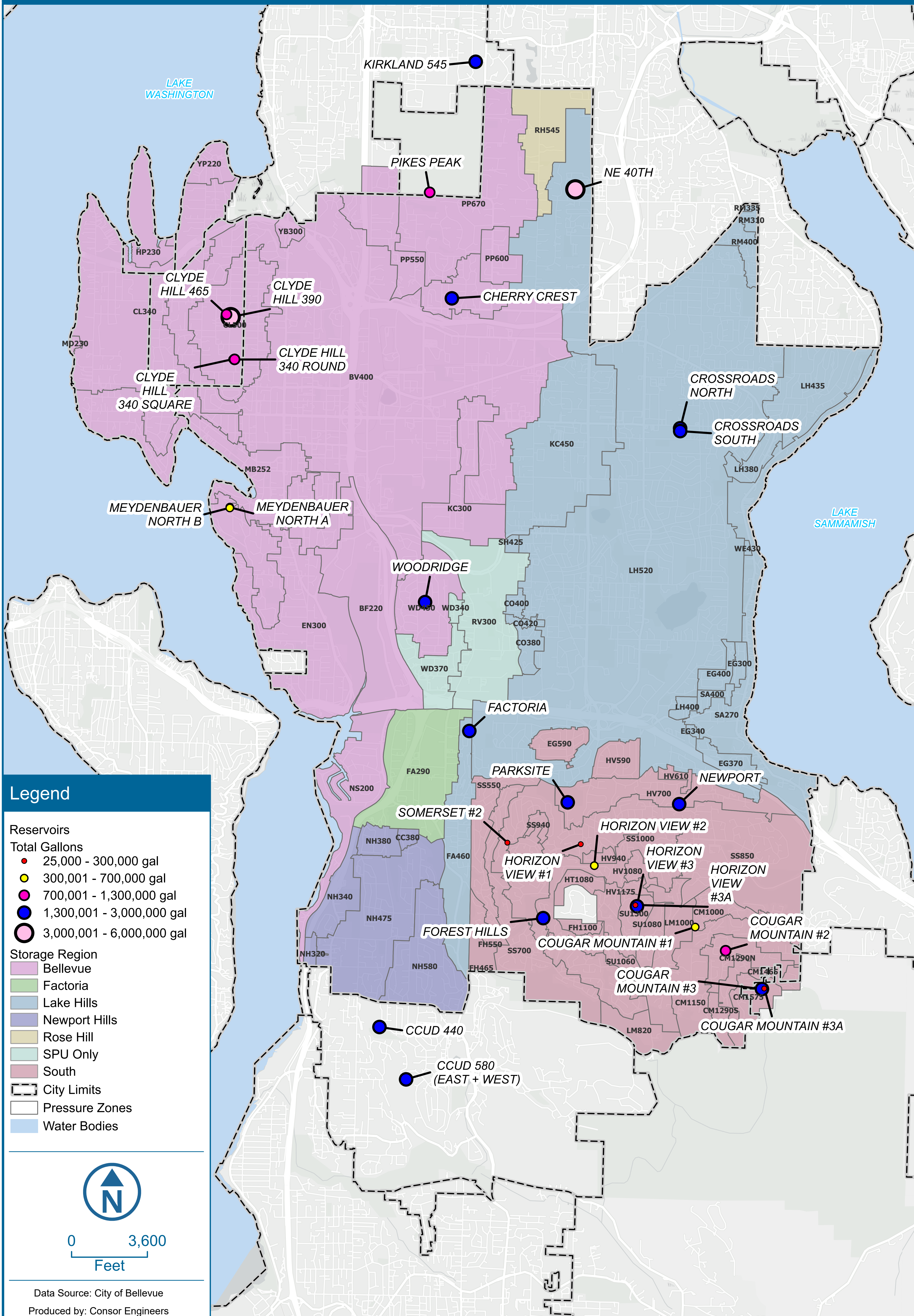
- As shown in the City hydraulic profile, the RV300 zone is connected to the LH520 pressure zone. Though flow does not travel from LH520 to RV300 during typical operations, storage volume is available for emergencies and fire flow. Combining this zone with the Lake Hills Storage Region is conservative since equalizing storage for the zone is included in the analysis even though that volume is usually provided through the SPU inlet stations.

- The City hydraulic profile also demonstrates that the WD370 zone can access Woodridge Reservoir storage via a backup PRV. Similar to the RV300 zone, storage is accessible during emergencies even though it is not transferred between zones on a daily basis. This zone was combined with the Bellevue Storage Region for the purposes of planning adequate storage in the future.

- The WD340 pressure zone could access Lake Hills storage if a zone boundary valve is opened from the RV300 in an emergency. The City is considering installing an RV300-WD340 check valve so that this flow transfer is possible without operator intervention. However, the WD340 pressure zone was included in the Bellevue Storage Region because it is possible for the City to backflow Woodridge storage through the SPU inlet station into WD340. During preparation of this WSP, SPU shut down the inlet station supplying WD340 and the City successfully conducted this alternate operational scheme.

Storage Regions and Reservoirs

Figure 4-4



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Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community

Although the Lake Hills Region wheels water to Redmond's Overlake area, Redmond's demands are not considered in the storage evaluation, because the City is not responsible for providing storage for Overlake. It is assumed that Redmond will construct storage as needed to meet the needs of growth in Overlake. Redmond owns a 44 percent share of volume in NE 40th Reservoir, which was excluded from the storage evaluation (only the City's 56 percent share was considered in the evaluation).

Included in the storage evaluation are Issaquah's Lakemont Triangle (LH520, Lake Hills Storage Region) and Montreux/Glacier Ridge (CM1150, South Storage Region) neighborhoods, because Issaquah pays a wheeling charge that includes access to storage in the City's system. The City is responsible for providing storage for these customers in Issaquah, per agreement.

Sammamish Reservoir volume and future wheeled flows to Issaquah's South Cove area have been excluded from the storage evaluation, under the assumption that Issaquah will meet its own storage needs with the Sammamish Reservoir or another reservoir in its system.

Table 4-6: Storage Regions and Total Available Storage

Storage Region	Pressure Zones Served by Storage Region	Reservoirs	Reservoir Volume		BPS or Gravity Fed
			Total Storage (MG)	Gal/ft Storage	
Bellevue	BF220, BV400, CL340, CL500, EN300, HP230, KC300, MD230, MB252, NS200, PP550, PP600, PP670, WD370, WD450, YB300, YP220	Cherry Crest	3.01	150,394	Gravity
		Clyde Hill 465	0.72	7,614	BPS
		Clyde Hill 390	4.02	132,183	Gravity
		Clyde Hill 340 Rd.	0.79	41,452	Gravity
		Clyde Hill 340 Sq.	0.51	31,603	Gravity
		Meydenbauer N	0.65	32,972	Gravity
		Meydenbauer S	0.65	32,972	Gravity
		Pikes Peak	1.08	39,985	Gravity
		Woodridge	2.10	29,615	Gravity
South	CM1000, CM1150, CM1290N, CM1465, CM1575, CM1290S, EG590, FH1100, FH465, FH550, HT1080, HV1080, HV1175, HV590, HV610, HV700, HV940, LM1000, LM820, SS1000, SS550, SS700, SS850, SS940, SU1060, SU1080, SU1300	Cougar Mt. 1	0.50	21,860	BPS
		Cougar Mt. 2	1.00	31,307	BPS
		Cougar Mt. 3	2.00	99,284	BPS
		Cougar Mt. 3A	0.30	14,687	BPS
		Forest Hills	2.00	84,597	BPS
		Horizon View 1	0.33	9,876	BPS
		Horizon View 2	0.39	13,535	BPS
		Horizon View 3	2.08	99,284	BPS
		Horizon View 3A	0.10	6,732	BPS
		Somerset 2	0.10	9,574	BPS
Factoria	FA290	Factoria	2.63	99,284	Gravity
Lake Hills	CO380, CO400, CO420, EG300, EG340, EG370, EG400, FA460, KC450, LH380, LH400, LH435, LH520, RM310, RM335, RM400, RV300, SA270, SA400, SH425	Lake Hills North	2.04	27,165	Gravity
		Lake Hills South	2.04	27,165	Gravity
		N.E. 40th	3.38	169,781	Gravity
		Newport	3.16	150,394	Gravity
		Parksite	2.03	50,811	Gravity
Rose Hill	RH545	Kirkland 545	1.50	224,000	Gravity
Newport Hills	CC380, NH320, NH340, NH380, NH475, NH580	CCUD 580 East	0.40	25,000	Gravity
		CCUD 580 West	1.00	62,500	Gravity

Storage Region	Pressure Zones Served by Storage Region	Reservoirs	Reservoir Volume		BPS or Gravity Fed
			Total Storage (MG)	Gal/ft Storage	
		CCUD 440	1.65	250,000	Gravity

Required Storage

The DOH[16] requires that water utilities analyze and provide adequate volume for five storage components: operational, equalizing, emergency/standby, fire, and dead storage. The criteria used to evaluate the City's storage infrastructure are summarized in Table 4-1 and described in detail below.

Operational Storage (ST-2)

Operational storage is used to supply the water system under normal demand conditions and provides pump protection to avoid frequent starting and stopping of pumps that are used to fill reservoirs. Operational storage also provides routine tank cycling for water turnover, which helps maintain water quality. For reservoirs that are not filled using pumps, a 2 to 3-foot operational band was used to calculate operational storage. Operational storage is calculated for each reservoir in Table 4-7.

Equalizing Storage (ST-3)

Equalizing storage is provided to maintain a minimum service pressure of 30 psi during peak hour demand. This storage is utilized when source capacity cannot meet the periodic peak demands placed on the water system.

The WAC 246-290-235(2) states that equalizing storage "shall be provided to meet peak periods of demand, either daily or longer, for all pressures zones to meet both normal as well as abnormal demands of the system". The City performed a detailed analysis of the summer (summer conditions represent the most conservative demand peaking diurnal) demand diurnals and required equalizing storage volume in 2014 as a part of the 2016 WSP.

Equalizing storage was calculated as the difference between maximum and minimum cumulative storage volumes, assuming water supply with constant flow. The analysis indicated that 25 percent of the volume required for one day of MDD should be reserved for equalizing storage in predominantly single-family areas, and that 10 percent of the volume required for one day of MDD should be reserved for equalizing storage in mixed land use areas.

Standby Storage (ST-4)

Standby storage is the portion of the reservoir used to supply the water system when supply facilities are out of service. DOH recommends a minimum standby storage of 200 gallons per ERU

[16] DOH Water System Design Manual, 2020, Chapter 7.

in the system for systems with more than one source. The city has two sources, the Tolt River watershed supplied through the TESSL and the Cedar River watershed supplied through the CESSL.

The City's risk of a water supply emergency is mitigated by the presence of the two independent sources and by significant additional storage upstream in the regional system (SPU's Eastside Reservoir). Therefore, the minimum DOH recommendation was used for calculating standby storage volume.

Fire Suppression Storage (ST-5)

Fire suppression storage is the portion of the reservoir with sufficient volume to supply water to the system at the maximum rate and duration required to extinguish a fire at the building with the highest fire flow requirement. The required volume of fire suppression storage is the product of the fire flow rate and duration of the system's maximum fire flow requirement. The DOH allows water utilities to "nest" the standby and fire suppression storage components (use the larger required volume to satisfy both). However, the City uses the cumulative sum of both to accommodate a fire during a supply emergency. The methodology and calculations used to evaluate fire suppression storage are laid out in Table 4-7.

Dead Storage (ST-6)

Dead storage is the bottom portion of a reservoir that cannot be used because water is stored below an elevation that is too low to provide sufficient system pressure (below 20 psi at the highest elevation served by the reservoir or for booster pump suction). Dead storage is evaluated for each reservoir in Table 4-7.

Table 4-7: Operational, Dead, and Fire Suppression Storage

Storage Region	Reservoirs	Operational Storage per Reservoir				Dead Storage					Fire Suppression Storage Per Storage Region			
		On Elevation (ft)	Off Elevation (ft)	Height to Overflow (ft)	Req'd Operational (MG)	Maximum Service Elevation (ft)	Minimum HGL Req'd at 20 psi (ft)	Base Elevation (ft)	Min elevation for Pump Suction (ft)	Dead Storage Volume (MG)	Pressure Zone with Largest Fire Flow	Largest Fire Flow (gpm)	Duration (hrs)	Total Required Fire Suppression Storage (MG)
	Cherry Crest	17	19	20	0.27	318	364	384	N/A	0.00				
	Clyde Hill 465	91	93	94	0.02	318	364	371	N/A	0.00				
	Clyde Hill 390	24	28	30	0.53	318	364	363	N/A	0.16				
	Clyde Hill 340 Rd.	18	19	19	0.04	228	274	314	N/A	0.00				
Bellevue	Clyde Hill 340 Sq.	18	19	16	0.03	228	274	322	N/A	0.00	BV400	8000	4	1.92
	Meydenbauer N	17	19	20	0.05	179	225	231	N/A	0.00				
	Meydenbauer S	17	19	20	0.05	179	225.2	231	N/A	0.00				
	Pikes Peak	25	26	27	0.04	463	509.2	530	N/A	0.00				
	Woodridge	64	69	71	0.15	333	379.2	333	333	0.00				
	Cougar Mt. 1	12	16	23	0.24	766	812	823	N/A	0.00				
	Cougar Mt. 2	25	29	32	0.22	1,044	1,090	1,118	N/A	0.00				
	Cougar Mt. 3	14	18	20	0.61	1,365	1,411	1,445	N/A	0.00				
	Cougar Mt. 3A	14	18	20	0.09	1,365	1,411	1,445	N/A	0.00				
	Forest Hills	16	20	24	0.65	766	812	825	N/A	0.00				
South	Horizon View 1	26	30	34	0.07	631	677	669	N/A	0.08	SS850	6500	4	1.56
	Horizon View 2	16	20	29	0.18	766	812	821	N/A	0.00				
	Horizon View 3	15	19	21	0.60	1,102	1,148	1,158	N/A	0.64				
	Horizon View 3A	15	19	16	0.00	1,102	1,148	1,164	N/A	0.00				
	Somerset 2	7	9	11	0.04	601	647	693	N/A	0.00				
Factoria	Factoria	22	25	27	0.30	217	263	265	N/A	0.00	FA293	4750	4	1.14
	Lake Hills North	65	68	75	0.08	446	492	449	453	0.11				
	Lake Hills South	65	68	75	0.08	446	492	449	453	0.11				
Lake Hills	N.E. 40th	32	34	36	0.34	446	492	377	379	0.34	LH520	6500	4	1.56
	Newport	16	18	21	0.30	446	492	502	N/A	0.00				
	Parksite	34	37	40	0.15	446	492	484	N/A	0.42				
Rose Hill	Kirkland 545	COB Operational Storage assumed at zero for facilities owned by others				COB dead storage assumed at zero for facilities owned by others (i.e. assume all of COB's storage share is usable)					RH545	2000	2	0.24
	CCUD 580 East													
Newport Hills	CCUD 580 West										NH470	8000	4	1.92
	CCUD 440													

Storage Analysis

The combined required storage volumes for each storage region are compared to the region's available storage volume in Table 4-8. Potential strategies to address projected storage deficits are described below.

Bellevue Region

The Bellevue Storage Region is the largest in the system and includes Downtown. The storage region is served by nine reservoirs with a total of approximately 13.5 MG of storage. The analysis revealed a 7.2 MG deficiency for this region at the end of the planning period. The existing deficiency shown is alleviated through the City's ability to utilize surplus storage volume from the Lake Hills Region due to previously completed transmission improvements. This future volume deficiency will be addressed via the new 6.0 MG Meydenbauer South Reservoir that is currently in design and potential upgrades to the Clyde Hill 390 reservoir capacity, further discussed in Chapter 9. Figure 4-5 visualizes how the growing storage requirement will be fulfilled over time.

Newport Hills Region

The Newport Hills region consists of the CC380, NH320, NH340, NH380, NH475, and NH580 pressure zones. Water assets in these areas were transferred to the City from CCUD as part of its assumption in 2003. This region is served exclusively by storage in CCUD.

A slight 20-year deficiency of 0.06 MG was calculated for this storage region. A total of 3.05 MG of storage is available for the City's use in CCUD's 440 Reservoir and 580 Reservoirs, per their partial assumption agreement (see Volume 3).

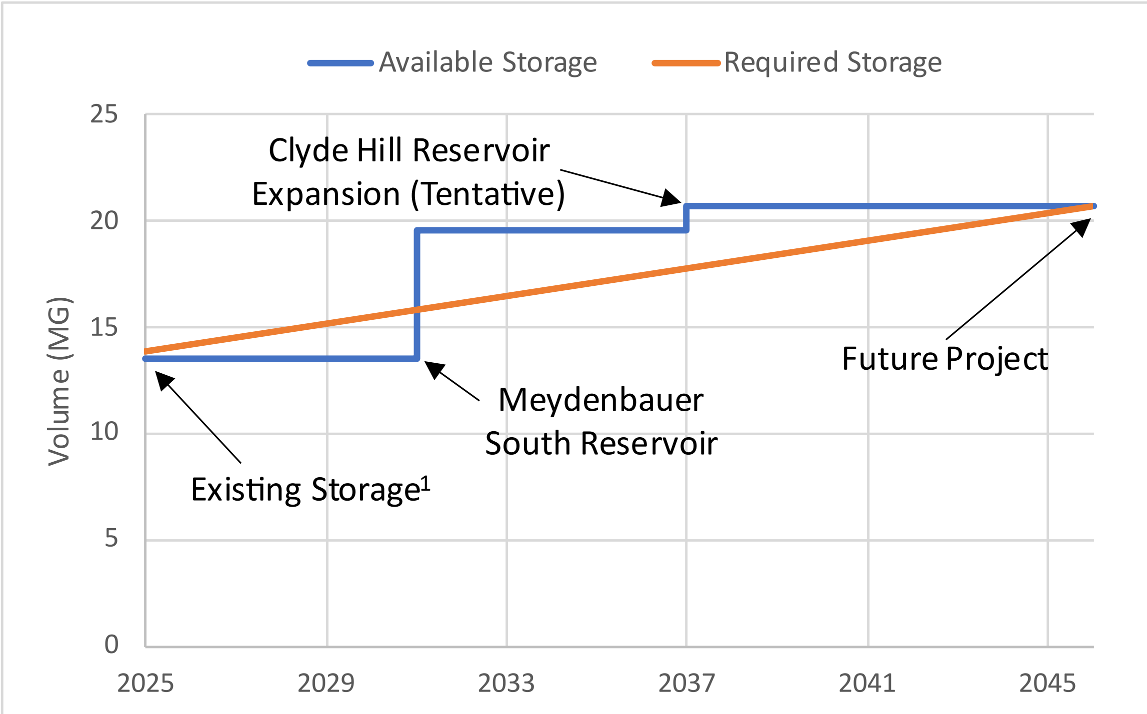
The CCUD currently does not use the full capacity of its reservoirs, in order to limit water age and optimize water quality[17]. Although the contractual agreement does not indicate "on paper" that the City has access to storage in CCUD's other reservoirs, this storage is realistically available, as CCUD's zones are connected. The City should work with CCUD to optimize water quality provided to customers in the City with available storage volume and begin negotiations to make up the 20-year volume deficiency.

[17] CCUD 2013 Water & Sewer System Plan.

Table 4-8: Storage Analysis

Storage Region	Bellevue	Newport Hills	Lake Hills	South	Factoria	Rose Hill
Storage Requirements						
Projected MDD (MGD)						
Existing, 2027	19.25	1.41	12.55	4.18	0.84	0.06
10-year, 2036	24.00	1.50	13.29	4.43	0.93	0.06
20-year, 2046	29.27	1.59	14.57	4.73	1.02	0.06
Projected Retail System ERUs						
Existing, 2027	47,483	3,512	31,538	10,478	2,088	154
10-year, 2036	59,654	3,724	33,087	11,110	2,297	156
20-year, 2046	72,745	3,960	36,276	11,854	2,529	159
MDD per ERU (gpd/ERU)	402	402	398	399	402	402
Operational Storage (MG)	1.18	0.00	0.96	2.70	0.30	0.21
Equalizing Criteria (% of MDD)	10%	25%	10%	25%	10%	25%
Equalizing Storage (MG)						
Existing, 2027	1.93	0.35	1.25	1.04	0.08	0.02
10-year, 2036	2.40	0.37	1.33	1.11	0.09	0.02
20-year, 2046	2.93	0.40	1.46	1.18	0.10	0.02
Equalizing Storage Required Per ERU (gal/ERU)[1]	40	101	40	100	40	101
Emergency (Standby) Storage (200 gpd Required Per ERU) (MG)						
Existing, 2027	9.57	0.70	6.31	2.10	0.42	0.03
10-year, 2036	11.93	0.74	6.62	2.22	0.46	0.03
20-year, 2046	14.55	0.79	7.26	2.37	0.51	0.03
Total Required Fire Storage (MG)	1.92	1.92	1.56	1.56	1.14	0.24
Dead Storage Volume (MG)	0.16	0.00	0.98	0.72	0.00	0.00
Total Required Storage						
Existing, 2027 (MG)	14.76	2.98	11.06	8.12	1.94	0.50
10-year, 2036 (MG)	17.59	3.04	11.44	8.31	1.99	0.50
20-year, 2046 (MG)	20.73	3.11	12.21	8.53	2.05	0.50
Total Storage Available (MG)	13.52	3.05	12.64	8.82	2.63	1.50
Available ERU Capacity (Equalizing and Standby, ERUs)	42,703	3,759	38,131	12,818	4,967	3,493
Storage Surplus/Deficit (gal)						
Existing, 2027	**-1.24**	0.07	1.58	0.70	0.69	1.00
10-year, 2036	**-4.07**	0.01	1.20	0.51	0.64	1.00
20-year, 2046	**-7.22**	**-0.06**	0.43	0.29	0.59	1.00
Storage Surplus/Deficit (ERUs)						
Existing, 2027	**-5,169**	247	6,593	2,340	2,878	3,340
10-year, 2036	**-16,951**	35	5,044	1,708	2,669	3,337
20-year, 2046	**-30,042**	**-201**	1,855	964	2,438	3,334

Figure 4-5: Bellevue Region Storage Balance



Note: 1. The Lake Hills existing surplus can be used in the Bellevue Region due to the recent EOA-WOA transmission improvements.

4.8 Condition Assessment

The City's water utility infrastructure is evaluated periodically for renewal and replacement (R&R), regardless of capacity needs. Additional information on R&R is provided in Chapter 8.

Inlet Stations

The City's existing inlet stations are periodically surveyed and maintained as described in Chapter 6. There is currently a comprehensive condition assessment project specifically for inlet stations in the 2027-2032 CIP Budget.

Two existing inlet stations have been identified as deficient:

- Factoria Inlet (Inlet 11): Wiring and conduit are aging and corroded from being in damp environments. Additionally, the arrangement of the vaults causes safety concerns for staff working on the PRVs. Replacement of this inlet is included in the 2027-2032 CIP.
- Eastgate Inlet: Access to the inlet is poor due to the existing vault lid which is in a highly trafficked area and is beginning to deteriorate. The station lacks fiber optic communications which is a new standard per the Supervisory Control and Data Acquisition (SCADA) Master Plan. Eastgate Inlet controls and communication are currently linked with Parksite Pump

Station, which limits some functionality. R&R of this inlet is currently included in the 2025-2031 CIP and is intended to be coordinated with replacement of the Parksite Pump Station.

It is recommended that these inlet station rehabilitations be prioritized to address these reliability and safety deficiencies.

Distribution System Piping

The City's methods for pipeline assessment, failure analysis and prioritizing pipe replacement are described in Chapter 8. CIP W-16 funds pipeline replacement, as described in Chapter 9.

When appropriate, aging water main replacement is coordinated with sidewalk or street paving projects, to reduce grind & overlay pavement costs and neighborhood impacts. This benefits utility rate payers, because the significant roadway pavement restoration costs are reduced or eliminated and benefits the Transportation Department because the risk of water main breaks and need to replace pipe below new pavement is reduced. Costs are shared fairly and equitably between the Utility and the Transportation Department, recognizing the forfeited remaining asset life of the old piping as well as the value of new piping.

The City maintains a programmatic replacement plan for aging water main infrastructure. This plan can extend out as far as 10 years, with higher certainty of timing and scope in the near-term years. Near-term capital project locations can be found on the Bellevue Map Viewer available through the City website or at cobgis.maps.arcgis.com. Actual sites typically change somewhat due to project-specific factors or new information that affects site prioritization.

Fire Hydrants

The City maintains almost 6,000 fire hydrants. They vary widely in manufacturer and lineage. To improve operational efficiency while still allowing market competition, the list of acceptable hydrant manufacturers in the Engineering Standards has been limited to three.

Recently, replacement parts for Iowa Hydrants have been discontinued. There are approximately 850 of these hydrants in service. Most of these hydrants are on aging water main that will be replaced as part of the W-16 CIP. Maintenance staff can replace some through routine maintenance, however, future capital projects may be necessary to supplement their efforts.

Isolation Valves

Isolation valves serve multiple functions. Normally closed "zone valves" separate pressure zones but allow for connection in abnormal conditions. Normally open valves serve to limit the area (and number of customers) affected during planned and unplanned shutdowns and also facilitate unidirectional flushing activities. Isolation valves are not frequently used, but are periodically actuated to verify operation, as described in Chapter 6.

Isolation valves are not as critical as PRVs or check valves, since they are not relied on to provide fire flows. However, failure of the isolation valve packing (leakage out of the system), or leakage at the seating surface (leakage across a closed valve, within the system) does impact efficiency of operations and customer service. Leakage through stem packing can create icy surfaces on streets and sidewalks and contribute to non-revenue flows. Zone valves that leak from a higher-pressure zone to a lower zone require additional pumping energy. During a planned or unplanned shutdown, significantly more customers can be affected if the nearest valve is not functional or the seat leaks excessively.

The City maintains an inventory of every isolation valve, including work order records in Maximo and mapping in GIS, and performs condition assessment during scheduled maintenance. Isolation valves typical have a service life equal to or greater than the connected pipes and are replaced when the pipes are replaced. Valves that fail prematurely are replaced by Water O&M. Effort to repair failed isolation valves is periodically reviewed to consider whether an annual repair project is warranted.

Check Valves

Check valves are installed in several locations between pressure zones throughout the City, in place of zone isolation valves. They stay closed during normal conditions, but open to allow flow from a normally lower-HGL zone to augment supply to the higher-HGL zone in case of a severe loss of pressure. Some are relied on to actuate during fire flow events.

The City maintains an inventory of check valves, but check valves are not considered in the R&R program. In addition, maintenance is limited due to field conditions. Some check valves are inaccessible and unserviceable due to limited clearance in existing manholes and vaults. The City is developing a standard detail to be included in the 2026 standard details to help mitigate these check valve issues in the future.

It is recommended that a standardization program and an asset management program be established for check valves.

Reservoirs

The City's reservoirs are regularly inspected, as described in Chapter 6, and funding is set aside for their R&R, as described in Chapter 8. Small reservoir repairs such as joint sealing (for concrete tanks), touch-up paint (for steel tanks), and repairs to reservoir appurtenances (ladders, screens, hatches, etc.) are generally made as needed through the O&M budget, based on routine observations. Larger repairs such as re-coating or structural retrofits are budgeted in advance.

Table 4-9 shows the status of steel reservoir lining and coating. The scope, schedule, and prioritization of future projects will be established as needs are assessed. Steel reservoir relining and recoating projects are currently funded through the CIP, since these projects often include structural or other improvements.

Table 4-9: Steel Reservoir Lining and Coating Age

Reservoir	Year Built	Last Exterior Coating	Last Interior Lining
Clyde Hill 335 Round	1952	1987	2014
Clyde Hill 465	1958	2010 2025 (Roof Touch-up)	2025
Cougar Mountain 3	1997	2005	1997
Cougar Mountain 3A	1997	2005 (Sides)	2020
Crossroads North	1959	2000	2011 2019 (Floor Recoat)
Crossroads South	1962	2000	1983
Factoria	1981	2005 (Roof) 2015 (Touch-up)	2005
Horizon View 1	2017	2017	2017
Parksite	1964	2011 2023 (Touch-up)	2023
Woodridge	1956	2005	2001

The recent Clyde Hill 465 rehab project also installed cathodic protection, and all steel reservoirs now have cathodic protection. The next reservoirs prioritized for recoating and relining are the Crossroads North and South Reservoirs. A project to replace the Clyde Hill 335 Round Reservoir is scheduled to begin within the planning period due to seismic deficiencies, so it is unlikely to be relined or recoated.

Engineering consultants have performed multiple structural and seismic evaluations of the City's reservoirs, and many of the recommended projects have been completed, as described in Chapter 8. Table 4-10 shows the near-term future recommended reservoir rehabilitation projects. The scope, schedule, and prioritization of future projects will be established as needs are assessed. The required programmatic rehabilitation of all 25 reservoirs (plus a portion of an additional four reservoirs operated by CCUD and Kirkland) is assumed and is funded continuously through CIP W-85 Reservoir Rehabilitation and Replacement program, as described in Chapter 9.

Table 4-10: Proposed CIP W-85 Reservoir Rehabilitation and Replacement Projects

Reservoir	Recommendations	Scheduled Completion	Estimated Cost
Clyde Hill 390	Resolve seismic deficiency; potentially add storage	Alternatives Evaluation started 2025	TBD
NE 40th	Roof Repair & Misc Improvements	TBD	TBD
Somerset #2	Seismic Retrofit	2029	$260,000
Somerset #3	Abandon Reservoir	TBD	TBD
Clyde Hill 335 Round & Square	Add storage; resolve seismic deficiency	Scheduled to start in 2031	$TBD

A recent seismic resiliency evaluation of Kirkland's South Reservoir determined that full replacement was necessary. The next phase of the project (replacement of the existing 11.2 MG reservoir with a new 15 MG reservoir) is now in design, construction is anticipated to begin in 2027.

Pump Stations

Table 4-11 shows the near-term recommended pump station rehabilitation projects. The scope, schedule and prioritization of future projects will be established as needs are assessed. The required programmatic rehabilitation of all pump stations maintained by the City is assumed, and is funded continuously, through CIP W-91 Water Pump Station Rehabilitation or Replacement program, as described in Chapter 8 and Chapter 9.

Table 4-11: Recommended Pump Station Rehabilitation or Replacement Projects

Pump Station	Recommendations	Scheduled Completion	Estimated Cost
Somerset #2	VFDs, backup power, electrical upgrades, access upgrades	2030	$7,800,000
Horizon View #2	Replace pump station	Complete 2025	
Parksite[1]	Replace pump station	2035	$9,200,000
Cougar Mountain #2	VFDs, backup power, building upgrades	TBD	TBD
NE40th – 670	VFDs, pumps, electrical and building upgrades	Project start 2033	TBD
Clyde Hill	Replace pump station	2032	$11,900,000
NE40th Reservoir	VFDs, electrical, mechanical, and building upgrades	Project start 2032	TBD

1. Estimated cost is to replace with existing capacity (does not include additional capacity to increase fire flow).

Pressure Reducing Valves

Table 4-12 lists the tentative PRV station replacement projects scheduled during the 2027-2032 CIP window. PRV station replacement typically includes new valves but may also include structural repairs or replacement of the vault, site improvements, and/or safety and access improvements. The PRV station replacement schedule is typically prioritized and triggered based on station attributes such as age, condition, safety concerns, etc., but may also be influenced by transportation projects, as with water main replacement. When appropriate, PRV replacement may be accelerated concurrently with sidewalk or street paving projects, to reduce pavement grind & overlay costs and neighborhood impacts.

Table 4-12: Recommended PRV Station Rehabilitation Projects

PRV Station No.	Asset No.	Install Year	Proposed Replacement Year	Station Age at Replacement
12	101101	1985	2026	41
22	101086	1984	2028	44
98	101073	1980	2028	48
102	101184	1979	2027	48
105	101113	1980	2026	46
108	101183	1982	2026	44
109	101184	1982	2029	47

PRV Station No.	Asset No.	Install Year	Proposed Replacement Year	Station Age at Replacement
112	101186	1982	2026	44
113	101185	1983	2026	43
121	101140	2004	2026	22
124	101179	1987	2026	39
125	101150	1993	2026	33
133	101136	1986	2028	42
137	101123	1986	2027	40
139	101174	1986	2026	40
140	101180	1986	2028	42
172	101372	1988	2026	38

4.9 Emergency Preparedness

Section 6.4 describes the City's emergency operations procedures. In order to improve system reliability and resiliency, some additional analysis and capital improvements are recommended, as described below.

Electrical Supply Reliability

The most densely populated portions of the City's service area are served by gravity supply inlets and gravity reservoirs, which are generally unaffected by power outages. However, higher-elevation areas rely on intermittent pumping to fill local reservoirs, and some "closed" zones rely on continuous pumping service at all times, as indicated in Table 1-3.

For most of the City's pump stations, some downtime is acceptable due to available reservoir storage. Most pump stations are equipped with receptacles to accommodate quick connection to a portable generator. Currently the City's water utility has two portable generators, stored at Forest Hills (200 kilowatt) and Cougar Mountain #2 (125 kilowatt). Pump stations that are critical, either due to the size of population served or due to lack of downstream storage (requiring continuous service), have on-site generators installed. Table 1-6 indicates the backup power availability at each pump station.

Past hydraulic modeling indicated a potential vulnerability in the SOA for water supply due to power outages during the high-demand season. Power outages during low demand season typically occur due to storms and require extensive 24-hour/7-day efforts by City staff to maintain service. However, the temporary supply efforts are adequate for the low demand season. Since the time of the past hydraulic modeling, additional permanent standby generators have been added and Cougar Mountain 1, Cougar Mountain 3, and Horizon View 1, 2, and 3 have permanent on-site backup power supply, with portable standby generators being parked at Cougar Mountain 2 and Forest Hills. Adding backup power at Somerset Inlet and Somerset #2 Pump Stations would improve reliability for the entire SOA.

It is recommended that the City perform a risk-based evaluation of vulnerability during power outages. The evaluation should consider:

- Adding permanent on-site power on a prioritized basis
- Purchasing additional portable generators
- Developing a plan for alternative water service to affected customers in the case of extended outage (no additional backup power)

Seismic Resiliency

Since the 1990s, the City's ongoing CIP W-85 Structural/Seismic Reservoir Rehabilitation has identified and addressed seismic deficiencies specific to the City's reservoirs. Some reservoirs identified for seismic improvements in W-85 have not yet been retrofitted or replaced but are scheduled for near-term replacement.

An overall seismic evaluation of the City's distribution system piping was conducted in 1996, with an updated water system seismic vulnerability assessment completed in 2022. The recommendations of the vulnerability assessment include upgrading important pump stations, updating distribution system piping, addressing water supply resilience issues with Cascade and SPU, and ensuring key water supply routes are seismically resilient.

The City also participated in a regional seismic vulnerability assessment as part of the Central Puget Sound Water Supply Forum. This assessment evaluated regional utility vulnerabilities and criticality using American Lifelines Alliance and the Federal Emergency Management Agency's (FEMA's) Hazus methodology, with a focus on major water supply and transmission infrastructure.

Emergency Interties

Connections with adjacent utilities are encouraged when opportunities arise, as described in the Service Reliability Policy. Currently, emergency interties exist between the City and Kirkland, Redmond, CCUD, Beaux Arts/WD22, Issaquah, and Hilltop/WD117, as indicated in Table 1-2.

4.10 Wells

The City's wells and water rights are valuable assets. The City has investigated how these assets might be utilized to improve its water security, reliability, and independence. the City's water rights self-assessment is attached as Appendix C.

Wellhead protection has been identified as a challenge due to existing and historical use of the well sites. A Wellhead Protection Plan has not yet been required by DOH due to the limited approved use of the wells, however one will be needed prior to expanded use. It would likely require modification of existing well sites to incorporate wellhead protection, or development of new wells at alternative suitable sites nearby.

The condition of the City's wells was assessed in 2018 by Golder Associates; this assessment is included in the Emergency Water Supply Plan. It is recommended that the City continue to perform evaluations to better understand the potential costs, impacts and opportunities associated with well development, including:

- Improve the Crossroads and Samena well sites to help with:
  - Fast conversion of the local distribution system to groundwater supplies in case of an emergency
  - Well head protection measures meeting current standards
  - Staff readiness and a more effective use of resources for non-emergency demands
- Implement best practices for well head protection at the Crossroads site, including continued remediation of contaminated soils, site improvements, land use changes, and a sensitive area designation, if appropriate and applicable
- Legal assessment of potential to transfer existing rights to new wells at different locations
- Siting study to understand feasibility of existing sites and identification of potential new (emergency-only) well sites
- Water quality implications (treatment, monitoring, aesthetics, corrosion potential, etc)
- Hydraulic impacts to the system
- Production cost to supply well water

Consistent with policies regarding the wells and emergency water supply, the City will continue to assess the benefits of well development and the appropriate level of investment to optimize the use of wells for emergency water supply. The City should coordinate confirmation and acquisition of sufficient emergency water rights to coincide with the emergency well development planned as part of their emergency water supply master plan implementation.

4.11 Property Management

Land availability for future water system facilities is limited in the City, due to local land values and a lack of suitable vacant or underdeveloped properties. It is recommended that the City analyze the long-term need for real property to support continued water service delivery, then develop and maintain an updated property management plan. The property management plan would support decisions regarding whether to retain or acquire properties proactively or as opportunities arise.

4.12 ERU Capacity Analysis

The City's water system was evaluated at a high level for how many ERUs it will be able to serve in the future based on the limiting evaluation criterion from Table 4-1 (similar to the DOH WSDM Worksheet 4-1). The results of the ERU analysis are summarized in Table 4-13 below. The table does not include an ERU capacity value for the distribution system since the capacity of the distribution system is tied to storage, fire flow availability, and domestic pressures. Deficiencies where the distribution system is not adequate to serve the 20-year ERU projections are noted in Section 4.5.

The analysis indicates that the existing system has sufficient capacity to serve the current and projected water demands through 2036 (10-year planning horizon). Storage is the limiting system component for 2036 and 2046 (20-year planning horizon) demand conditions, with both planning horizon projections having deficient storage. As noted in Section 4.5, the distribution system limits ERU capacity for specific areas of the existing system.

Table 4-13: ERU Capacity Analysis

Description of Capacity Parameter	Planning Period		
	2027	**2036**	**2046**
Projected Retail System ERUs (with Redmond wheeled water)[1]	**103,930**	**119,727**	**138,790**
Projected Storage ERUs (without Redmond wheeled water)	**95,644**	**110,030**	**127,524**
Reliable Supply Capacity[2]			
Supply Capacity (Total, gpd)	89,596,800	89,596,800	89,596,800
Supply Required (MDD) (gpd) (SU-2)	41,618,736	48,041,080	55,652,899
Supply Surplus (gpd)	47,978,064	41,555,720	33,943,901
Supply Surplus (ERUs)[3]	**119,811**	**104,013**	**84,951**
Storage Capacity			
Available Standby and Equalizing Storage Capacity (MG)[4]	26.62	26.62	26.62
Required Equalizing Storage (MG) (ST-3)	4.68	5.32	6.08
Required Standby Storage (MG) (ST-4)	19.13	22.01	25.50
System Storage Surplus or Deficit (MG)	2.81	(0.71)	(4.97)
Equalizing Storage Requirement per ERU (gal/ERU)	[5]	[5]	[5]
Standby Storage Requirement per ERU (gal/ERU)	200	200	200
Available Storage Capacity (ERUs)[6]	105,872	105,872	105,872
Remaining System Capacity (ERUs)[7]	**10,229**	**(4,158)**	**(21,652)**
Limiting Factor of Growth	**None**	**Storage**	**Storage**

1. Totals from Table 3-17, Table 3-18, and Table 3-19
2. System service area-specific supply capacities evaluated in Table 4-3.
3. Equal to sum of rows in surplus/ deficit per operating area in Table 4-3
4. Assumes depleted operational storage and volume reserved for fire flow and dead storage.
5. Varies by storage region, see Table 4-8 for values.
6. Access to all system storage is not available to all pressure zones. ERU storage capacity delineated by hydraulic service area is evaluated in Table 4-13.
7. Equal to the total of rows in Table 4-8.

4.13 Summary of Recommendations

Key potential capital improvement recommendations in this chapter are summarized below in Table 4-14. This list does not include ways to address deficiencies that require further analysis. Smaller recommendations that can be accomplished through existing CIP programs or that do not immediately affect funding are also omitted.

Table 4-14: Summary of Recommended Improvements

Suggested Improvement	CIP Reference
Continued replacement of aging mains within the City's water system	W-16
Perform a system-wide hydraulic model calibration. Specific areas requiring more detailed calibration include the following: ○ LH520 Crossroads Area ○ PP550 zone ○ NH580 zone ○ FA290 zone ○ SS850 zone	Table 9-3
Evaluate distribution system pipe capacities for fire flow in recently re-zoned areas	Table 9-3
Evaluate transmission capacities between inlets and proposed reservoirs	Table 9-3
Complete a transmission velocity modeling analysis	Table 9-3
Inlet station rehabilitations at NE 40th Inlet, Factoria Inlet, and Eastgate Inlet	W-110
Improve resiliency of transmission mains between inlet stations and downtown	W-16
Replace the 10" AC main north of the Horizon View 2 Reservoir in the SS850 zone	W-16
Upgrade the capacity of the Clyde Hill 500 Booster Station	W-91
Establish a standardization and replacement program for check valves	Table 9-2
Reservoir replacement or rehabilitation indicated in Table 4-14	W-85
Pump station replacement or rehabilitation indicated in Table 4-15	W-91
PRV station replacement or rehabilitation indicated in Table 4-16	W-67
Perform a risk-based evaluation of pump station vulnerability during power outages	Table 9-3
Ensure key water supply routes are seismically resilient	W-16
Perform recommendations in Emergency Water Supply Master Plan	W-119
Analyze the long-term need for property to support continued water service delivery and acquire property as necessary.	Table 9-2
Develop and maintain updated property management plan	Table 9-3
Continue to cooperate with the City of Issaquah to separate the Bellevue and Issaquah water systems in the South Cove Assumption Area.	Table 9-3
Construct additional storage for the Bellevue Storage Region	Table 9-2
Work with CCUD to secure additional storage for the Newport Hills Storage Region (the current agreement expires in 2028).	Table 9-3

Existing CIP programs for R&R are also recommended to continue, as described in Chapter 8 and Chapter 9.

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Chapter 5 Water Use Efficiency Program

The City partners with Cascade to promote the wise use of water as described in the City's Water Utility policies (Chapter 2) and summarized in this chapter. These efforts, as well as changes to building codes, housing stock, and efficiency standards for household appliances, have impacted customer demand patterns.

The purpose of this chapter is to describe the water system's WUE program. WUE contributes to the long-term water supply reliability and promotes good stewardship of the State's water resources.

5.1 Water Use Efficiency Program

Table 5-1 lists the requirements for a WUE Program summarized in DOH's Water Use Efficiency Guidebook (last revised May 2025) addressing the stipulations set forth by WAC 246-290-810; the table also includes a summary of the City's level of compliance with each requirement.

Table 5-1: WUE Rule Requirements

Category	Requirement	City of Bellevue Compliance Status
Meters	Meter all sources.	All SPU inlet stations are metered.
	Meter all service connections.	Yes, all services are metered.
Data Collection	Provide annual consumption by customer class.	Yes, provided in Section 3.7.
	Provide "seasonal variations" consumption by customer class.	Yes, provided in Section 3.4.
	Evaluate reclaimed water opportunities.	Yes, provided in Section 5.3.
	Consider water use efficiency rate structure.	Yes, the City has a tiered rate structure to promote conservation.
DSL	Calculate annual volume and percent using formula defined in WUE Rules.	Yes, distribution leakage is calculated, as described in Section 3.2, and reported in the form of non-revenue water in Figure 3-9.
	Report annually: annual leakage volume, annual leakage percentage, and for systems not fully metered, meter installation progress and leak minimization activities.	Yes, distribution leakage is reported as a volume and percentage to DOH on an annual basis.
	Develop water loss control action plan (if leakage is over 10% for 3-year average).	N/A, system has a 3-year average water loss of less than 10%.

Category	Requirement	City of Bellevue Compliance Status
Goals	Establish measurable (in terms of water production or usage) conservation goals and re-establish every 6 years. Provide schedule for achieving goals. Use a public process to establish goals.	Yes, measurable goals were established in accordance with the conservation goals of the Cascade Water Alliance; see Section 5.1.
	Report annually on progress.	Yes, report submitted annually to DOH.
WUE Program	Describe existing conservation plan.	Yes, see Section 5.1.
	Estimate water saved over last 6 years due to conservation program.	Yes, see Section 5.1.
	Describe conservation goals.	Yes, see Section 5.1.
	Implement or evaluate 1-12 measures, depending on size. 12 measures for City of Bellevue.	Yes, see Section 5.1.
	Describe conservation programs for next 6 years including schedule, budget, and funding mechanism.	Yes, see Section 5.1.
	Describe how customers will be educated on efficiency practices.	Yes, see Section 5.1.
	Estimate projected water savings from selected measures.	Yes, see Section 5.1.
	Describe how efficiency program will be evaluated for effectiveness.	Yes, see Section 5.1.
	Estimate leakage from transmission lines (if not included in distribution system leakage).	N/A, transmission line leakage included in distribution system leakage.
Demand Forecast	Provide demand forecast reflecting no additional conservation. Provide demand forecast reflecting all “cost effective” evaluated measures.	Yes, provided in Section 5.2.
Performance Reports	Develop annual report including goals and progress towards meeting them, total annual production, annual leakage volume and percent and, for systems not fully metered, status of meter installation and actions taken to minimize leakage. Submit annually by July 1 to DOH and customers and make available to the public.	Yes, reports will continue to be submitted annually to DOH.

Water Savings Goals

As Cascade’s largest member, the City’s goal is to contribute a proportionate share of Cascade’s WUE savings in its own water service area.

In 2019, Cascade adopted the following short-term water efficiency goal:

- Cascade will dedicate the necessary staffing and financial resources to achieve a cumulative savings of 0.5 MGD of drinking water from 2019 to 2026.

- Cascade is currently developing an update to its WSP that will include a long-range forecast of water supply needs and projected savings from WUE measures.

Table 5-2 shows the future demands projected by Cascade for all of its members, with and without additional conservation, through 2060[18]. The percent reduction in water demand shown below is reflected in the City's projections shown in Figure 3-21 and Figure 3-22.

Table 5-2: Cascade Water Alliance Long-Term Water Use Efficiency Goals

	Without Conservation		With Conservation		Difference		% Reduction	
Year	**ADD**	**MWD**	**ADD**	**MWD**	**ADD**	**MWD**	**ADD**	**MWD**
2020	43.49	82.63	41.3	78.47	-2.19	-4.16	5.0%	5.0%
2027			Interpolated				6.4%	6.4%
2030	50.13	95.26	46.6	88.54	-3.53	-6.72	7.0%	7.1%
2036			Interpolated				7.8%	7.8%
2040	56.01	106.42	51.3	97.47	-4.71	-8.95	8.4%	8.4%
2046			Interpolated				8.6%	8.6%
2050	63.45	120.56	57.9	110.01	-5.55	-10.55	8.7%	8.8%
2060	71.36	135.58	65.3	124.07	-6.06	-11.51	8.5%	8.5%

Water Savings Measures

The City and Cascade use multiple measures to achieve stated water savings goals.

City Code Section 24.02.200 prohibits the waste of water:

> **24.02.200 Water conservation – Waste of water.**
>
> The waste of water supplied by the utility is prohibited at all times. Waste of water includes, but is not limited to, continuous application of water to lawns or landscaping that results in excessive puddling or runoff of water, failure to repair leaking water service lines and irrigation systems, application of water to impervious surfaces other than for cleaning purposes, and all other applications of domestic water that do not result in a beneficial use of the city's public water supply. (Ord. 5963 § 1, 2010.)

The City's tiered rate structure encourages water efficiency. For residential accounts, volume rates increase above the tiered thresholds of 11 hundred cubic feet (CCF), 17 CCF, and 45 CCF (CCF = 100 cubic feet = 748 gallons). For non-residential accounts, higher rates apply for irrigation

[18] Transmission and Supply Plan, Table 4-5. Cascade Water Alliance, July 2012.

meters than for domestic meters. For non-residential accounts with no separate irrigation meter, water rates increase during summer to encourage irrigation efficiency.

Figure 5-1 shows the current tiered rate structure adopted for 2025.

Figure 5-1: 2025 Tiered Rate Structure Volume Charges ($ per CCF)

DOMESTIC METERS / IRRIGATION METERS	
Residential / Non-Residential / Multi-Family	
5/8" and 3/4"	$64.08
1"	$113.40
1.5"	$191.82
2"	$294.82
3"	$644.07
4"	$948.91
6"	$1,776.20
8"	$2,763.20
10"	$3,880.94
DOMESTIC / FIRE COMBO METERS	
Residential / Non-Residential / Multi-Family	
1"	$68.73
1.5"	$75.65
2"	$105.91
WATER CAPITAL RECOVERY CHARGE	
Single Family Equivalent (SFE) per month for 10 years	$45.58

MISSION STATEMENT

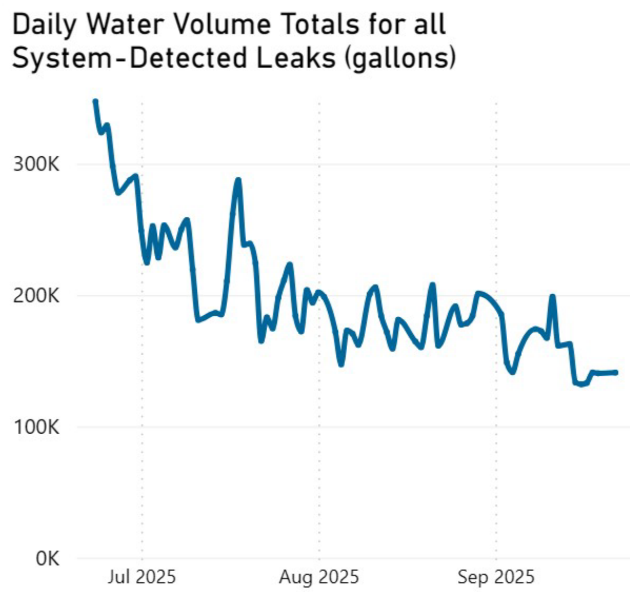
The mission of Bellevue Utilities is to actively support public health and safety, quality neighborhoods, and a healthy and sustainable environment and economy by effectively managing drinking water, wastewater, storm and surface water and solid waste.

SERVICE CHARGE FOR PRIVATE FIRE PROTECTION	
5/8" and 3/4"	$35.08
1"	$40.73
1.5"	$46.56
2"	$62.47
3"	$179.42
4"	$222.74
6"	$323.88
8"	$439.34
10"	$540.47
CONSUMPTION CHARGES	
Volume charges per CCF	
RESIDENTIAL CONSUMPTION	
0-11.00 CCF	$5.02
11.01-17.00 CCF	$6.39
17.01-45.00 CCF	$8.37
over 45 CCF	$11.96
NON-RESIDENTIAL CONSUMPTION	
Non-Summer	$6.35
Summer: July-October	$8.67
MULTI-FAMILY CONSUMPTION	
Non-Summer	$6.31
Summer: July-October	$8.63
IRRIGATION	
Irrigation CCF	$11.77

Utilities Online Customer Service Portal

The City's RMCS launched a Customer Portal in June 2025, giving customers convenient access to billing, usage tracking, and service alerts. A key feature is the portal's leak detection and notification system, which leverages data from the AMI system. Residential customers can receive timely alerts about potential water leaks, helping them conserve water and avoid costly bills. The portal also offers paperless billing, autopay, and high usage notifications. In the first 90 days after launch, the system identified over 2,000 residential accounts with potential leaks and sent notifications to all identified accounts. Figure 5-2 shows the reduction of approximately 200,000 gpd in usage for leaks detected by the portal since launch.

Figure 5-2: Daily Water Volume for Leaks Since June 2025 Portal Launch



Cascade administers numerous conservation programs on behalf of the City. These programs include:

- **Classroom Water Education**. The Classroom Water Education program delivers high-quality, locally relevant programming that is aligned with Washington essential academic learning requirements. Through its vendor, Nature Vision, Cascade provided in-person programs, remote learning opportunities, Blue Team projects, and online curriculum to support classrooms interested in water issues.

- **Problem-Based Learning for Water Systems**. Co-created the Problem-Based Learning for Water Systems program with Sustainability Ambassadors for teachers and students who want more in-depth learning about water systems.

- **Home Water Audits**. Cascade offered materials for teachers who wish to have their students conduct a home water audit to better understand how much water is used in their homes. The program includes digital materials to guide students through the process, measuring devices, and spreadsheets that record the findings. The spreadsheets calculate not only the potential water savings, but also the energy savings and avoided greenhouse gas emissions. When a classroom or entire grade sums the collective savings, the potential impacts are significant. Cascade also provides showerheads and aerators for students who find highflow fixtures in their homes.

- **Water Bottle Filling Station Project**. Cascade worked with Skyline High School in Sammamish to achieve the installation of a water bottle refilling station at the school. Cascade provided partial funding for the cost of the new station and 2,400 We Need Water stainless steel water bottles for any student who took a pledge to avoid plastic bottles and use the station.

- **Cascade Gardener**. Cascade continued its remote gardening classes with a winter, spring, and a fall series. Cascade holds a number of in-person garden walking tours with expert presenters to help residents see healthy watersheds and native plants options for their home landscapes.

- **Garden Hotline**. Cascade supports the regional Garden Hotline, which is a resource for residents to have their gardening and landscaping questions answered by gardening professionals from Tilth Alliance with an emphasis on water efficiency and sustainability.

- **Watershed Ecology Field Trips**. Working with member staff, Cascade provided watershed ecology field trips for residents who are interested in learning about ecology, plants, and wildlife, and stream sampling.

- **Irrigation Assessments**. Cascade provided four irrigation system assessments for high-peak season use customers. Cascade provides a detailed report of the assessment with specific strategies for achieving greater water efficiency and sustainability. Cascade maintains contact with staff at these properties and will assist in the implementation of Cascade's recommended measures over time.

- **Leak Detection Dye Distribution**. Cascade contacted 150 multi-family and public properties, 152 houses of worship, and 57 large employers with offers of free toilet leak detection dye during annual Fix A Leak Week.

- **Soil and Water Stewardship**. Cascade co-created and partners with Tilth Alliance to deliver the Soil and Water Stewardship program, which provides free training for residents on sustainable landscaping practices, rainwater harvesting, drip irrigation, and other water-related topics. Cascade assisted in promoting the program to recruit residents from Cascade member areas.

- **Events**. Cascade supports its members through events, such as fairs and festivals, to promote water efficiency and support member objectives.

- **Online Orders**. Cascade provided approximately 400 shower timers, rain gauges, leak detection dye packets, and other conservation items through Cascade's website. The conservation items are provided free of charge to Cascade member residents, schools, businesses, and homeowner associations who pay the postage to ship the items. Cascade also provides members with conservation items for distribution to customers at utility offices, community meetings, and events.

- **We Need Water**. In 2023, Cascade expanded the We Need Water social media campaign.

- **Shared Rebate Programs**. Cascade cost shares with Puget Sound Energy on selected Energy Star and WaterSense rebate programs, such as clothes washers, showerheads, and faucets.

WUE Program Planning and Performance

The City and Cascade plan to continue their successful collaborative approach to accomplishing WUE goals in the future. This will include establishment of updated goals and refinement of the water savings measures currently in place as described above. The program benefits thousands of member residents, students, businesses, schools, and parks by providing training, education, support, and conservation hardware. The program provides water savings, promotes the value of water, and extends the useful life of the region’s current water resources further into the future. Cascade employs one full-time employee to manage the program. The 2024 program expenses were $769,000, which is detailed in the 2024 Cascade WUE program report. See Appendix H for previous Cascade WUE program reports.

Cascade’s 2024 WUE Program (Appendix H) saved 83,401 gpd of water or approximately 30 MG per year. Along with the savings from 2019 through 2023, the program has achieved 69 percent of Cascade’s 2019-2026 WUE Goal. The DOH requires that the City estimates the amount of water saved through implementation of the system’s WUE program over the last six years. Table 5-3 summarizes the per capita ADD from 2019 to 2024. Per capita water usage decreased from 87.2 gpd in 2019 to 80.9 gpd in 2024.

Table 5-3: Per Capita Annual Average Day Demand[1] (gpcd)

Year:	2019	2020	2021	2022	2023	2024
Gpcd:	87.2	83.2	86.0	82.5	83.7	80.9

1. Calculated by dividing total system demand (single-family, multi-family, and commercial/municipal) by the total population.

The net water savings over this period equate to approximately 367 MG or 61 MG per year. This was calculated using population data from the CDD, included in Table 3-1. The service population was multiplied by the difference in calculated savings in per capita ADD for each respective year. The result was then multiplied by the total days in each year. Annual totals were then summed to obtain the six-year period total.

Metering

All inlet supply stations and non-emergency interties supplying the system are metered. Information on regional water supply inlet meters and adjacent utility connections is shown in Table 1-1 and Table 1-2. Meters used on the SPU inlets are Siemens Sitrans Mag 5100 models. These are electromagnetic flow meters, factory calibrated prior to installation, and are selected for their ease of maintenance and reliability. Flow data is compared monthly between SPU and City meters. These meters have a service life of 20 to 25 years and are typically replaced by O&M staff at end of service life.

Source meters on interties vary by agreement and ownership. Typically, meters measuring flow into the City meet requirements of the supplying agency. The City uses Sensus Omni C2 meters with internal strainers and electronic resolution registers on interties where the City supplies water. These meters are typically serviced and checked for accuracy every two to five years depending on agreement and replaced every 20 to 25 years.

Service meters are installed on all commercial, domestic, and irrigation customer lines to measure the quantity of water used per WAC 246-290-496 and City Code Chapter 24.02.100. In 2019 the City installed AMI on all service meters. The cost of this project was approximately $21 million which included the meter installation costs and 20 years of contract services for the life of the meters. The AMI system allows the City to receive meter reads via radio transmission and integrate the data into the billing software. The benefits of an AMI system include increased accuracy and efficiency, early leak detection, and improved customer service. The AMI system, including the system components and batteries in the radios, is anticipated to have a 20-year life. Service meters are *FlowIQ 2100* for residential accounts and Sensus Omni C2 for commercial accounts and are read and billed bi-monthly. The FlowIQ meters are factory sealed, do not have moving parts, and require no maintenance or field calibration. Operations staff services currently service 20 percent of commercial meters every year which correlates to servicing a meter approximately once every five years.

Fire sprinkler connections over two inches are typically not metered due to no anticipated demands and the relatively high cost of a meter and vault installation for these large pipelines. However, a “tattletale” device is typically installed at the backflow preventer to indicate if any usage does occur.

Where practicable, water consumed for controlled water utility maintenance activities (flushing, disinfection, reservoir draining, etc.) is directly metered. However, where direct metering is not feasible, volumes are calculated based on tank level, dimensions, etc., and later accounted for when reporting non-revenue flow.

Some known water demands are unmetered, such as firefighting, water main breaks, and limited other uses. These flows are approximated based on the best available information, such as local pressure, main size, flow duration, etc., and are also accounted for when reporting non-revenue flow.

Water Loss

Overall statistics for the City’s non-revenue flow (as a percent of total water supplied) during the 2015-2024 period are provided in Chapter 3. Non-revenue flow includes authorized un-billed consumption as well as water loss.

Annual Reporting

The WUE reports are submitted annually to the DOH with support from Cascade to describe customer WUE goals and progress towards reaching the goals.

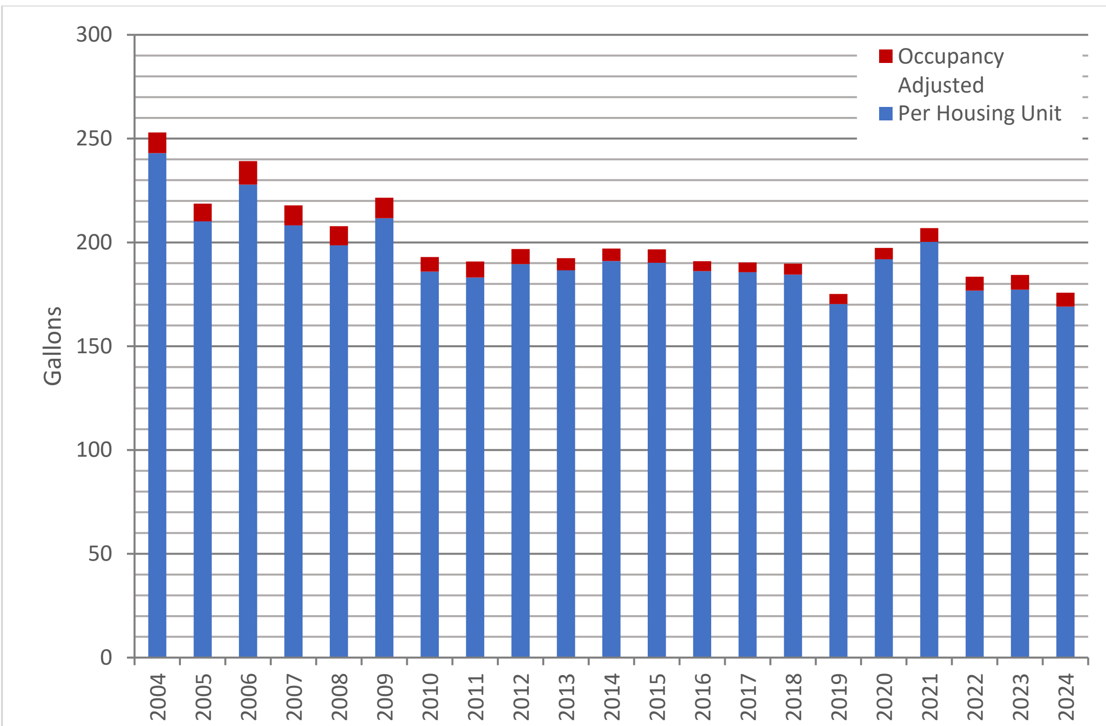
The previous three annual WUE performance reports are provided in Appendix I.

5.2 Water Supply and Demand Characteristics

Recent trends for total consumption as well as diurnal and seasonal demand patterns are described in Chapter 3. Long-term trends and the effects of conservation are discussed below.

Approximate single family residential water consumption trends over time are shown in Figure 5-3.

Figure 5-3: Average Daily SF Residential Consumption per SF Account



This figure illustrates total retail demand per single-family billing account plus a rough adjustment for occupancy rates (See Figure 3-5 for an annual estimate of use by ERU). Assumed occupancy rates are extrapolated to the entire service area based on data for the City only (service area-wide occupancy data is not available). The information is presented this way to match the historical data shown in the 2016 WSP in a consistent format, but updated with recent years and an adjustment to account for fluctuations in vacancy.

Although increased consumption during hot summer years (2006 and 2009) is reflected in Figure 5-3, a general long-term trend toward lower single-family residential water consumption per account is apparent.

Figure 5-4 shows trends in multi-family water consumption over time. These numbers represent billed multi-family retail consumption per estimated number of multi-family units provided by the CDD. Similar to Figure 5-3, the adjustment for assumed occupancy rates is based on the City only, extrapolated to the entire service area.

Figure 5-4: Average Daily MF Residential Consumption per Total # of MF Units

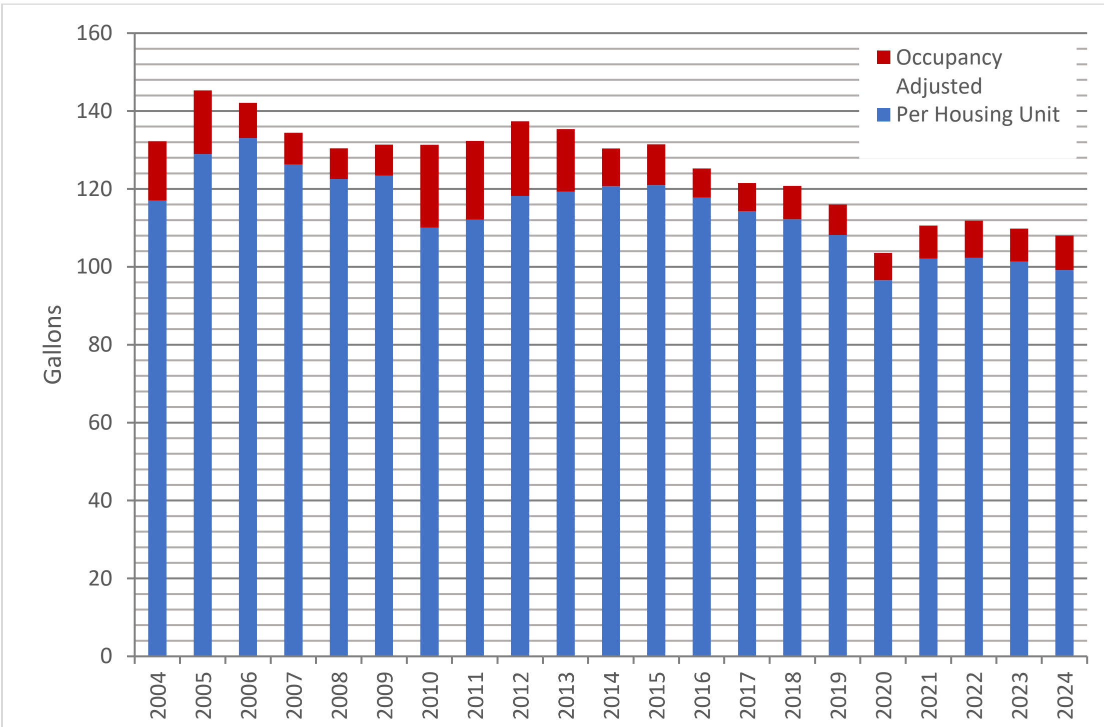
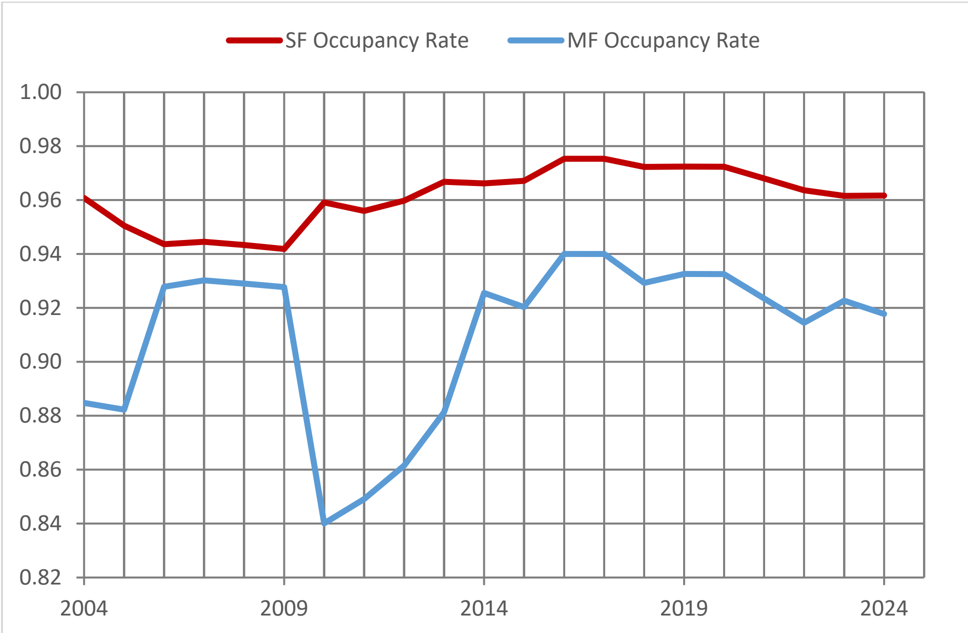


Figure 5-5 shows single-family and multi-family occupancy rates in the City (only) since 2004. This data does not include other parts of the water service area (Points communities, South Cove, etc.), but reflects the majority of the City's retail water sales, such that it is assumed that this percent occupancy can be applied over the entire service area.

Figure 5-5: Recent City of Bellevue Residential Occupancy Rates



Due to the recent stabilization of per capita water demands (2010-2024 in Figure 5-3), it is recommended that additional conservation not be assumed for the purpose of sizing new facilities.

5.3 Reclaimed Water

Cascade's 2019 TSP Extension (Appendix J) updated the 2012 TSP (Appendix F), which the City participated in. The 2012 TSP identified potential sources and customers for reclaimed water. The 2019 TSP Extension described Cascades current water supplies and operations and development of additional water supplies to meet the needs of Cascade members through 2060. The 2019 TSP Extension indicates no significant changes are expected, and forecasts indicate sufficient water supply to meet current and future needs.

The City has also completed an update of King County's Reclaimed Water Checklist (Appendix K), which evaluates the 20 largest customer accounts by volume for potential reclaimed water demands. The City's largest customers are not potential candidates for reclaimed water because they use water for food & beverage processing or for medical purposes. However, some significant irrigation customers were identified.

At this time, reclaimed water does not appear to be an economically viable option in the City due to the cost of building transmission pipelines and the de-centralized location of potential irrigation customers. However, the City continues to work with Cascade and King County Wastewater Treatment Division to evaluate feasible opportunities.

5.4 Climate Change Resiliency

In 2023, the Washington State Legislature passed House Bill 1181, which requires all group A community public water system serving 1,000 or more connections to include a climate resilience element in water system plans initiated after June 30, 2025. This section is not required for this WSP since it was initiated on January 21, 2025.

However, the City is being proactive in planning for climate change and resiliency. It maintains a Water Shortage Contingency Plan pursuant to the Water Utility Code Section 24.02.090. The Water Shortage Contingency Plan details the Utility's process for responding to anticipated or actual water supply shortages resulting from weather conditions, regional supply failures or disruptions, and/or local public water system failure. The Utility's Water Shortage Team has primary responsibility for administering and implementing the plan. A copy of the current plan is provided in Appendix L.

The current Comprehensive Plan has capital facilities policies to plan capital investment (which includes water utilities) to prepare for, withstand, rapidly recover from, and promote community resiliency against climate impacts, including extreme heat, wildfire, smoke, extreme precipitation, drought, flooding, and other disasters; and to consider climate change when siting and building essential public facilities. A more detailed climate resiliency element will be added to the next WSP update.

Chapter 6 Operation and Maintenance Program

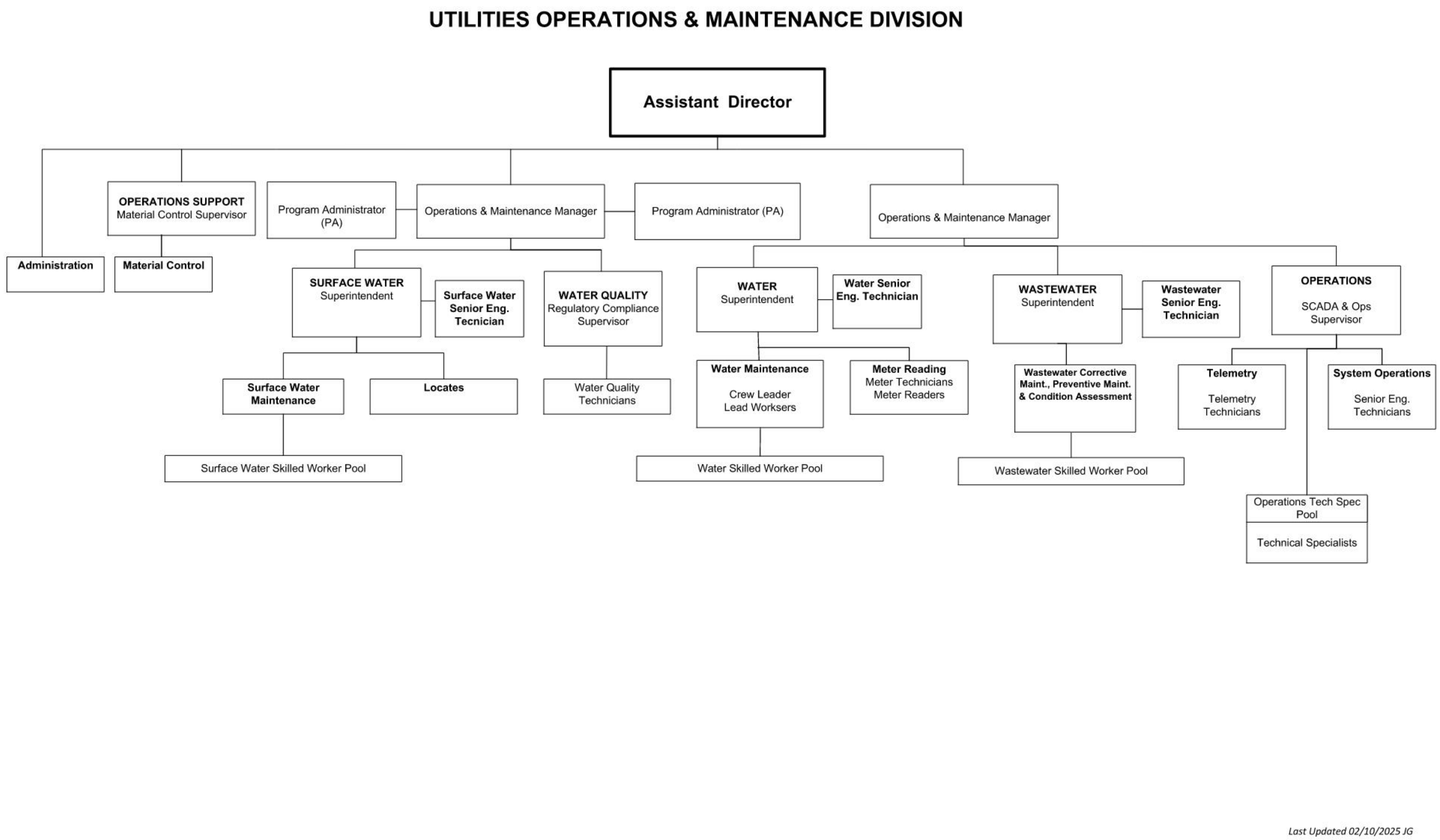
This chapter discusses current City water utility O&M programs. A description of the Utility's overall organizational structure, including the role of the O&M Division, is provided in Chapter 1.

The Utility is accredited by the American Public Works Association as compliant with internationally developed and accepted standards for water utility operations. The City's O&M Water staff operate and maintain the water system in accordance with City policy, accepted industry standards, and DOH requirements.

6.1 Water System Management and Personnel

Figure 6-1 shows the overall structure and leadership of the Utility's O&M Division. For clarity, detailed staff information is not shown for the Wastewater or Storm & Surface Water sections, or for administrative & support staff. This chapter focuses on the Water and Operations Sections within the O&M Division. Chapter 7 focuses on the Water Quality Group and water quality related programs.

Figure 6-1: Utilities O&M Division Organizational Chart



Major responsibilities of each role in the Water Maintenance Section and Operations Sections of the Utilities O&M Division are summarized below.

- Water Maintenance Section:
  - Maintenance Section Superintendent: Responsible for budget, distribution system repairs, Incident Command System (ICS), day to day maintenance and reactive response. Reports to O&M Manager.
  - Water Section Senior Engineering Technician: Supports daily activities of the Water Section Superintendent. Assists with permit-related activities involving the water system. Responsible for customer inquiries, assistance with applications, tracking water system usage and reporting, and updating water system records. Manages the ($600k+) annual asphalt restoration contract. Primary Water Section O&M representative for capital project and program planning, and design reviews.
  - Meter Read Crew: Manual reads, meter box maintenance, meter/encoder receiver transmitter troubleshooting, high-use investigations, turn off/on for non-payment, move out/in reads.
  - Water Maintenance Crew: Responsible for all distribution system repairs and preventive maintenance activities in the distribution system as well as new water service connections, coordination for shutdown support related to developer tie-ins and support for water infrastructure renewal in Utility and Transportation CIP Projects.
- Water Operations Section:
  - SCADA and Operations Supervisor: Oversees and directs System Operations, Telemetry, and Operations Tech Spec Pool teams. Reports activities and issues to the O&M Manager.
  - SCADA and Operations Senior Engineering Technician: Manages SCADA monitoring for City's water system. They Serve as the Primary Water Operations O&M representative for capital project and program planning, and design reviews.
  - System Operations Crew: Implements operational activities and changes at major water system facilities. Examples include modifications to booster pump station control strategy and adjustment of PRV setpoints or reservoir operational levels. Responsible for maintenance activities for all vertical water assets, reservoirs, pump stations and appurtenances, pressure reducing stations, and all meters 3-inch and larger.
  - Telemetry Crew: Maintains and implements changes to utility telemetry equipment.

Table 6-1 lists the titles, certifications, and number of positions filled for current water system staff in the O&M Division. Staff maintain these certifications through continuing education. The definition and duties of certified waterworks operators are defined in WAC 246-292; the City serves a population greater than

50,000, which classifies their distribution system into a Group 4. The certifications listed in Table 6-1 meet the minimum requirements per WAC 246-292.

Table 6-1: Current O&M Water Section Staff

Position Title	Certification	Number of Positions
O&M Assistant Director[1], Primary Operator in Charge	WDM 4	1
O&M Manager[1]	WDM 4, CCS	1
Water Senior Engineering Technician	CCS, WDM2	1
Water Quality Supervisor[1]	WDM 2, CCS, WTPO IT[1]	1
Water Quality Senior Engineering Technician[1]	WDM 4, CCS, WTPO 3	1
Water Quality Senior Engineering Technician[1]	WDM 1, WTPO1, CCS	1
Operations Supervisor	WDM4, CCS	1
Operations Senior Engineering Technician	CCS, WDM2	1
Water Maintenance Crew Leader	None	1
Water Crew Leader	CCS, WDM2	1
Water Lead Worker	None	5
Water Technical Specialist	CCS, WDM2	1
Water Meter Technical Specialist	None	1
Telemetry Technical Specialist	None	1
Water Skilled Worker	None	6
Water Skilled Worker	CCS	1
Water Maintenance Worker	None	3
Meter Reader	None	5

1 Provides support for all 3 Bellevue utilities, including water, sewer and stormwater.

The Utility recognizes the importance of proactive succession planning to ensure continuity of operations and regulatory compliance as key personnel retire or transition. The Utility monitors staffing trends and anticipated retirements in certified positions and takes steps to maintain institutional knowledge through cross-training, mentorship, and targeted recruitment. Staff are encouraged and supported in developing the skills and experience necessary to be competitive for internal promotions. The Utility also invests in professional development and certification advancement to prepare internal candidates for future leadership and operational roles. These efforts are aligned with the City's broader workforce planning initiatives and are reviewed periodically to adapt to evolving operational needs.

The City's O&M staff operate and maintain the existing water distribution system while also assisting with rapid system growth and the extension of service to new or redeveloping customers. Staff are also available and trained to support Transportation during snow and ice events as well as 24/7 emergency response. Procedures for many routine O&M tasks are documented in formal SOPs. SOPs that are relevant to this WSP are included in Appendix M.

The City's employees are provided with appropriate safety and personal protective equipment for the tasks and work environments they encounter as part of their jobs. Staff are also provided with necessary training to ensure that they understand and practice all applicable safety regulations.

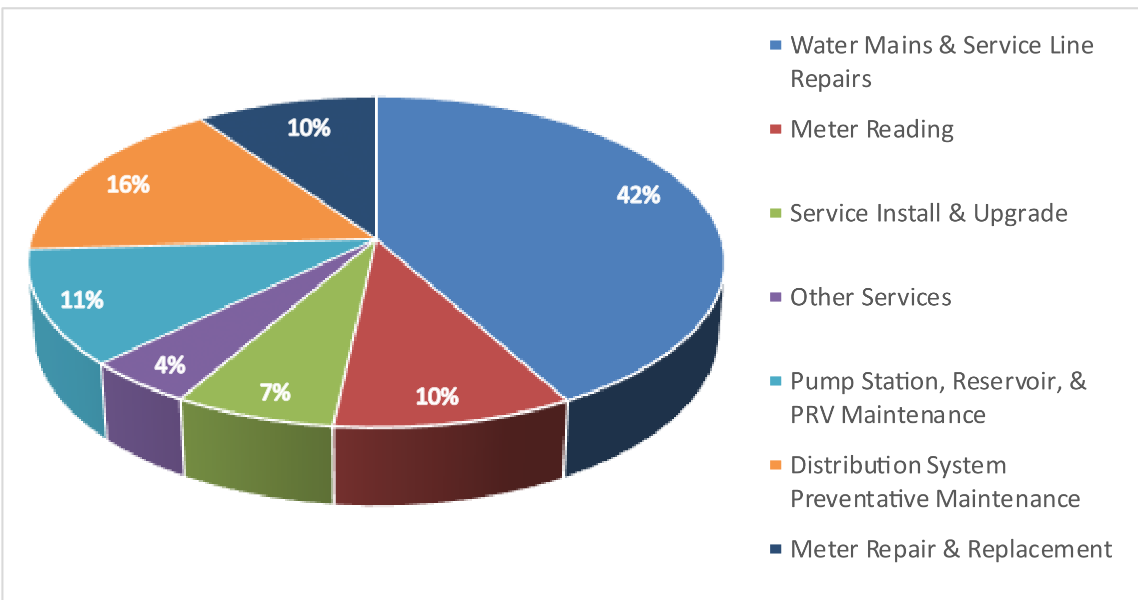
When local water service is interrupted for any reason, the Utility's standard procedure is to work continuously until service is restored. Dedicated staff are on call 24 hours a day so that necessary repairs to the system can be made promptly.

Preventive maintenance consists of regularly servicing pumps and motors, PRVs, exercising valves and fire hydrants, and cleaning reservoirs. While the City does not perform proactive flushing, reactive flushing is conducted in coordination with the Water Quality and Operations teams when lower-than-expected chlorine residuals are observed or when excessive debris is found in reservoirs during offline cleaning.

The O&M Section establishes goals for maintenance intervals based on industry standards, manufacturer recommendations, asset risk & criticality, and available resources. They have the flexibility to optimize or defer lower-priority maintenance activities in order to respond to emergencies, developer extensions, or special projects. Actual maintenance achievements are documented and tracked in the Computerized Maintenance Management System, the Utility's Maximo Application Suite management system and are reviewed annually to assess whether staffing levels and the goals themselves are still appropriate.

Figure 6-2 shows the 2024 distribution of O&M labor in the City's O&M Water Section.

Figure 6-2: 2024 O&M Workload (% of Total Labor Hours)



The O&M procedures for specific types of assets and facilities are described in the following sections. Historical statistics are shown for the years 2020 through 2024.

Service Connections

Service connections generally include piping from the water main to the customer's meter or fire suppression system. In 2025, there were more than 40,000 active service connections in the City's service area. The number of connections exceeds the number of accounts, because many commercial and multi-family customers have multiple service connections (e.g. irrigation and/or fire suppression, separate from domestic supply).

The O&M staff perform service connection relocations and upgrades (to serve redevelopment of existing properties) as well as new service installations (on previously undeveloped properties). Figure 6-3 and Figure 6-4 and show recent service connection statistics.

Figure 6-3: Service Upgrades & Relocations

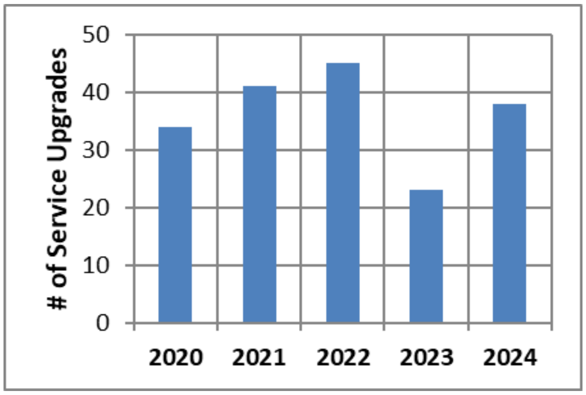


Figure 6-4: New Service Installations

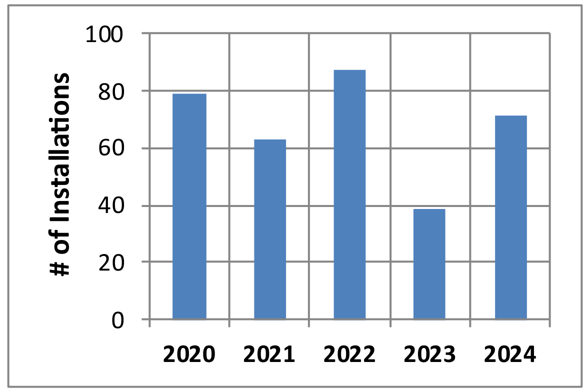
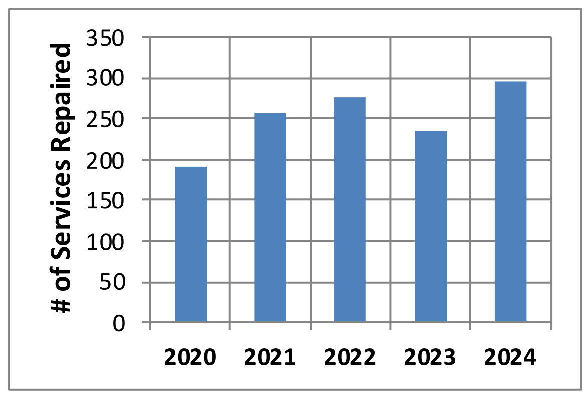


Figure 6-5: Service Repairs



Service connections generally require little maintenance once installed, although failure at service saddles (connections to the water main) occasionally cause leakage due to corrosion, disturbance (from nearby construction, etc.) or other factors. Often what is initially believed to be a water main break can actually be a failed saddle. Figure 6-5 quantifies recent service connection repairs. Saddle failures are treated as main breaks and Figure 6-5 represents both service line failures and saddle failures. These repairs are all performed by O&M staff and are separate from the contracted work performed under the City's Water Service Line and Saddle Replacement Program.

The City also replaces service saddles during water main replacements and, when appropriate, may evaluate replacement of aging service saddles when potential coordination opportunities arise, such as adjacent projects in the right-of-way.

Customer Meters

The O&M Section is responsible for installing, reading, and maintaining all commercial and domestic meters. They work closely with Utility Billing staff to ensure customers are billed accurately on a bi-monthly cycle. In addition to normal meter reading and maintenance, meter reading staff are responsible for meter turn-on/shut-off when an account is opened or closed, and field response (when necessary) due to billing questions or problems.

Figure 6-6: Meter Reading

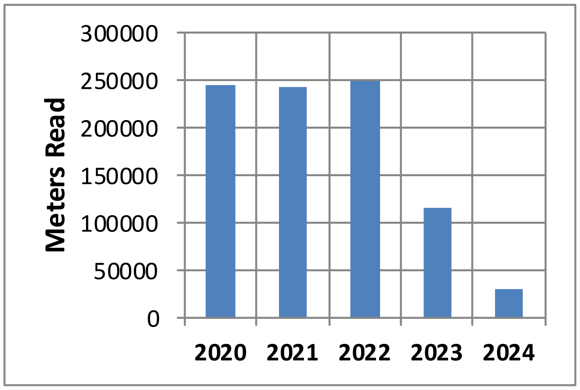
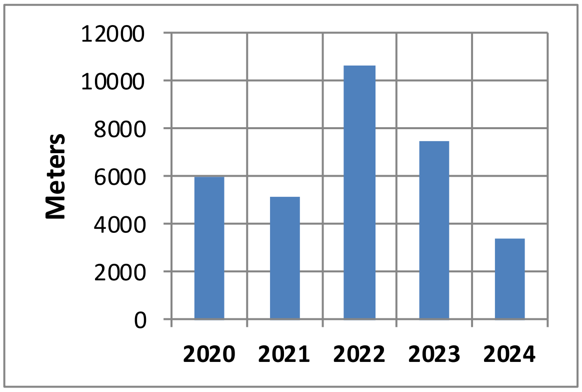
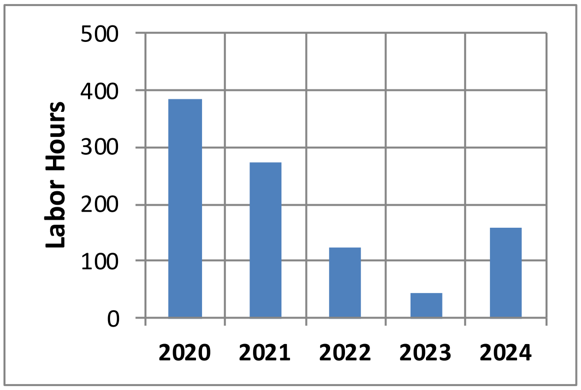


Figure 6-7: Meter Billing Support



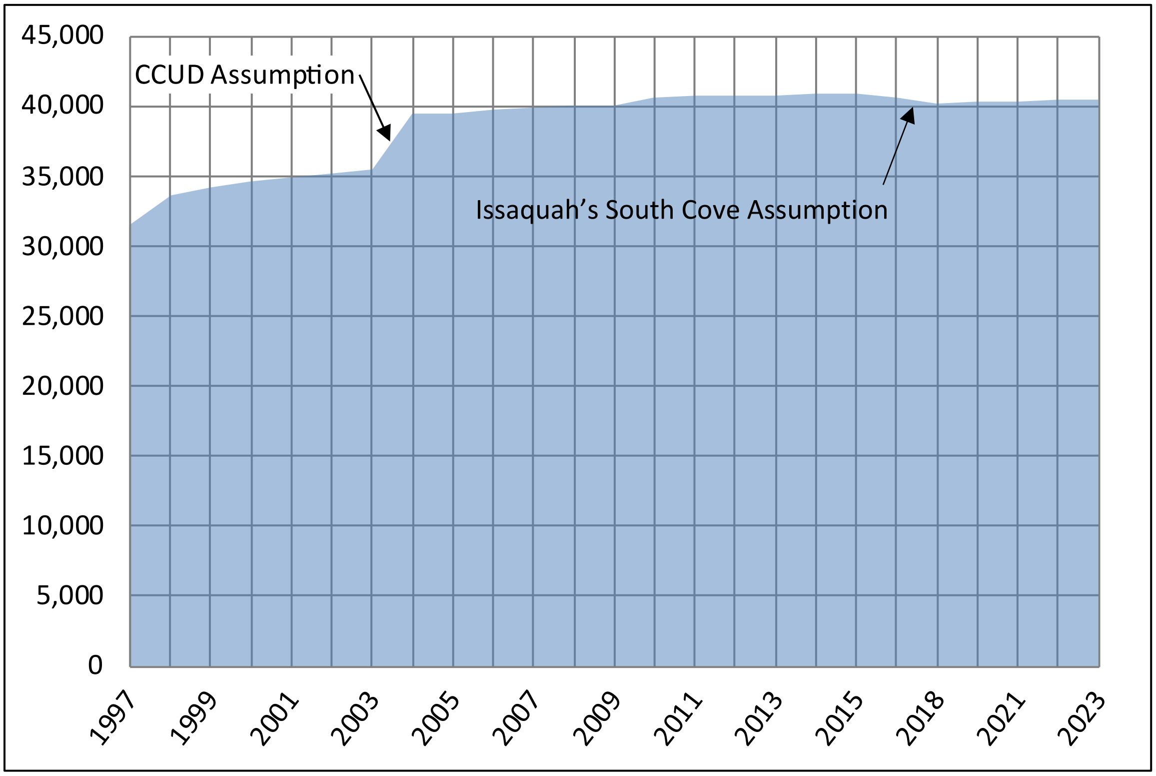
Meter readings, meter reading support, and meter billing support tasks are all performed by O&M staff. The number of meters read from 2020 through 2024 is shown in Figure 6-6. The number of meters read decreased in 2023, and then again in 2024, due to the completion of the AMI system. The number of meters that require support with billing are shown in Figure 6-7, and the hours spent on support for meter readings are shown in Figure 6-8.

Figure 6-8: Meter Reading Support



As of 2025, there are nearly 41,000 meter connections. See Figure 6-9 below for the number of meter connections over time.

Figure 6-9: Number of Meter Connections



The O&M staff perform both replacement of aging customer meters ("Change-outs") and the installation of new meters ("drop-ins"). As of December 2025, the City had converted 96.3 percent of its customers to AMI. New drop-in meter installation workload varies based on development activity. Actual recent workload statistics for small meters (≤ 2-inch diameter) are shown in Figure 6-10 and Figure 6-11. The Water Meter Installations SOP in Appendix M describes this work in more detail.

Figure 6-10: Small Meter Replacement

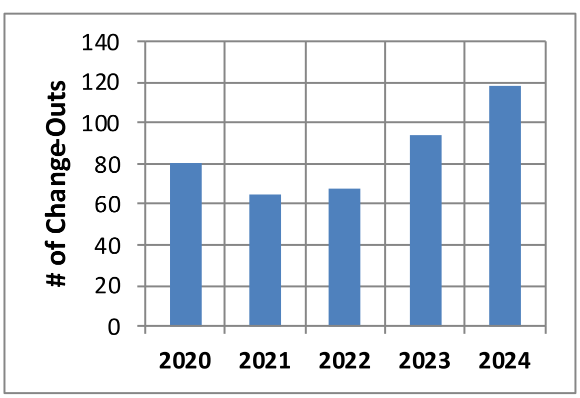
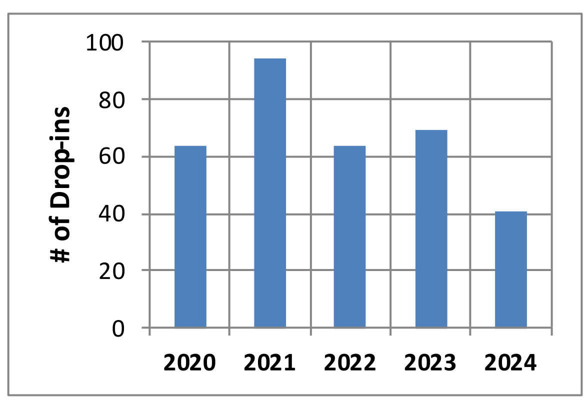
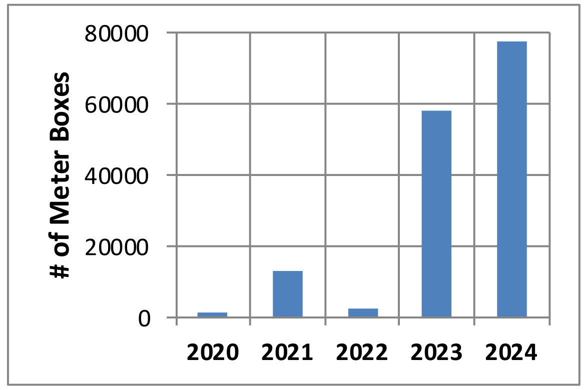


Figure 6-11: New Small Meter Installations



The O&M staff perform meter box maintenance. For small meters, this work includes box adjustment, internal cleaning, external clearing, etc., as well as replacement of the box lid and/or inspection plates when required. Figure 6-12 shows recent statistics. The amount of meter box maintenance increased in 2023, and then again in 2024, which is likely related to City staff performing meter box replacements as part of the AMI system implementation. Both City staff and contractors installed meter boxes. The increase in meter box replacements in 2023 and 2024 coincides with a reduction in meter readings, which is shown in Figure 6-6.

Figure 6-12: Meter Box Maintenance



The City has approximately 253 "large" commercial meters (3-inch diameter and larger). O&M's current practice is to survey and test each commercial meter for accuracy every five years, although AWWA and meter manufacturers typically recommend annual testing. The City will reevaluate the appropriate testing frequencies as part of the AMI assessment. Figure 6-13 and Figure 6-14 show recent meter survey/testing and repair statistics, respectively.

Figure 6-13: Commercial Meter Surveys

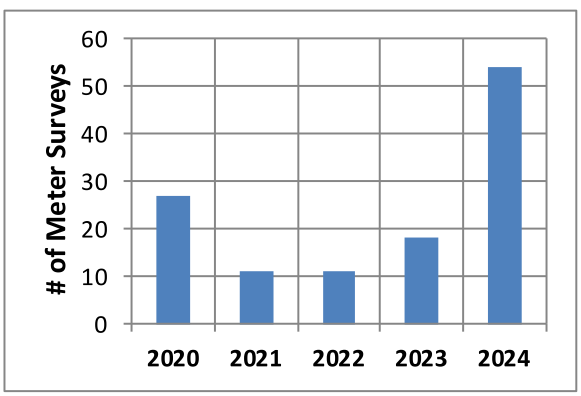
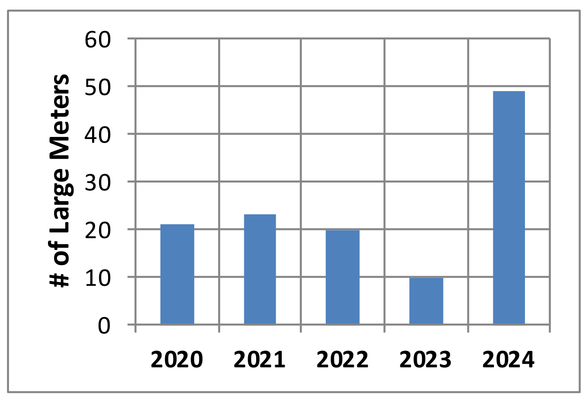


Figure 6-14: Large Meter Repair/Change-out



O&M staff conduct valve and hydrant surveys by map grid, with Grids A–H completed in odd-numbered years and Grids I–P in even-numbered years. Field crews use mobile devices synced with the City's GIS system to record inspection and exercising activities, including the date, responsible staff, and any deficiencies or follow-up work required. This approach ensures consistent coverage, improves data accuracy, and supports timely maintenance planning.

Isolation Valves

Each valve is inventoried with a unique asset number in the City's Maximo database and mapped in the City's GIS geodatabase. Work order history and information such as the type of valve, size, number of turns to close, etc. is stored in Maximo.

The O&M Section conducts routine surveys of all isolation valves in the system, as described in the Valve Survey SOP in Appendix M. O&M has a current annual goal of surveying and fully exercising 50 percent of distribution system isolation valves (each valve every two years). Figure 6-15 shows recent valve survey statistics.

Figure 6-15: Valve Surveys

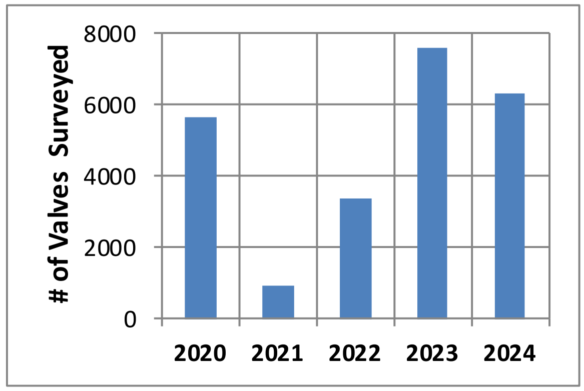
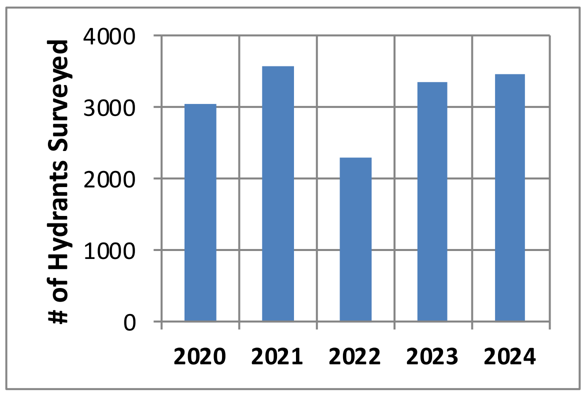


Figure 6-16: Fire Hydrant Surveys



The AWWA[19] recommends that gate valves be exercised from full open to full close and back to open at least once every five years, with a less intensive visual inspection performed annually. The City performs a full valve survey every two years, which combines visual observation and exercise into one visit.

The O&M Section also performs isolation valve repairs as needed. Currently, staff record observed deficiencies during valve survey (e.g. valve not seating properly or water leaking through) for later repair. Valve repair workload varies on a priority basis, depending on other workload.

Fire Hydrants

Each public fire hydrant is inventoried with a unique asset number in Maximo and mapped in the City's GIS geodatabase.

The O&M Section's goal is to survey each public hydrant every other year. Hydrant surveys include full operation of the hydrant, plus inspection. Potential concerns such as leaks, difficulty opening or closing, drain malfunction, lack of visibility or access, etc. are documented and flagged for

[19] AWWA Manual M44 Distribution Valves: Selection, Installation, Field Testing, and Maintenance

follow-up. The Fire Hydrant Survey SOP is included in Appendix M. Figure 6-16 shows recent hydrant survey statistics.

The AWWA[20] recommends annual hydrant inspection, or semi-annual inspection in freezing climates. Hydrant manufacturers[21, 22] typically recommend semi-annual inspection and operation.

Figure 6-17 and Figure 6-18 indicate the quantity of hydrants for which additional maintenance or repair was performed. Hydrant maintenance may include cleaning, lubing, painting and/or rotating the hydrant, cleaning & adjusting of the foot valve box, and/or clearing a three-foot radius of overgrowth to meet Fire Code requirements. Hydrant repair includes more major work such as parts replacement of fire hydrant assembly, foot valve, and or piping. Maintenance or repair might also include adjusting the ground surface. Currently the City's goal is to repair inoperable hydrants within 10 business days of discovery, with more minor work orders addressed on a priority basis.

The City's fire hydrant inventory includes a wide variety of different hydrant models, sizes, and manufacturers. This lack of consistency reduces O&M productivity and efficiency, due to the need for separate spare parts, training and maintenance procedures for each unique type of hydrant. The Water Engineering Standards now limit the number of acceptable fire hydrant manufacturers to address performance issues and to help mitigate the ongoing, long-term inefficiency of maintaining excessive different types of hydrants. However, this will not affect the near-term hydrant workload.

Additionally, the City has identified that Iowa-brand hydrants are no longer maintainable due to the lack of available replacement parts. These hydrants are being prioritized for replacement as part of ongoing asset management efforts to improve system reliability and maintenance efficiency.

Figure 6-17: Hydrant Maintenance

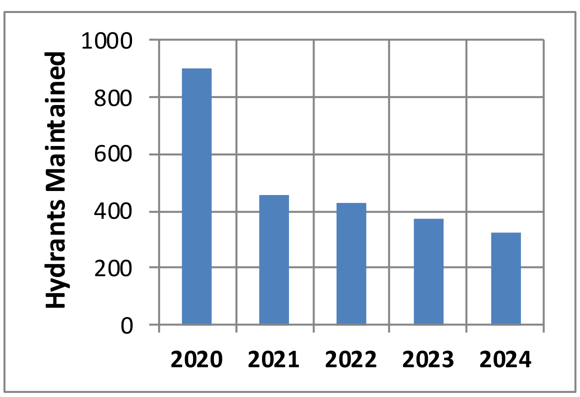
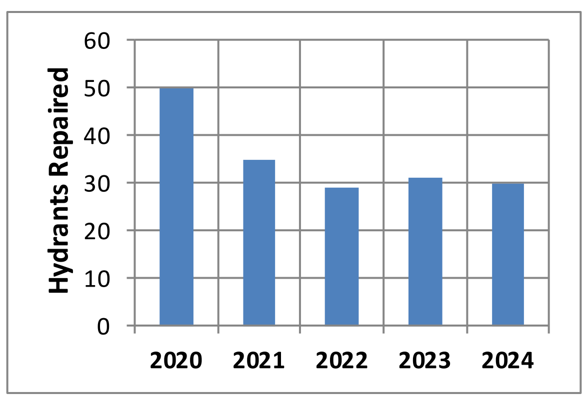


Figure 6-18: Hydrants Repairs



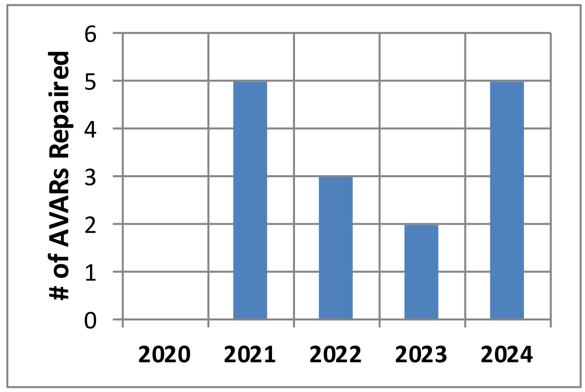
[20] AWWA Manual M17 Installation, Field Testing and Maintenance of Fire Hydrants
[21] Operation and Maintenance Manual, Waterous 5-1/4-inch Pacer Fire Hydrant. American Flow Control, 2025.
[22] WaterMaster 5CD250 Installation, Operation & Maintenance Manual. EJ Group (E. Jordan Iron Works), 2015.

Air Vacuum/ Air Release Valves

Each air vacuum/air release valve (AVAR) is inventoried with a unique asset number in Maximo. AVARs do not require extensive maintenance but are repaired when necessary. Figure 6-19 shows recent repair statistics.

The O&M Section performed a system-wide survey of AVAR installations in 2015 to evaluate potential water quality risks.

Figure 6-19: AVAR Repairs



Pressure Reducing Valves

Each PRV station and inlet station is inventoried with a unique asset number in Maximo (shown in Table 1-7). Individual valves, including parallel low flow (2 to 3-inch diameter) and high flow (6 to 8-inch diameter) PRVs and settings are listed as attributes, along with ancillary equipment such as pressure relief valves. Work order history is also stored in Maximo.

The PRV and inlet stations (which include PRV valves) are typically surveyed on an annual basis. Surveys include only a visual check to identify access problems, leaks, plugged drains, hatch/vault condition, etc., and do not include valve maintenance.

Figure 6-20 and Figure 6-21 indicate the quantity of PRVs in inlet stations and PRV stations (most PRV stations include three valves) for which additional maintenance or repair was performed. PRV maintenance includes replacement of diaphragms & other rubber parts, inspection of all metal parts (with replacement when necessary), removal of debris from controls & copper piping, and valve setting adjustment. PRV repair includes major repair and replacement of valves and/or components such as the vault and access hatch.

Figure 6-20: PRV Maintenance

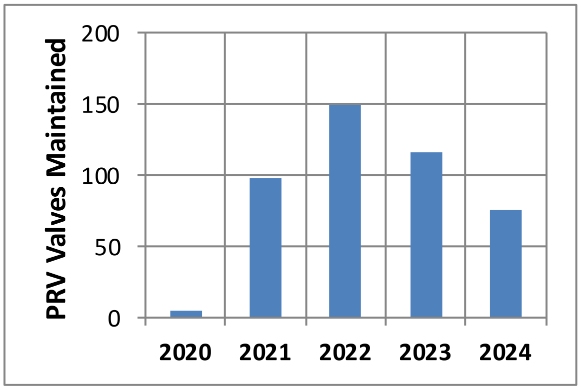
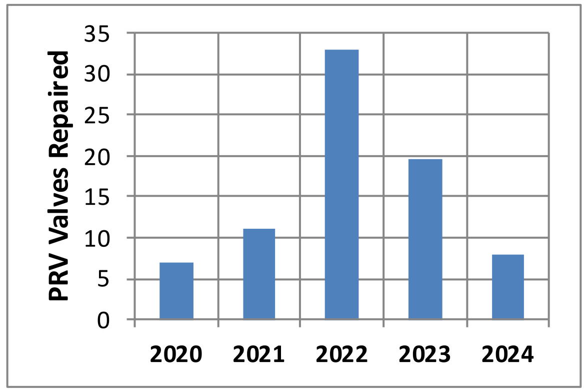


Figure 6-21: PRV Repairs



Maintenance intervals depend on valve function and criticality, but maintenance for each valve normally occurs every five years. Typically, 20 percent of the system's PRVs are serviced each year. Inlet stations are assigned the highest priority.

Manufacturer recommendations for PRV maintenance are evolving as valve materials change. For instance, newer epoxy coated valves may not need a complete disassembly and parts replacement every five years. PRV maintenance intervals may be re-evaluated as part of O&M optimization and the City's ongoing asset management program.

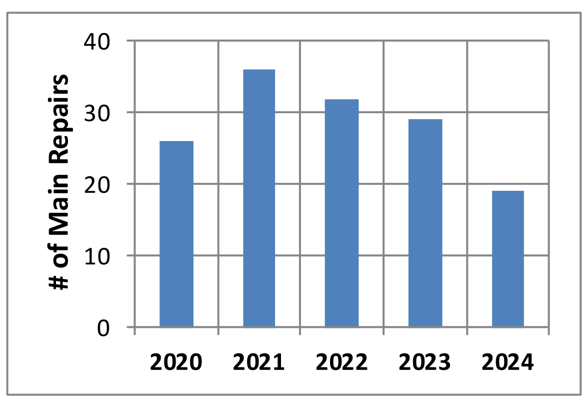
Distribution System Piping

The City monitors, operates, and maintains the distribution system on a continual basis. The City no longer performs unidirectional flushing of the water mains as new treatment facilities have reduced turbidity levels and buildup in the reservoirs. Flushing is now completed based on water quality data related to chlorine residuals and taste and odor complaints affecting large areas. The taste and waster complaints are typically caused by dead end pipes.

During water main flushing, water is discharged to sewer and/or to storm drains, depending on local drainage infrastructure. When discharging to storm drains, the City de-chlorinates water flushed from water mains using an environmentally sensitive method described in the Potable Water Dechlorination SOP included in Appendix M.

The O&M staff also perform repairs in the case of observed defects. Figure 6-22 shows recent statistics on water main repairs, which include not only main breaks but also more minor repairs (data specific to water main breaks can be found in Chapter 8).

Figure 6-22: Water Main Repairs



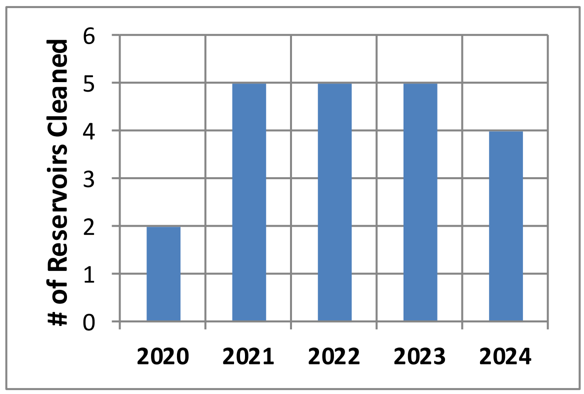
Reservoirs

Each reservoir site is surveyed monthly by O&M staff, including a visual inspection of the grounds and perimeter. Reservoir survey statistics are combined with pump station surveys (see discussion in the following Pump Stations Section) because these inspections are typically concurrent. A complete list of reservoir survey tasks is provided in the Pump and Reservoir Run SOP in Appendix M. The AWWA[23] recommends that reservoirs be inspected at least monthly (or weekly if possible) and the City meets this recommended inspection interval.

Additional reservoir site visits are conducted if an alarm requiring a response is triggered. In addition, annual inspections are performed to trip and test alarms and to check cathodic protection (of steel reservoirs) for normal operation.

The City's telemetry system continually monitors and records the water level in each storage reservoir. If a problem occurs, the telemetry system triggers an alarm and O&M staff respond as appropriate. Telemetry staff perform an annual site visit at each reservoir to trip alarms and test.

Figure 6-23: Reservoir Cleaning



Steel and concrete reservoirs are typically drained, cleaned, and inspected for structural integrity every five years. This includes inspection by consultants and Water Quality staff. The numbers of recent cleanings completed are shown in Figure 6-23.

Figure 6-24 and Figure 6-25 show the labor hours spent performing reservoir maintenance and minor repairs, respectively. Maintenance includes roof cleaning, clearing downspouts, maintenance of fall prevention systems, and other non-repair tasks. Minor reservoir repair work includes fixing broken ladders, cathodic protection systems, damaged vents or failed paint. More significant reservoir repairs are typically performed by contractors.

[23] AWWA Manual M42 Steel Water Storage Tanks

Figure 6-24: Reservoir Maintenance

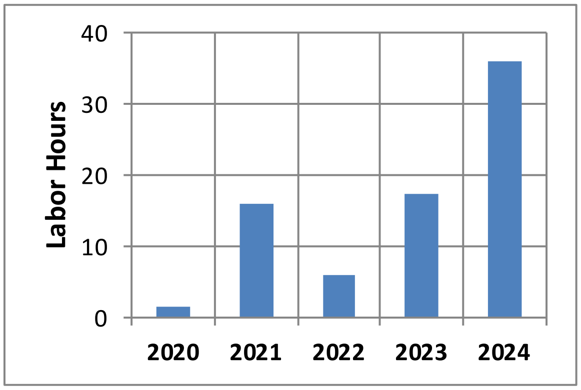
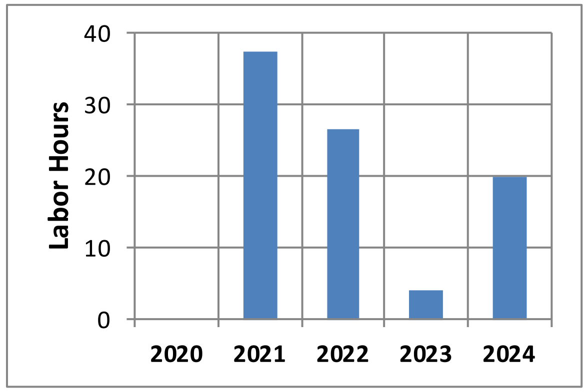


Figure 6-25: Reservoir Repairs

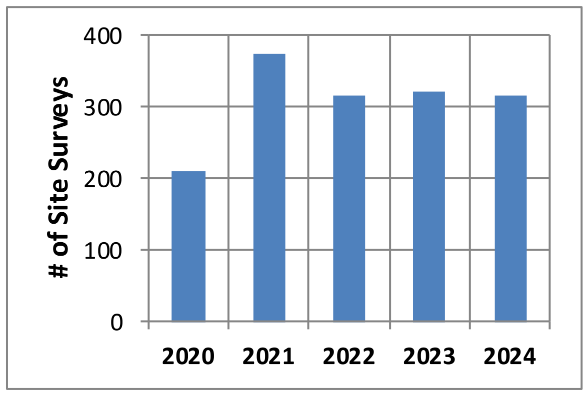


Minor reservoir repairs (Figure 6-25) are typically not critical to safety or public health, and are performed on a priority basis, so that O&M staff have flexibility to address the most critical needs. Major or more critical repairs are typically performed by contractors and/or managed by the Engineering Division.

Pump Stations

Each pump station is surveyed monthly by O&M staff. Annual survey totals are shown in Figure 6-26 (this includes reservoir surveys that are typically on shared sites). Survey tasks are described in the Pump and Reservoir Run SOP in Appendix M. During these visits, diesel-driven generators are exercised, visual checks are made of the grounds, and the station is observed for security issues, leaks, unusual odors, noise, etc.

Figure 6-26: Pump Station & Reservoir Surveys



Additional site visits are conducted as required for longer-term maintenance needs, or if triggered by an alarm. All pump motors are lubricated and load tested annually, with other maintenance performed as needed.

On-site generators are maintained by a contracted service provider, including a semi-annual oil change and load bank testing at each. Portable generators are maintained by City Fleet Services.

Figure 6-27 shows O&M labor hours for pump station building & grounds maintenance, such as sweeping, cleaning, graffiti removal, and similar activities. Figure 6-28 shows labor maintaining pump station components, including pumps, motors, valves and generators.

Figure 6-27: Pump Station Building & Grounds Maintenance

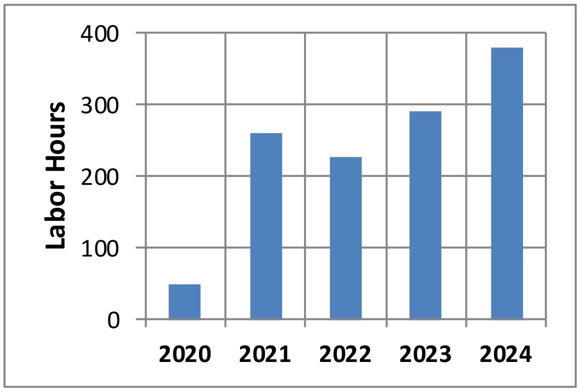
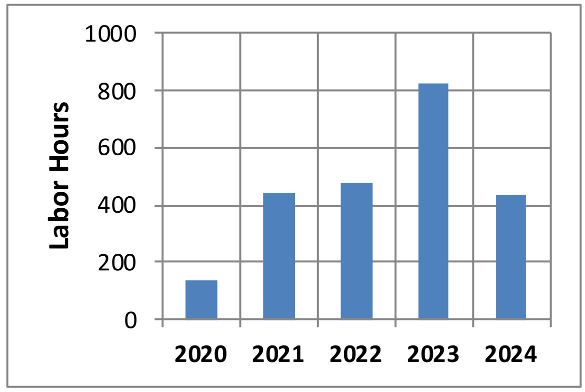


Figure 6-28: Pump Station Component Maintenance



In addition to the general maintenance activities described above, O&M staff perform some repairs to pump station buildings (including fences and gates), and some minor pump & motor repairs, including components such as shafts and couplings. Major pump station upgrades or repairs are typically performed by contractors.

Emergency Wells

O&M Staff perform annual sampling, maintenance, and site surveys at the emergency well locations. Site surveys include an inspection for security concerns and/or maintenance problems. Maintenance includes pumping the well to confirm operation and obtain representative groundwater. While annual coliform and nitrate samples are required to maintain the emergency use status, O&M staff also collect annual samples for volatile organic chemicals (VOCs), inorganic chemicals (IOCs), synthetic organic chemicals (SOCs), NWTPH-Dx, and per & polyfluoroalkyl substances (PFAS) to better understand the overall water quality.

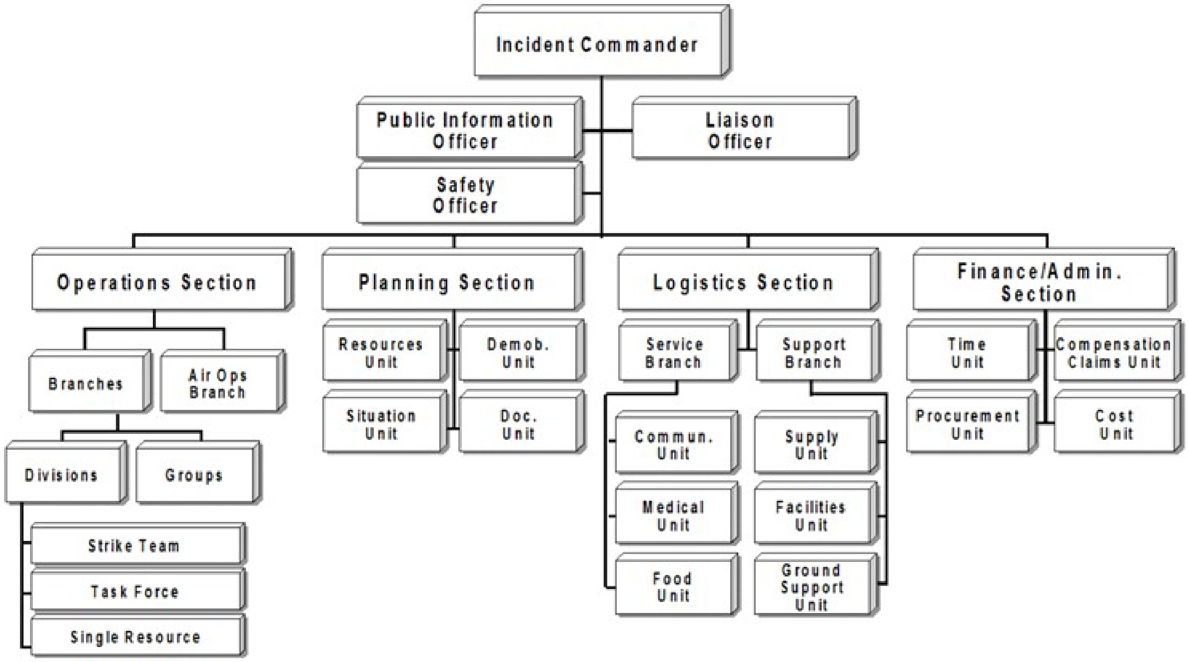
6.2 Comprehensive Water Quality Monitoring

The O&M staff maintain a water quality monitoring program to ensure a safe and high-quality water supply that prioritizes protection of public health. See Chapter 7 for discussion of water quality.

6.3 Emergency Preparedness and Response

The City of Bellevue Fire Department, Office of Emergency Management maintains an emergency operations center (EOC) to coordinate City-wide response from all departments in the event of a large emergency or disaster. When activated, the EOC operates within the FEMA National Incident Management System ICS framework, to allow consistency between government agencies during incident response. Figure 6-29 shows the basic ICS command structure. Appropriate City staff from all departments, including the Utility, are required to complete the City's on-site EOC training and FEMA's ICS training courses, in preparation for City-wide emergency response.

Figure 6-29: ICS Command Structure



The Utility also maintains its own emergency management plan, known as the "Red Book." The Red Book documents roles and responsibilities, communications procedures, contact information, inventories of equipment & facilities, and other relevant information specific to the Utility. The Red Book is updated annually.

During a minor emergency such as a water main break, the EOC is not typically activated, and the Utility responds in accordance with the procedures in the Red Book. If the EOC is activated, the Red Book may be incorporated into the EOC's Incident Action Plan.

Water Supply Emergencies

the City's response to water supply shortages is guided by its Emergency Water Supply Master Plan. During a supply shortage, SPU and Cascade are responsible for coordinating regional response activities, while the City is responsible for customer service within the local service area and coordination with local media.

Water Quality Emergencies

the City maintains a Water Quality Emergency Response Plan as part of the Red Book.

Water Main Break Response

The City has developed an SOP for response to water main breaks (see Appendix M), to ensure the protection of drinking water quality and public health. This SOP utilizes current best management practices, national research findings, and guidance provided by DOH.

Power Outages

Water is distributed in the service area by gravity (through pressure reducing valves) and/or by pumps driven with electric motors. Although most of the City's water customers can be fully served by gravity, significant portions of the service area are at higher elevations that require electrical power for water service via pumps, as shown in Table 1-3.

In order to provide continuous service at higher elevations during a power outage, backup power is required. All of the City's normally operated pump stations have either a permanent, on-site backup diesel generator, or a receptacle for connection to a portable generator, as shown in Table 1-6. Backup power cannot currently be provided at NE 8th Inlet or SE 28th Inlet pump stations, but these are typically gravity-only facilities (pumping is generally not needed). O&M's Water Section currently maintains two portable generators.

In the event of a localized power outage, the Utility staff respond as appropriate to maintain service, in accordance with the Red Book. When a wider, regional power outage occurs, the EOC will be activated and all City departments coordinate resources as appropriate and on a priority basis in the National Incident Management System ICS structure. The City's critical emergency response facilities have reliable on-site backup power that is exercised weekly.

The City's most significant power outage event occurred following the windstorm of December 14-15, 2006. All of the City's facilities lost external power, and relied on backup generators, where available. Most facilities had no external power for several days, and some lost power for more than a week. Uninterrupted service was maintained throughout 100 percent of the water service area during this event, due to low seasonal water demands and staff working extended 12-hour shifts on an extended 24/7 basis. Despite O&M's success in maintaining service, the event revealed some vulnerabilities in the delivery of water to the SOA during an extended power outage, and an evaluation of power supply resiliency and redundancy is recommended, as discussed in Chapter 4.

Security

The City has instituted multiple security measures to manage the potential risks of vandalism and sabotage to water infrastructure or customer service. The City's water security system has been reviewed and evaluated using the Risk Analysis and Management for Critical Asset Management Protection standard developed by the American Society of Mechanical Engineers as a part of the City's 2025 America's Water Infrastructure Act certification.

Security for the City's SCADA network is provided by isolating the system, controlling access, regularly scanning internal and external drives, and similar measures. The SCADA system has no internet connectivity, to preclude the opportunity for system hacking. Credentials are required both to physically access the SCADA computers, and to log into the system. File transfer to/from the system is only allowed on USB drives keyed to matching locking USB docks. Physical security is provided at water system sites through locks, intrusion alarms, and other measures. Alarms are sent to cell phones as well as to the SCADA system.

For security reasons, portions of the City's GIS data are not generally available, except as needed to conduct the City's business, as required for public records requests, or for other legitimate purposes, such as coordination with private utilities (PSE, Lumen, etc.) to avoid underground conflicts. Requests for GIS data are each documented and require a statement of the intended use. The City reviews each request, and when approved, provides only the necessary portion of the system.

6.4 Cross-Connection Control Program

See Chapter 7 for the discussion of the City's cross-connection control program, included as Appendix N.

6.5 Sanitary Survey Findings

DOH most recently completed a Sanitary Survey of the City's water system in November 2025. DOH's findings letter summarizing observations, issues, and recommendations is provided as Appendix O.

6.6 Recordkeeping, Reporting, and Customer Complaint Program

Work requests are scheduled by O&M according to priority. Emergency request response is immediate. Secondary priority response is typically within 48 hours. The City complies with DOH reporting requirements including regular submittals of required assessments, emergency conditions, public notice certifications, and WFI updates.

The City has used Maximo software as its maintenance management information system since 1999. The program is accessible at personal computers throughout the City. Maximo integrates O&M planning, budgeting, and performance reporting, while maintaining records of activities in a consistent format. The system tracks how actual performance compares to plan with respect to infrastructure maintenance, customer service demand, and costs. The Maximo database includes an inventory of the City's assets, records of maintenance activities (known as Work Orders), and allocation of labor, equipment, materials, and contracted services.

The Utility's Maximo database is used to track Work Orders from both internal and external customers. Work Orders from internal customers are typically feedback from City staff who notice maintenance needs while in the field. Work Orders from external customers can include some customer complaints (taste, odor, loss of pressure, etc.) but also feedback such as missing valve box covers and leaking meters. Work orders are frequently generated by a phone call to customer service staff but are often generated through the City's "MyBellevue" mobile phone application.

The City is looking to improve its use of Maximo to enhance the City's asset management capabilities and interface better with its GIS and mapping data, billing systems, and other software applications. The MyBellevue mobile phone application has allowed customers to directly generate work orders. The City's

Utilities Mobile Initiative implemented iPad tablet devices for O&M field crews in 2017 to allow real-time data entry and retrieval, and to reduce or eliminate the office data entry time currently necessary at the end of each day.

The volume of data generated in the Utility is substantial and includes utility billing and customer information, work orders, design and as-built drawings and specifications, water quality monitoring, and telemetry (supply inlet flow and pressures, reservoir levels, pump station operation and flow rates, event and alarm data, etc.). Most of this information is computerized; however, it is maintained in separate databases due to software limitations and/or security requirements. Improving access to data and computer mobility is one of the potential process improvements being evaluated by the City.

Figure 6-30 shows trends in customer service requests (non-billing related). These requests can be related to leaks, water pressure, water quality (taste and odor), damaged or leaking hydrants, valve box problems, etc. Customers are notified when the request is logged and completed; also during response if coordination with the customer is necessary.

Figure 6-30: Customer Service Requests (Non-Billing)

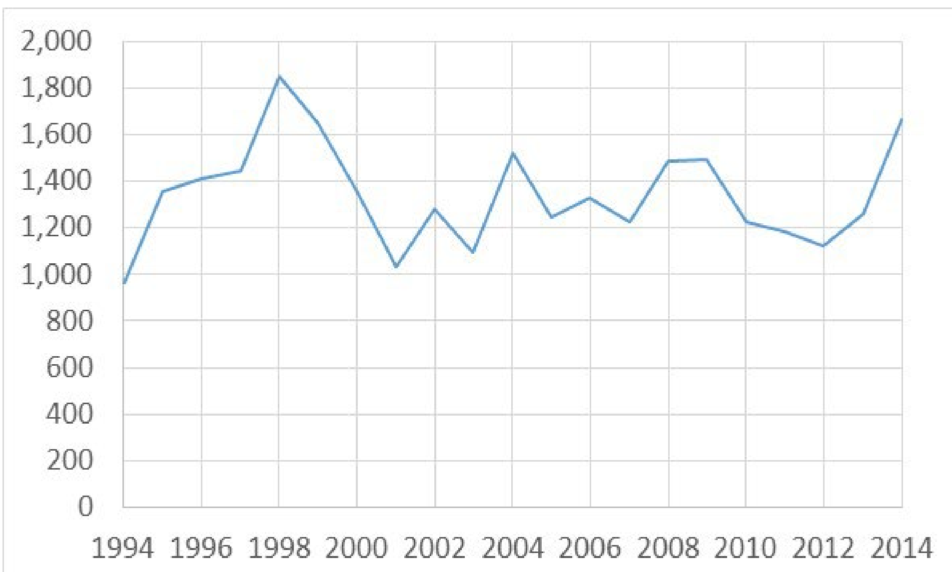
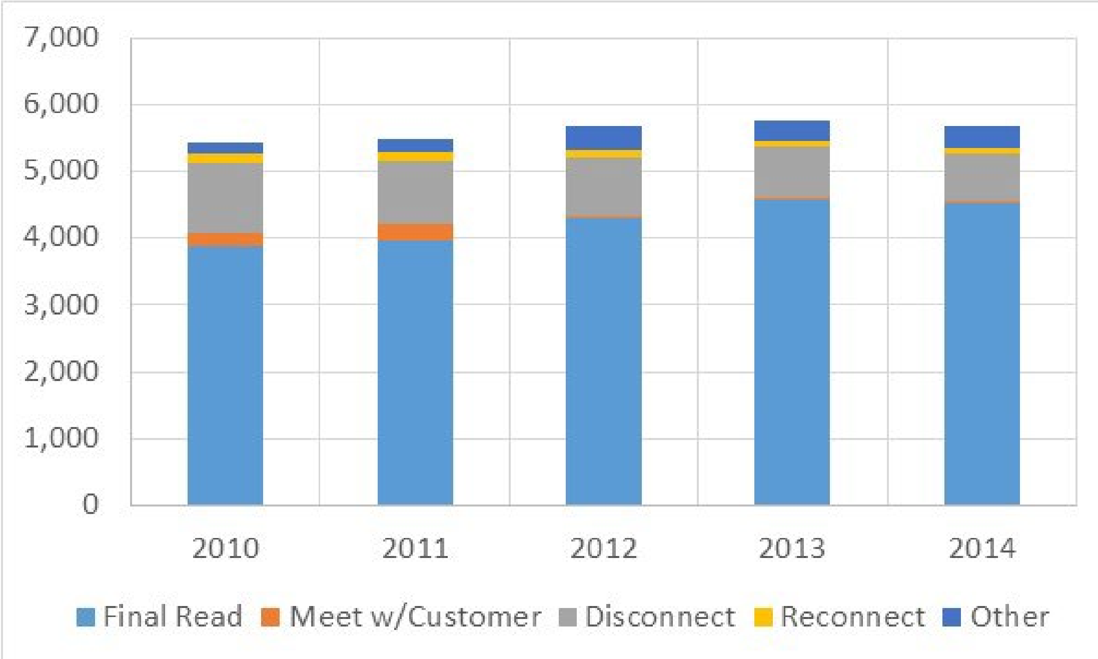


Figure 6-31 shows statistics for billing-related Work Orders. Most billing-related Work Orders are internal requests by the Utility's RMCS division; however, some billing Work Orders are generated by customers. Examples include requests for temporary service shutoff, reading verification (in the case of unexpected billing volumes), or requests associated with site demolition or redevelopment.

Figure 6-31: Billing-Related Work Orders



6.7 Summary of O&M Deficiencies

Some needs and opportunities specifically affecting O&M's Water Section are summarized below.

Asset Management & Infrastructure

Evaluate and implement targeted asset management programs to address aging and high-risk infrastructure. Key priorities include:

- A Water Service line and Saddle Replacement Program to proactively address leaks and failures at service connections.
- An Isolation Valve Condition and Replacement Assessment Program to identify non-functional or deteriorated valves and prioritize replacements.
- A Strategic Replacement Plan and CIP Program for the City's inventory of over 800 Iowa-brand fire hydrants, which are no longer maintainable due to lack of available parts.
- The City already maintains a robust Water Main Assessment and Capital Improvement Program, as described in Chapter 4.
- Verify and maintain seals and screens on storage tank vents, access hatches, overflows, and other appurtenances to ensure water quality and system integrity.
- Perform routine inspection and cleaning of access hatches with gutter designs to prevent debris accumulation and potential contamination.

Technology & Data Systems

- Establish consistent standards for data collection and entry into the City's GIS and Maximo systems to improve asset tracking, maintenance history, and performance analysis.
- Improve integration between mobile field devices and asset databases to ensure real-time updates and reduce manual data entry.
- Enhance use of Maximo and GIS to support predictive maintenance and long-term planning.

Metering & AMI Implementation

- Since the implementation of AMI in 2019–2020, manual meter reading has decreased significantly. However, a backlog of meters not converted by the original contractor remains and is being addressed in-house over time.
- Investigate and resolve non-transmitting encoder receiver transmitters to ensure complete and accurate data collection.
- Respond to increasing customer concerns regarding perceived high water use, particularly related to AMI alerts for continuous flow. The system can detect usage as low as 10 gallons per hour but does not differentiate between leaks on the customer side versus the Utility's infrastructure.

Staffing & Workforce Development

- Evaluate staffing levels and certification coverage to ensure adequate support for certified roles and emergency response.
- Monitor anticipated retirements and support succession planning through cross-training and professional development.
- Continue to develop internal staff to be competitive for promotional opportunities and leadership roles.

Customer Service & Communication

- Improve customer-facing tools and communication strategies to help residents understand AMI alerts and water usage trends.
- Enhance coordination between field crews and Water Quality staff for reactive flushing and reservoir inspections, using shared data platforms and mobile tools.

General water system deficiencies and opportunities are described in Chapter 4.

Chapter 7 Water Quality

This chapter evaluates the City's compliance with applicable state and federal drinking water regulations. The discussion includes the following:

- Drinking Water Regulations
- Drinking Water Quality Compliance
  - Surface Water Treatment Rule (SWTR)
  - Total Coliform Rule (TCR)
  - Lead and Copper Rule (LCR)
  - Disinfection Byproduct Rule
  - Phase II Rule - Asbestos
  - Unregulated Contaminants Rule (UCMR)
  - Fluoride
  - Cross Connection Control
  - Consumer Confidence Reports
  - Public Notification Rule
- Customer Service
- Anticipated Regulations

The DOH performs periodic sanitary survey inspections of the system. See Chapter 6 for a discussion on the most recent sanitary survey findings. DOH's findings letter from the most recent (2025) sanitary survey is included in Appendix O.

7.1 Drinking Water Regulations

Washington State drinking water suppliers are subject to both federal and state drinking water regulations. At the federal level, the Safe Drinking Water Act (SDWA) (1974) and its Amendments (1986 and 1996) assign the US Environmental Protection Agency (EPA) the responsibility of developing and administering national standards for drinking water quality. Table 7-1 lists current federal drinking water regulations developed as part of the SDWA and amendments and indicates which regulations apply to source and treatment or to the distribution system.

Table 7-1: Federal Drinking Water Quality Regulations

Rule (Date Effective)	Parameters Regulated	Requirements Apply Primarily to…
National Primary Drinking Water Regulations (1976)	Physical and chemical	Treated water
Total Trihalomethane Rule (1979)[1]	Trihalomethanes	Distribution system
Phase I (VOCs) and Phase II and Phase V (IOCs and SOCs) - (1989 and 1993, respectively)	Volatile Organic Chemicals (VOCs), Inorganic chemicals (IOCs), and Synthetic Organic Chemicals (SOCs)	Treated water[2]
Surface Water Treatment Rule (1990)	Turbidity, disinfection, viruses, *Giardia lamblia*, and disinfectant residual	Source and treated water[3]
Revised Total Coliform Rule (2016)	Coliform	Distribution system
Lead and Copper Rule (1992) and Lead and Copper Rule Improvements (2024)	Lead and Copper and treatment for corrosion control	Treated water and at customers' taps
Interim Enhanced Surface Water Treatment Rule (2002)	Turbidity and *Cryptosporidium*	Source and treated water
Arsenic Rule (2002)	Arsenic	Treated water
Stage 2 Disinfectant/Disinfection By-Products Rule (2006)	Disinfectant Residual, Total Trihalomethanes, and Haloacetic Acids	Distribution system
Radionuclides Rule (2003)	Radionuclides	Treated water

1. Replaced by the Stage 1 Disinfectant/Disinfection By-Products Rule in 2004 which was replaced by the stage 2 rule in 2006.
2. Asbestos is monitored in the distribution system.
3. A disinfectant residual must be present in 95 percent of samples collected monthly at coliform monitoring sites or heterotrophic plate count levels must be less than or equal to 500 colony forming units per mL.

The DOH is the primary agency responsible for ensuring state drinking water laws are implemented and enforced. Washington State must adopt laws at least as stringent as federal regulations. When a federal drinking water law has yet to be included in state drinking water codes, drinking water suppliers are responsible for meeting federal regulatory requirements as put forth by the EPA.

The WAC 246-290 - Group A Public Water Systems incorporates federal drinking water requirements. The City is a Group A system; defined as a drinking water system that provides service to 15 or more service connections used by year-round residents for 180 or more days within a calendar year or regularly serving at least 25 year-round residents (in residence at least 180 days per year).

Since the City does not own or operate any primary drinking water supply sources, it is not responsible for monitoring at the source(s) or directly after treatment for purchased water. As a consecutive system that purchases water from another utility, the City is responsible for monitoring and maintaining compliance with drinking water regulations that apply to distribution system water quality. In some cases, the City is required to perform monitoring to assess the effectiveness of treatment techniques.

The City's compliance with these regulations is detailed below.

7.2 Drinking Water Quality Compliance

The City purchases 100 percent of its water from Cascade and provides no additional treatment. Currently, Cascade supplies the City with water purchased from SPU. During typical operations, water is supplied from both the Cedar and South Fork Tolt Rivers. The Cedar supply is a treated, but unfiltered drinking water supply while the Tolt River water has been filtered since the Tolt Water Treatment Facility came online in 2001. See Section 4.2 for additional information.

With respect to the quality of the drinking water provided, Cascade's contract with member agencies states:

> "Cascade shall be responsible for water quality that meets or exceeds all federal or state requirements at the point of delivery from Cascade to the Member, consistent with applicable laws and regulations. Cascade assumes source water quality responsibility and liability with respect to Water Supply Assets under its ownership or control (including water wheeled to a Member utility through another Member's facilities). Cascade is also responsible for preparing and carrying out water quality activities compatible with the water quality requirements of Regional water suppliers integrated with Cascade's system (i.e. Tacoma, Everett, and Seattle)."

While Cascade is responsible for ensuring the quality of water reaching its member utilities, it plans to purchase most of its water from SPU during the next 20 years. It also plans to begin purchasing water from Tacoma Water around 2041. Clearly defined roles and responsibilities with respect to water quality management will be particularly important.

The WAC 246-290 requires the following of systems that are selling and/or receiving water:

- Source water monitoring – Utilities are responsible for conducting monitoring per regulations for drinking water supply sources under their control. For regulations with population-dependent monitoring requirements, these utilities are to meet requirements for the entire population served by the source of supply. This does not apply to systems that wheel water.
- Distribution system monitoring – Utilities that receive and distribute water are responsible for meeting water quality requirements in the distribution system.

Therefore, SPU (or any future water supplier to Cascade) is responsible for ensuring that its sources, treatment processes, and finished water meet applicable state and federal water quality regulations to the point of connection. The City is responsible for ensuring compliance with water quality regulations that apply to drinking water throughout the distribution system, from the point of supply to the point of use with the customer.

Surface Water Treatment Rule

Regulatory Requirements

Although the City does not currently have any of its own primary source waters feeding the distribution system, it does receive water that originates from a surface water supply. SWTRs apply to water systems that utilize surface water supplies or groundwater under the influence of a surface water body and include the following:

- Surface Water Treatment Rule – June 1989
- Interim Enhanced Surface Water Treatment Rule – December 1998
- Filter Backwash Recycling Rule – June 2001
- Long Term 1 Enhanced Surface Water Treatment Rule – January 2002
- Long Term 2 Enhanced Surface Water Treatment Rule – January 2006

After treatment, the SWTRs require monitoring for disinfectant residuals at entry points to the distribution system and specify that the concentration cannot be less than 0.2 milligrams per liter (mg/L) for more than four hours at those locations.

Additionally, systems must monitor for disinfectant residuals in the distribution system. Distribution system monitoring must take place at the same location and frequency as TCR sampling and residual disinfectant concentrations must be detected in at least 95 percent of the samples each month. Systems may measure heterotrophic plate count (HPC) in lieu of disinfectant residuals. If HPC is less than 500 colonies per milliliter, the site has the equivalent of a “detectable residual”.

City Status

From 2015 through 2024, the City maintained compliance with the disinfectant residual monitoring portion of this regulation. Chlorine residuals were detectable in at least 95 percent of the samples collected. In addition, the City had results from 92 HPC analyses from water throughout the distribution system. The results showed no HPC was found in 77 of the samples (84 percent). In 15 HPC occurrences the highest result was 12 (the remainder were 1 or 2).

Revised Total Coliform Rule

Regulatory Requirements

The EPA revised the 1989 TCR, which set both maximum contaminant level goals (MCLGs) and maximum contaminant levels (MCLs) for the presence of total coliforms in drinking water, on February 13, 2013 with the Revised TCR (RTCR). The RTCR includes provisions allowing public water systems to transition from the TCR to the RTCR using their existing TCR monitoring frequency, including systems on reduced monitoring under the existing TCR. The RTCR is intended to improve public health protection and the implementation of the rule by states and public water systems.

The RTCR sets both an MCLG and MCL for E. coli for protection against fecal contamination. It sets a total coliform treatment technique requirement and includes monitoring requirements for total coliforms and E. coli in accordance with a sample siting plan and a schedule, both specific to the respective public water system. The RTCR also includes public notification requirements for violations and language for community water systems to include in their consumer confidence reports (CCRs) when they need to conduct an assessment, or in the event of an E. coli MCL violation. Requirements for seasonal systems (such as non-community water systems not operated on a year-round basis) to monitor and ensure the completion of a state-approved start-up procedures and requirements for assessments and corrective action when monitoring results indicate that a system may be susceptible to contamination are also included.

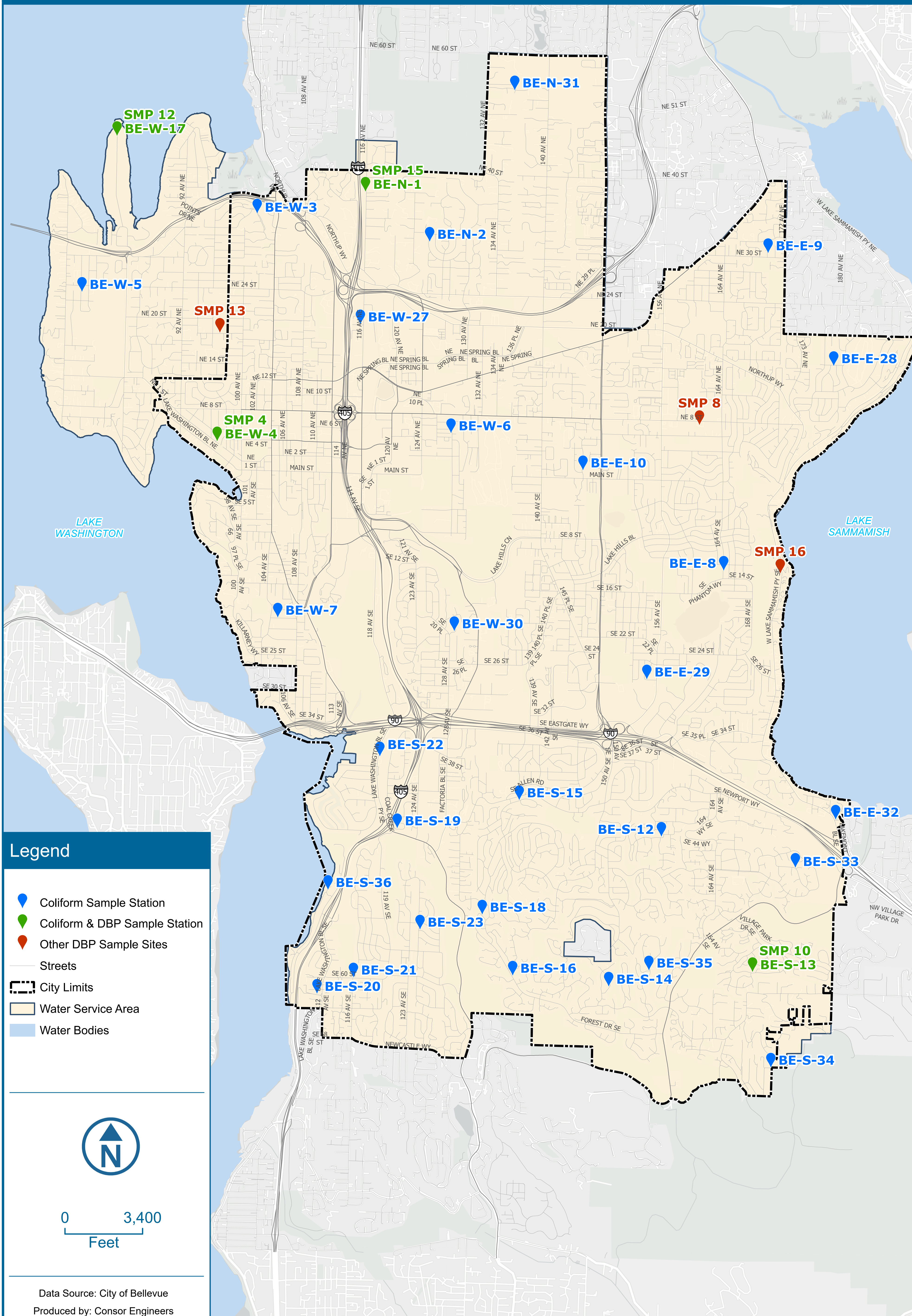
Bellevue Status

The City is one of approximately 27 water systems and districts that receive water from sources treated and operated by SPU. SPU and its wholesale customers have been part of a regional, DOH-approved, coliform monitoring program since 1972. As part of the regional program, SPU collects the routine monthly samples, while wholesale customers are responsible for installing and maintaining designated coliform monitoring sample stands, and for collecting any repeat samples when necessary. Samples are currently collected at 37 sample stands under a regional monitoring program with SPU as approved by DOH, shown in Figure 7-1.

Under this agreement, SPU and its purveyors sample at a rate of 70 percent of samples required by the RTCR. The number of coliform samples required to be collected in the City's distribution system changes with population. In 2025, the number of residents served was over 165,000 and the sampling amount was 180 per month.

Water Sample Locations

Figure 7-1



Date: 4/7/2026

File Name: C:\Users\cory.owsen\Consor North America, Inc\City of Bellevue WSP - Plan Development\GIS Figures and Shapefiles\Chapter 4-9 Figures\Chapter 4-9 Figures.aprx

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community

The City's approved coliform monitoring plan(CMP) is attached as Appendix P. The CMP covers the following topics.

- Compliance requirements, sampling procedures, and reporting to the State
- Public notification for acute and non-acute violations
- Relevant system maps
- City, DOH, and adjoining system contacts
- The City's strategy for compliance with the RTCR and changes to the regional monitoring program requirements imposed by DOH

The City has been in compliance with the TCR/RTCR since 1998. From 1996 to 2024, there have been 32 positive coliform samples. In only one occurrence has a repeat sample been coliform positive. The City has never exceeded more than 3 percent of monthly coliform samples positive.

As a result of an undetermined E.coli event in another water system in the regional coliform monitoring program, the DOH initiated review of the participating systems' coliform monitoring plans. The City agreed to add nine additional sample stands and remove the reduced monitoring as an allowance. The CMP covers in detail the City's strategy for meeting DOH expectations.

Lead and Copper Rule

Regulatory Requirements

Lead and copper enter drinking water primarily through plumbing materials. Exposure to lead and copper may cause health problems ranging from stomach distress to brain damage. On June 7, 1991, the EPA published a regulation to control lead and copper in drinking water. This regulation is known as the LCR. The treatment technique for the LCR requires systems to monitor drinking water at customer taps. If lead concentrations exceed an action level of 15 parts per billion or copper concentrations exceed an action level of 1.3 parts per million (ppm) in more than 10 percent of customer taps sampled, the system must undertake a number of additional actions to control corrosion. If the action level for lead is exceeded, the system must also inform the public about steps they should take to protect their health and may have to replace lead service lines under their control.

In 2021, the EPA passed the Lead and Copper Rule Revisions (LCRR) requiring public water systems to maintain a lead service line inventory, notify customers of known or potential lead service lines including lead action level exceedances, and report the inventory data to DOH.

In 2024, the EPA issued the Lead and Copper Rule Improvements (LCRI), which requires water systems to replace lead service lines by 2034, regardless of ownership. This builds off the LCRR inventory requirements.

City Status

A regional, DOH-approved lead and copper monitoring program was adopted by SPU and its purveyors in 1992. This type of program is appropriate because SPU applies corrosion control as part of their drinking water treatment. Monitoring was initiated in 1992 and conducted most recently in both 2020 and 2023. The samples collected every three years from the City's system are pooled with the rest of SPU's direct service and wholesale customer samples. Table 7-2 shows the results of the City's last two sampling efforts and shows compliance with both the lead and copper action levels throughout the testing periods.

Table 7-2: 2020 and 2023 Lead and Copper Monitoring Results

Parameter	Action Level	90th Percentile – 2020	90th Percentile – 2023	# of Homes Exceeding Action Level – 2020	# of Homes Exceeding Action Level – 2023
Lead (ppb)	15	5.1	3.7	0 of 62	0 of 52
Copper (ppm)	1.3	0.16	0.11	0 of 62	0 of 52

The City is in compliance with the LCRR requirements and actively maintains an updated lead service line inventory. It has never used lead in service lines from the water mains to the meters. The LCRI requires water systems to replace lead service lines by 2034, including privately owned service lines. Homes built prior to 1968 could have lead pipes running from the water meter to the house that would require replacement by the LCRI.

Disinfection By-Product Rule

Regulatory Requirements

The Stage 2 DBP Rule sets monitoring requirements for total trihalomethanes (TTHM) and haloacetic acids (HAA5) which are the two most common DBPs formed when chlorine is added to drinking water as a disinfectant. The EPA published the Stage 2 Rule in January 2006 and Washington State assumed responsibility for the Stage 2 Rule on January 4, 2010. The Stage 2 Rule applies to all community and non-transient non-community Group A water systems that deliver water continuously treated with a primary or residual disinfectant other than ultraviolet light. The MCL for TTHM has been set at 80 micrograms per liter (µg/L) and the MCL for HAA5 is 60 µg/L.

City Status

Chlorine is added to SPU's treated source water as a disinfectant and to also maintain a disinfectant residual as water flows through the distribution system. The Utility collects 12 TTHM and 12 HAA5 samples on a quarterly basis. throughout the city, as currently required. The historical results of this sampling show that DBP concentrations across the city are well below the MCL and hover just above the trigger for reduced monitoring approval. Water systems become eligible for reduced monitoring when locational running annual average concentrations fall below

40 ug/L for TTHM and 30 ug/L for HAA5. Recent results are shown in Table 7-3. The DBP Monitoring Plan is included as Appendix W.

Table 7-3: Disinfection Byproduct Sampling Results 2019 - 2024

Year	TTHM MCL (µg/L)	Annual Average and Range	HAA5 MCL (µg/L)	Annual Average and Range
2019	80	Average = 34 Range = 19.9 – 41.6	60	Average = 28 Range = 14.6 – 38.6
2020	80	Average = 32 Range = 22.5 – 53	60	Average = 37 Range = 17.9 – 50.7
2021	80	Average = 32 Range = 11.9 – 44.2	60	Average = 36 Range = 17.0 – 41.3
2022	80	Average = 24 Range = 11.8 – 32.8	60	Average = 32 Range = 16.3 – 51.7
2023	80	Average = 27 Range = 13.6 – 47.4	60	Average = 23 Range = 14.5 – 27.7
2024	80	Average = 31 Range = 21.0 – 43.2	60	Average = 27 Range = 14.2 – 37.1

Phase II Rule - Asbestos

Regulatory Requirements

The SDWA requires the EPA to determine the level of contaminants in drinking water at which no adverse health effects are likely to occur. These non-enforceable health goals, based solely on possible health risks and exposure over a lifetime with an adequate margin of safety, are MCLGs. The Phase II Rule, the regulation for asbestos, became effective in 1992. The EPA regulates asbestos in drinking water to protect public health as it may cause health problems if present in public or private water supplies in amounts greater than the drinking water standard. Because asbestos fibers are resistant to heat and most chemicals, they have been mined for use in more than 3,000 products, including roofing materials, brake pads, and cement pipe often used in distributing water to communities. The MCL and the MCGL for asbestos is 7 million fibers per liter.

City Status

Approximately 37 percent of the City's distribution system piping (by length) is comprised of AC pipe, which is being systematically replaced along with other aging water mains using a risk-based prioritization through the W-16 Water Main Replacements capital renewal program. As the City still has AC pipe in the distribution system, there is a requirement to monitor for asbestos during each nine-year compliance cycle, with the most recent cycle being January 2020 through December 2028.

Unregulated Contaminant Monitoring Rule

Regulatory Requirements

The 1996 SDWA amendments require that, once every five years, the EPA issue a new list of no more than 30 unregulated contaminants to be monitored. UCMRs 1 through 5 were published on September 17, 1999, January 4, 2007, May 2, 2012, December 20, 2016, and December 27, 2021. The UCMR 5 requires public water systems to monitor for 30 chemical contaminants. This monitoring provides a basis for future regulatory actions to protect public health, and the data collected under it helps improve understanding of the prevalence and amount of 29 PFAS as well as lithium in drinking water systems.

City Status

The Utility completed all required samplings on a quarterly basis (January, April, July, October) throughout 2024. Out of the 29 PFAS compounds tested, there were four minor detections in January. There were no detections in April, July, or October for all 30 compounds. It was determined that the first quarter detections were errors due to sampling environment and conditions. Results are shown in Table 7-4.

Table 7-4: Unregulated Contaminants Sampling Results

	MDL[3]	MRL[4]	MCL[5]	MCLG[6]	Tolt[1]	Cedar[1]
PFBA	0.0750	5	None	None	0.2830[2]	0.3170[2]
PFHpA	0.0520	3	None	None	0.0833[2]	0.0800[2]
PFOS	0.0980	4	4	0	0.1170[2]	0.1200[2]
PFOA	0.0750	4	4	0	0.0833[2]	0.0833[2]

1. January 2024 samples
2. Estimated value – typically occurs when the result is below MRL but above MDL
3. MDL – lowest level the testing method can detect
4. MRL – lowest level the testing method can quantify with high confidence.
5. MCL – the highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology. On April 10, 2024, the EPA established MCL for five PFAS compounds.
6. MCLG – the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

Fluoride

Regulatory Requirements

Fluoridation of drinking water began in the United States in 1945 after extensive studies showed that fluoride helped prevent tooth decay. The EPA regulates fluoride in drinking water to protect public health as it may cause health problems if present in public or private water supplies in amounts greater than the drinking water standard. The MCLG and MCL for fluoride are both 4.0 mg/L. The EPA has also set a secondary standard for fluoride at 2.0 mg/L or 2.0 ppm. Secondary standards are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. In 2011, the Centers for Disease control and the EPA announced a proposed recommended level of fluoride in drinking water of 0.7 ppm. The US Department of Health and Human Services formalized this recommendation in 2015.

City Status

Fluoridation of the Seattle water supply began in 1970 after a referendum vote in 1968 directed the City of Seattle to fluoridate the drinking water. In 2011, in response to the revised EPA guidance, SPU adjusted its fluoride level from 1.0 ppm to 0.8 ppm, closer to the Centers for Disease Control recommendation, but within the range of 0.8 to 1.3 ppm allowed by DOH. SPU reduced the concentration to 0.7 ppm in May of 2016 following the US Department of Health and Human Services recommendation and new state requirements issued by the state.

Cross Connection Control

Regulatory Requirements

The WAC 246-290-490 requires purveyors to develop and implement a written cross-contamination control program to protect the system from contamination via cross connections. The specific purpose of a cross-contamination control program is to protect public health by helping to ensure the quality of water delivered to customers. This is accomplished by protecting the collection, treatment, storage, and distribution facilities under the control of the purveyor from contamination via cross connections.

In addition to the written program plan, the regulations specifically require purveyors to implement their programs. Implementation activities include, but are not limited to:

- Hazard surveys
- Installation of backflow preventers to protect the water system
- Establishing a record-keeping system
- Tracking assembly test reports
- Public education

City Status

The Utility has implemented a cross-connection control program (see Appendix N) with the authority established by City Ordinance No. 24.02.190. The written program conforms to WAC 246-290-490(3) minimum elements of a cross-connection control program. The Senior Engineering Technician for Water Quality is the designated Cross-Connection Control Specialist program administrator and is the citywide lead for this program. This position prepares and administers program guidelines, documents, standard operating procedures and reports to DOH on the annual progress of the cross-connection control program.

Consumer Confidence Reports

Regulatory Requirement

The EPA's 1998 CCR Rule requires community water systems to provide an annual CCR on the source of their drinking water and levels of any contaminants found. The annual report must be supplied to all customers and include:

- The type of water served (such as groundwater, surface water, water from another system) and the name and location of its source.
- Regulated and unregulated contaminants detected in the water, their concentrations, and the allowable federal or state standard.
- DBPs or microbial contaminants, their concentrations and the applicable standard.
- Descriptions of possible health effects of contaminants in drinking water at concentrations greater than the federal or state health standard.
- Identification of the likely source of contamination.
- Violations of any monitoring, reporting, treatment, or record-keeping requirements.
- Opportunities for public involvement and water system contact information.

State and federal drinking water rules require community water systems to produce and distribute an annual CCR to customers by July 1 and provide certification to DOH no later than October 1st. Effective in 2027, community water systems must issue two reports per year, the first by July 1st and the second report by December 31st. Certification of each delivery will need to be provided to DOH within 10 days of each reporting deadline.

City Status

The City is in compliance with the CCR Rule. Annual CCRs have been published and distributed to all customers as required by July 1 and are provided to all customers via direct mail, the City's website, the City's newsletter, and are made available at city owned facilities including City Hall and community centers.

In 2013 the EPA began allowing electronic delivery of CCRs in addition to traditional mail and web postings. An independent research firm was retained to poll City customers as to their preferences for receiving the annual report electronically. Of the 403 residents polled, 63 percent preferred receiving the printed report in the mail as opposed to electronic delivery. Print copies of the report continue to be mailed to customers.

Public Notification Rule

Regulatory Requirement

Public Notification is intended to ensure that consumers will always know if there is a problem with their drinking water. These notices immediately alert consumers if there is a serious problem with their drinking water that may pose a risk to public health. They also notify customers if their water does not meet drinking water standards, the water system fails to test its water, or if the system has been granted a variance (use of less costly technology) or an exemption (more time to comply with a new regulation).

Public notification has always been part of the SDWA and in 2000, the EPA revised the existing Public Notification Rule to better tailor the form, manner, and timing of the notices to the relative risk to human health. The revised rule makes notification easier and more effective for both water systems that must do the notification and to their customers.

The EPA specifies three categories, or tiers, of public notification. Depending on what tier a violation or situation falls into, water systems have different amounts of time to distribute the notice and different ways to deliver the notice.

Table 7-5: Public Notification Tiers

Notice Type	Notice Tier	Notification Time
Immediate Notice	Tier 1	Notification within 24 hours
Notice as Soon as Possible	Tier 2	As soon as possible but within 30 days of violation
Annual Notice	Tier 3	Up to a year to provide notice of violation

City Status

In the event of a drinking water violation, the City will provide public notice, as outlined by the EPA.

7.3 Summary of Monitoring Requirements

Table 7-6 summarizes current monitoring requirements applicable to the City. The EPA and DOH have authority to require additional sampling, such as UCMR 5. The City's Water Quality Monitoring Schedule is included as Appendix Q.

Table 7-6: Summary of Distribution System Monitoring Requirements

Parameter	Regulatory Requirement	Location	Frequency
Lead and Copper	LCR	Customer taps	Every three years
Asbestos	Phase II Rule	One site representative of each source and in areas of the distribution system known to contain asbestos cement water mains	Once every nine years. Next monitoring is required in the nine-year period after 2020.
Total Coliform	TCR	Approved locations throughout the water distribution system as defined by the city's CMP.	180 samples per month.
Chlorine Residual	SWTR	There are 12 approved TCR locations throughout the water distribution system	150 samples per month. Increased May 2012 due to population growth
Disinfection Byproducts (TTHM and HAA5)	Stage 2 DBP Rule	Approved locations throughout the water distribution system	Quarterly

The City uses two State-certified laboratories to perform water quality analysis. Their contact information is listed below:

Seattle Public Utilities – Water Quality Laboratory
800 S. Stacey Street
Seattle, WA 98134
206-684-3000

Am Test Laboratories
13600 NE 126th Place #C
Kirkland, WA 98034
425-885-1664

7.4 Summary of Regulatory Status

Review of water quality data collected between 1999 and 2024 indicates that the City complied with all applicable federal and State drinking water regulations. Table 7-7 summarizes those regulations and the City's compliance status.

Table 7-7: Summary of Applicable Regulations and Compliance Status

Regulation	Requirements	Status	Compliance?
Phase II Rule	Monitor distribution system for asbestos	Meets MCL	Yes
SWTR	Monitor chlorine residuals throughout the distribution system	Meets minimum Cl2 requirement	Yes

Regulation	Requirements	Status	Compliance?
TCR and RTCR	Written Plan and Monitoring	Monitors throughout distribution system as part of SPU regional program Meets MCLs	Yes
Stage 2 DBP Rule	Monitoring	Monitored at representative distribution system locations. Met MCL.	Yes
LCR	Monitoring and Reporting	Monitors as part of SPU regional program. Meets MCLs. Maintains Lead Service Line Inventory for reporting to DOH.	Yes
UCMR 3	Monitoring and Reporting	Monitoring study completed and submitted	Yes
CCR and Public Notification Rules	Annual Reports and Reporting as needed	CCRs published annually	Yes

7.5 Customer Service

Customer-based water quality service requests are recorded in the City's Maximo database. When the cause of the complaint originates in the publicly owned distribution system, the situation is mitigated by the City. If the source of issues is a private property concern, the City provides suggestions to the customer for resolution. When appropriate, water samples are collected and analyzed by a certified laboratory.

Review of customer complaint data indicates that the City has typically received less than 100 water quality complaints per year for the last five years (2021 to 2025), or about 3 per 1,000 customers. The vast majority of these are associated with clarity of the water and are typically caused by construction or main breaks occurring nearby. Taste and odor are typically the second and third most common complaints, and those are mostly caused by stagnant water in the private plumbing systems (home or office buildings, etc). The number of calls per year has reduced and stabilized at an average of about 70.

7.6 New or Anticipated Regulations

New or revised SDWA regulations that are anticipated in the near future that will impact the City are summarized below. It is important that the City continue to track the development of these regulations which affect distribution system monitoring and compliance.

Unregulated Contaminant Monitoring Rule 6

The SDWA requires the EPA to establish criteria for monitoring unregulated contaminants in drinking water. Monitoring varies based on system size, source water, and contaminants likely to be found. Per the SDWA, the EPA is required to issue, every five years, a list of not more than 30 unregulated contaminants to be monitored by public water systems. The most recent rule, UMCR 5, was published on December 27, 2021. The UCMR 6 is scheduled to be published by December 2026.

Contaminant Candidate List 6

The EPA issues the Contaminant Candidate List every 5 years which is a list of contaminants in drinking water that are not currently subject to any national primary drinking water regulations, including proposed regulations. These contaminants occur in public water systems, or are anticipated to, and may require regulation under the SDWA. Nominations for the 6th Contaminant Candidate List were accepted until April 18, 2023and it is anticipated to be published in 2026.

PFAS

The EPA announced the final National Primary Drinking Water Regulation for PFAS on April 10, 2024, which includes regulations for six PFAS. At that time, the EPA established legally enforceable levels for these PFAS in drinking water and gave public water systems until 2029 to comply with the MCLs. To allow drinking water systems additional time to develop plans for addressing PFAS, the EPA plans to develop a proposal to extend the compliance date to 2031. The EPA plans to issue a proposed rule in the Fall of 2025 and finalize this rule in the Spring of 2026.

Strontium

In October 2014 the EPA reported a preliminary determination to regulate strontium in drinking water. Strontium is a naturally occurring element that, at elevated levels, can impact bone strength in people who do not consume enough calcium. Strontium was sampled under UCMR 3 and was detected in all the samples collected in the City's water system, with an average concentration of 24 ug/L. The City is expected to be in compliance with monitoring requirements. The EPA delayed the final regulatory determination on strontium to consider additional data and decide whether there is a meaningful opportunity for health risk reduction by regulating strontium in drinking water.

Perchlorate

The EPA has committed to issue a proposed National Primary Drinking Water Regulation for perchlorate by November 21, 2025, and a final regulation by May 21, 2027, as required by court orders.

Carcinogenic VOCs (cVOCs)

The EPA is considering which contaminant to include in the expanded group of VOCs. Additional monitoring will likely be required by SPU, not the City.

Hexavalent Chromium

Risk assessment is not complete, but the EPA is required to move forward with a rule. Outcome is unknown but could be addressed in an update to the total chromium regulation. The City may be required to participate in this sampling.

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Chapter 8 Asset Management

The Utility's mission is 'Deliver high quality, reliable drinking water, wastewater, storm and surface water, and solid waste services in a manner that is environmentally responsible and cost competitive'. To achieve this mission, the Utility depends on the knowledge, experience, and coordination of its staff to gain the most value from the infrastructure assets it operates and maintains. The City is committed to supporting, adopting, and the continuous improvement of asset management practices in its business processes to attain and maintain asset infrastructure that effectively and efficiently delivers reliable and sustainable services to its customers.

Utility Asset Management's (UAM's) vision is to become a leader in infrastructure management by optimizing performance, risk, and lifecycle costs for the wellbeing of City communities. In order to achieve this vision, an Asset Management Policy[24] was adopted in 2019, which informs the organizational processes linking all stages of the asset lifecycle. It also empowers staff to deliver services using the most effective and efficient means. The asset management policy provides the following UAM Principles.

- Adopt a lifecycle approach to managing infrastructure assets to include planning, acquisition, operation, maintenance, renewal, and disposal.
- Balance cost, risk, and performance of assets.
- Place a high priority on environmental and financial sustainability, while meeting desired levels of service.
- Endorse evidence-based decisions utilizing robust software systems to manage and analyze information.
- Achieve organizational priorities and objectives through continuous improvement.

The UAM has a well-established program that oversees the Asset Management System (AMS). The approach to asset management is modelled after the International Organization for Standardization 55000 suite of standards, as well as incorporates elements outlined in the International Infrastructure Management Manual and International Institute of Asset Management guiding literature.

[24] https://mrsc.org/getmedia/9EC14E10-8B6D-48C7-9722-E8BF749F07DC/b44finpol.pdf

8.1 Strategic Asset Management Plan

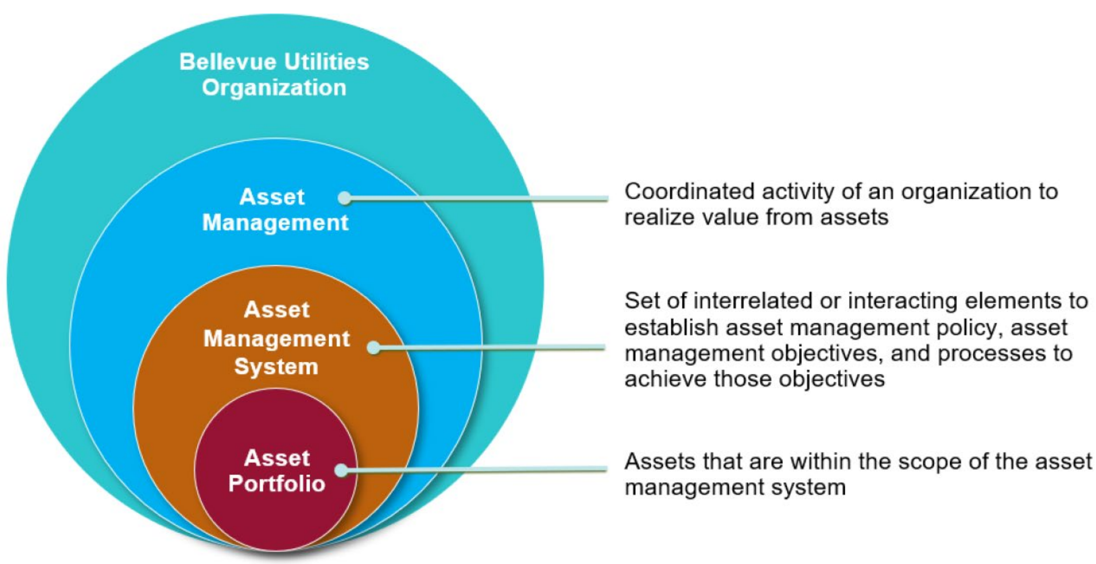
The UAM is guided by a Strategic Asset Management Plan (SAMP), which describes the current methods and future improvements in the AMS. The current SAMP was published in 2021 and is scheduled to be updated in 2026-2027.

The purpose of the SAMP is to establish an asset management framework, which includes the following.

- Asset management vision, policy, and objectives
- Line-of-sight linking each employee's asset management contributions to Utilities' organizational objectives
- Asset management governance, roles and responsibilities, and principles for decision making
- Asset management implementation plan with improvement initiatives
- Expectations for development of Asset Management Plans (AMPs)

The SAMP is the foundation of Utilities' AMS. The AMS is the set of interacting and interrelated elements that guide the development and implementation of asset management activities. The Utility's AMS includes the SAMP, AMPs, Asset Management Policy, the Asset Management Objectives, and the needed leadership, governance, and processes to achieve those objectives and help accomplish the Utility's mission, vision, and organizational goals. The AMS also includes the asset portfolio and how the assets in the portfolio are to be managed throughout their lifecycles as guided by AMPs, which focus on a set of assets having a similar purpose or similar characteristics. Figure 8-1 illustrates how the AMS relates to the Utility's organization, its overarching asset management activities, and its asset portfolio.

Figure 8-1: Bellevue Utilities Asset Management[25]



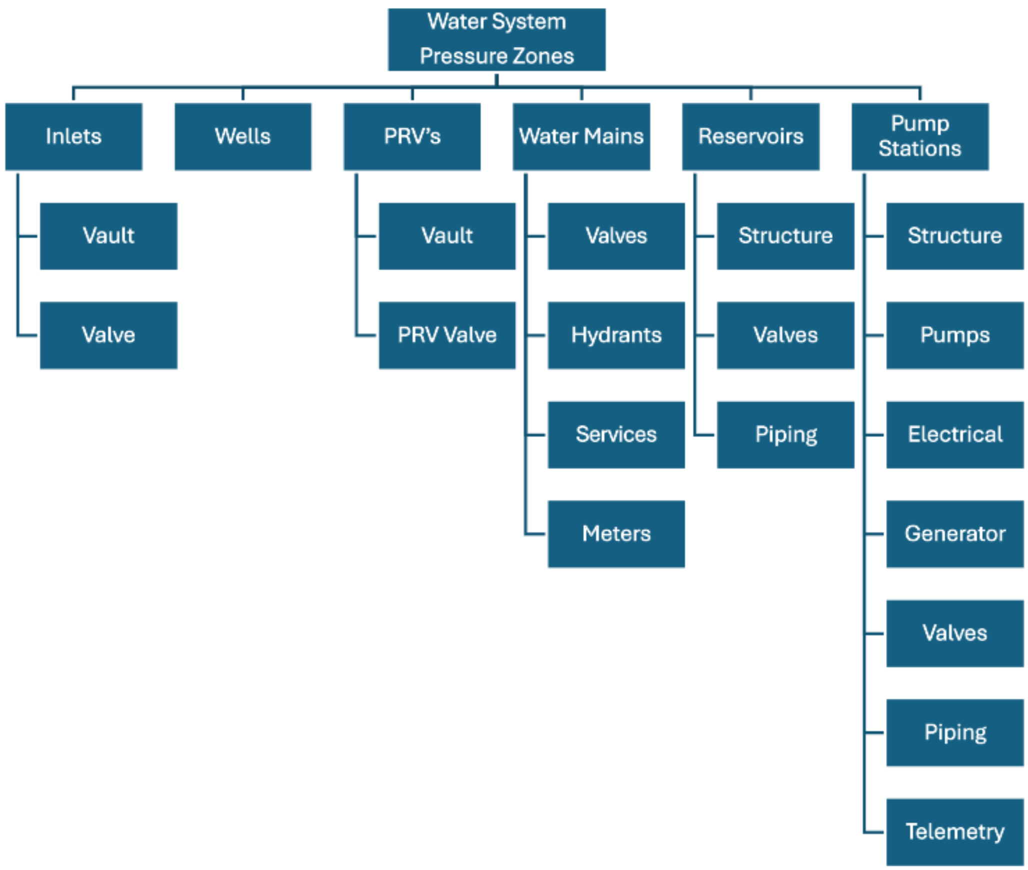
[25] Adapted from 'Asset Management – An Anatomy' – Institute of Asset Management V4, 2024

Additional detail is provided in the SAMP and the remainder of this chapter describes the water system asset portfolio and provides a high-level overview of the Utility's Asset Management Strategies applied to the water system infrastructure.

Asset Portfolio

The City's water utility assets include piping, valves, fire hydrants, inlet stations, pump stations, reservoirs, and associated infrastructure. Figure 8-2 provides a visual representation of the water system asset hierarchy.

Figure 8-2: Water System Asset Hierarchy



The City maintains an inventory of the asset portfolio using the City's GIS database and Computerized Maintenance Management System, Maximo. These systems are integrated to easily share asset information across tools, supporting the overall management of the assets.

The location of facility assets and pressure zones are shown in Chapter 1. The hydraulic profile of the City's water system is presented in Figure 1-7.

Condition Assessment

Condition assessment is used to monitor the performance and health of the water system assets, inform maintenance strategies, and adequately plan for rehabilitation or replacement. The City's O&M staff routinely assesses the condition of major assets, such as pump stations and reservoirs, as described in Chapter 6. More rigorous engineering evaluations are also conducted periodically or when needed.

Condition assessment for buried assets is more challenging and can be cost prohibitive. The Utility opportunistically evaluates exposed underground assets wherever possible, primarily in instances such as failed or replaced assets. The City's biggest challenge in this area is monitoring the deterioration of aging AC water mains and identifying areas of aggressive corrosion on ductile iron pipe due to soil conditions.

The City currently runs a full range of tests on failed AC pipes, when available. Figure 8-3 shows a cement mortar leach test, which uses dye to indicate the presence of calcium, a key component of asbestos cement pipes which can leach out of the pipe material after prolonged exposure to water. An evaluation of soil corrosivity and the impact to metallic pipes in the water system is planned for 2026. The results of this study will be incorporated into the Utility's risk assessment strategy. Figure 8-4 shows an example of accelerated corrosion on a ductile iron pipe showing complete deterioration well before its expected end of useful life.

Figure 8-3: Cement Mortar Leach Test on AC Main

Figure 8-4: Corroded Ductile Iron Water Main

Non-invasive acoustic technology has been used by the City as another non-destructive condition assessment tool. UAM is currently structuring a condition assessment approach for water mains that will focus strategies and balance investments based on cost of inspection, asset consequence of failure, and effective timing of assessment.

Life Cycle Cost Analysis

Economic, social, and environmental costs all affect decisions for management of assets. Asset life cycle costs begin when a need for the asset is identified, and they accumulate throughout the life of the asset, including needs justification, design, construction, operation, maintenance, condition assessment, risk management, renewal, replacement, and disposal. Risk management includes an evaluation of environmental and social costs which generally involve a disruption of service or impact to habitat. All costs must be accounted to determine the real cost of owning and operating assets. When planning capital investment in large assets such as pump stations or reservoirs, the Utility conducts a Business Case Analysis to evaluate alternatives and determine the most prudent and effective course of action. The Business Case Analysis process includes a lifecycle cost analysis for each alternative to inform decision making. The City is developing a process for maintaining an automated evaluation of up-to-date life cycle costs for existing assets.

Levels of Service

Levels of service are statements of desired performance outcomes that reflect high priorities from customers and the community, as well as outcomes important for environmental protection, or as required by regulators. They are important in asset management decision making because they inform targets for maintenance and capital investment strategies.

Performance indicators are used to track and measure delivery on those levels of service. The City, in alignment with industry standards, uses levels of service and corresponding performance indicators to evaluate the quality and continuity of services delivered to its customers. This approach provides the ability to monitor the balance between service expectations and the cost of providing that service. Table 8-1 describes the City's water system levels of service, performance indicators, and targets.

Table 8-1: Water System Levels of Service and Performance Indicators

Mission	Levels of Service Objective	Performance Indicator	Target
Provide a reliable supply of safe, secure, high-quality drinking water that meets all the community's water needs in an environmentally responsible manner.	Maintain an adequate and uninterrupted supply of drinking water.	Unplanned service interruptions per 1000 customer accounts	3/1000
		Number of water main breaks per 100 Miles of pipe annually	8
	Provide water that is safe and healthy to drink.	Percent of days/yr in compliance with state and federal drinking water regulations.	100%

Table 8-2 and Table 8-3 show the City's recent performance against the performance targets associated with the defined levels of service.

The City has maintained 100 percent compliance with drinking water regulations. See Chapter 7 for a full description of drinking water regulations and the City's status.

Table 8-2: Bellevue Service Area Unplanned Water Service Outages per 1,000 Customers

Year	# Unscheduled Water Interruptions per 1000 Customers
2010	2.07
2011	1.68
2012	1.70
2013	1.82
2014	2.78
2015	2.19
2016	1.87
2017	1.97
2018	1.72
2019	2.29
2020	2.07
2021	2.56

Year	# Unscheduled Water Interruptions per 1000 Customers
2022	2.88
2023	2.12
2024	1.60
14 Year Average	2.09

Table 8-3: Water Main Break Occurrences from 2014-2024

Year	Blow Out	Circumferential	Hole	Longitudinal Crack	Saddle Fail	Joint or Collar	Pitting or Corrosion	Valve or Fitting	Total
2014	11	10	1	1	30	4	1		58
2015	8	6		2	16	1	4		37
2016	4	3		1	26	3	2		39
2017	10	11	1		23	2	7		54
2018	5	7	1		16	1	2		32
2019	3	8			13	2	2	1	29
2020	6	7			21	3	2		39
2021	7	6	2		18	2	2	2	39
2022	9	10	2		22	3			46
2023		4	5		4	3	2	5	23
2024		6	5	1	10	3			25
Total	**63**	**78**	**17**	**5**	**199**	**27**	**24**	**8**	**421**

Per the City's 2022 Linear Water Asset Renewal Forecast Update, included as Appendix R, the City reported approximately 40 main breaks per year. "Break rate" measures the annual number of main breaks per 100 miles of pipe operated. The City's current break rate (measured as a 5-year trailing average) is 5.65 annual breaks per 100 miles. Table 2-1 in Appendix S benchmarks the City's historic system performance against the AWWA Utility Benchmarking Survey and the University of Utah Watermain Breaks Rates in the USA and Canada and comes in well under the national average and in line with regional performance.

Business Risk Exposure

The City uses an industry standard risk analysis method called Business Risk Exposure. Risk exposure is influenced by both the likelihood and consequence of asset failure. Threats that may cause asset failure could include natural events (earthquakes, landslides), external impacts (poor pipe bedding, construction disturbance), severity of use (cavitation, hydraulic transients, and surge), asset deterioration due to age, or other factors.

For the purpose of ranking the relative risk of each asset, risk is quantified using the following formula:

(*Likelihood of Failure*) + (*Consequence of Failure*) = Risk

The City has established risk matrices for each of the major asset classes which incorporate asset class specific likelihood and consequence of failure factors. In general, likelihood of failure (LoF) factors are made up of observed conditions (when available), or extrapolated performance of an asset class or cohort using failure history of nearby and/or similar assets. Consequence of failure (CoF) is based on factors that represent the impact of failure. Those impacts can be environmental (e.g., sensitive area damage), social (e.g., park or road closure), or economic (e.g., deep excavation required or extensive restoration).

The application of LoF and CoF to pipelines, PRVs, reservoirs, and pump stations is discussed in Section 8.2.

Maintenance Priorities

Each year, the City develops an Operations and Maintenance Annual Plan. This plan identifies O&M needs and the resources required to meet those needs for the coming year. Current O&M practices are described in Chapter 6.

Capital Improvement Strategy

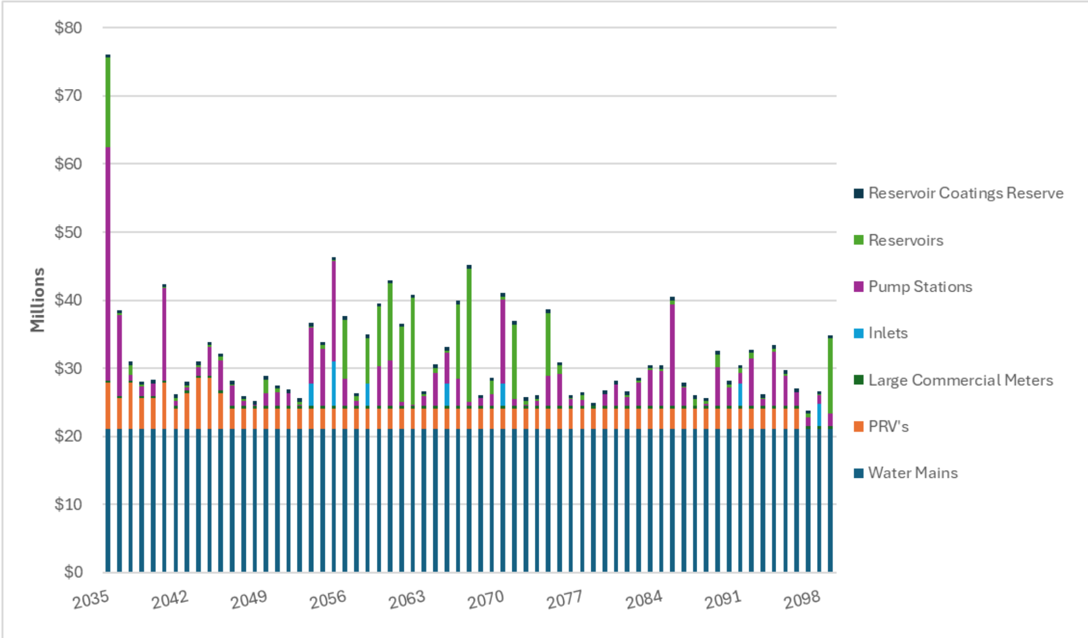
Every two years, the City updates its CIP Plan. The CIP identifies and justifies the planned capital projects and programs over the next rolling six-year period, to accommodate growth, implement City policy, and address R&R of aging infrastructure. Additional information on the CIP is provided in Chapter 9.

Individual AMPs establish R&R targets that form the basis for ongoing CIP programs such as water main replacements. For discrete projects (e.g. reservoir or pump station replacements) they provide condition and risk-based prioritization that informs the capital planning process. The City's Vertical Water Asset Renewal Forecast (Appendix U) included a prioritized renewal and replacement forecast for vertical water facilities.

Long-term Funding Strategy

The City established an R&R account in the 1990s to address anticipated future asset needs. While the CIP funds current investments (6 years), the R&R account is used to supplement rate revenue to meet the forecasted large capital expenditure needs over the next 75 years. The R&R account should therefore provide better rate stability and intergenerational equity over time. See Figure 8-5 below for the 75-year projected R&R expenditures.

Figure 8-5: Projected 75-Year R&R Expenditures



More information is provided in Chapter 2 (Waterworks Utility Financial Policies) and Chapter 10 (Financial Information).

Asset Management Program Continuous Improvement

The UAM strives for continuous improvement. The program uses ongoing analysis and monitoring of both the assets and the AMS to identify opportunities and make related improvements. This process is most effectively described by the 'Plan-Do-Check-Act' cycle, also known as the Deming Cycle or Shewhart Cycle.

- **Plan**: Identify an opportunity and plan for change.
- **Do**: Implement the improvement in a controlled form, or small scale.
- **Check**: Use data to evaluate the results and determine if the impact was successful.
- **Act**: Based on the results, either broaden the application of a successful approach and continue to monitor results, or if the analysis did not show improvement, restart the process.

The 2021 SAMP outlines a roadmap of continuous improvement initiatives for UAM based on identified opportunities. The SAMP is scheduled to be updated in 2026-2027, and this effort will result in an update to the improvement initiatives and roadmap.

8.2 Asset Inventory

This section establishes a date-based inventory of all system-owned water assets and satisfies the requirements of WAC 246-290-100(4)e(iii). The City actively assesses and plans for the maintenance, repair, and replacement of its major assets while preventive maintenance practices keep assets in good condition, thereby extending their useful life.

Water Supply Facilities

The City receives its water supply from regional inlet stations via the Cascade Water Alliance. Table 1-1 inventories the water supply inlet stations that supply the City. A more detailed analysis of inlets, including contract minimum flow/pressure and available hydraulic capacity, can be found in Chapter 4. The City also maintains four emergency wells, which are inventoried in Table 1-8.

Reservoir Inventory and Evaluation

The City maintains and operates 24 reservoirs, including one joint-use reservoir shared with Redmond (NE 40th Reservoir). Table 1-5 inventories the City's reservoirs. The City inspects and cleans its reservoirs on a five-year cycle, evaluates the condition of each reservoir and incorporates the results into the Business Risk Exposure approach to prioritize improvements.

In 1993, the City authorized Kennedy/Jenks Consultants to conduct a Reservoir Seismic Vulnerability Study. The study looked at 21 of the City's (at the time) 26 reservoirs. The study did not include five reservoirs (Horizon View 3a, Cougar Mountain 1, 2, 3, and 3a) since they had been recently constructed and were built to seismic design standards in place at the time. A total of 12 reservoirs were identified as requiring more detailed analysis.

In 1995, KCM, now Tetra Tech, completed detailed structural analysis of the three highest priority reservoirs. In 1999 Montgomery Watson completed a detailed structural analysis of the next seven reservoirs on the priority listing.

Murray, Smith, and Associates, Inc., now Consor, performed a detailed seismic evaluation and condition assessment of eight water storage reservoirs: Clyde Hill 335 – Round, Clyde Hill 335 – Square, Clyde Hill 390, Forest Hills, Horizon View 3, Horizon View 3A, NE 40th, and Newport. This project was carried out in two phases. Phase 1 was completed in 2018 and involved data review and evaluation approach development. Phase 2 was completed in 2020 and involved a seismic evaluation and condition assessment based on the evaluation approach developed in Phase 1. Reservoir condition assessment and seismic assessment risk scores were used to summarize the overall identified risk at each reservoir based on the condition assessment and seismic evaluation results. The reservoirs from this assessment are listed from highest seismic assessment score to lowest:

1. Clyde Hill 335 – Round Reservoir
2. Clyde Hill 335 – Square Reservoir
3. Clydie Hill 390 Reservoir
4. Newport Reservoir
5. Horizon View 3 Reservoir

6. Forest Hills Reservoir
7. Horizon View 3A Reservoir
8. Northeast 40th Reservoir

The City funds rehabilitation or replacement of reservoirs through CIP W-85 Reservoir Rehabilitation or Replacement. Approximately $20 million (2025 dollars) has been budgeted for reservoir structural rehabilitation and replacement during the 2027-2036 CIP planning period (See Chapter 9). Specific project scopes, expenditures and schedules will be developed and adjusted as the results of each reservoir's specific improvement needs are determined.

Pump Station Inventory and Evaluation

The City maintains and operates 21 pump stations and shares several joint-use facilities. Table 1-6 inventories the system's pump stations. Murray, Smith, and Associates, Inc., now Consor, performed an evaluation of all of the City's pump stations (excluding the CCUD 475/580 Pump Station) in 2016 called the Water Pump Station Evaluation. Table 2-1 and Table 2-3 of the Water Pump Station Evaluation describe how the condition and criticality, respectively, of the pump stations were measured. The system pump stations get field evaluated for condition and the results are incorporated into the Business Risk Exposure approach to prioritize improvements.

The Water Pump Station Evaluation also developed a prioritized list of recommended station rehabilitation projects. Pump station prioritization has been adjusted slightly based on new information since that time. Additional information is provided in Section 4.7.

The City has set aside approximately $49 million (2025 dollars) for this work during the 2027-2036 CIP planning period in their program CIP W-91, Water Pump Station Rehabilitation or Replacement (See Chapter 9). Specific project scopes, expenditures and schedules will be developed and adjusted as the results of each pump station's specific improvement needs are determined.

Large Commercial Meters

The City owns and maintains approximately 370 large commercial meters (greater than 3-inch), accounting for nearly 30 percent of the total volume of water sold. A 2003 Water Loss Study identified that older commercial meters 3 inches and larger may significantly under-register flows and become less accurate over time. The study suggested the meters may underread as much as 102 MG annually (retail value ~$400,000, or about 1.7 percent of current typical volumes). The revenue lost by the meter inaccuracies affects both the water and sewer utilities, since sewer rates are based on winter water usage.

The current strategy for rehabilitation and repair is to address large meters through CIP W-98 Replacement of Large Commercial Water Meters. This program was established in 1991 to address increasing maintenance, obsolescence, safety, and reliability concerns at these facilities.

It is recommended that this program continue as a means of maintaining the reliability and accuracy of commercial meters, but that it be evaluated to ensure cost-effectiveness.

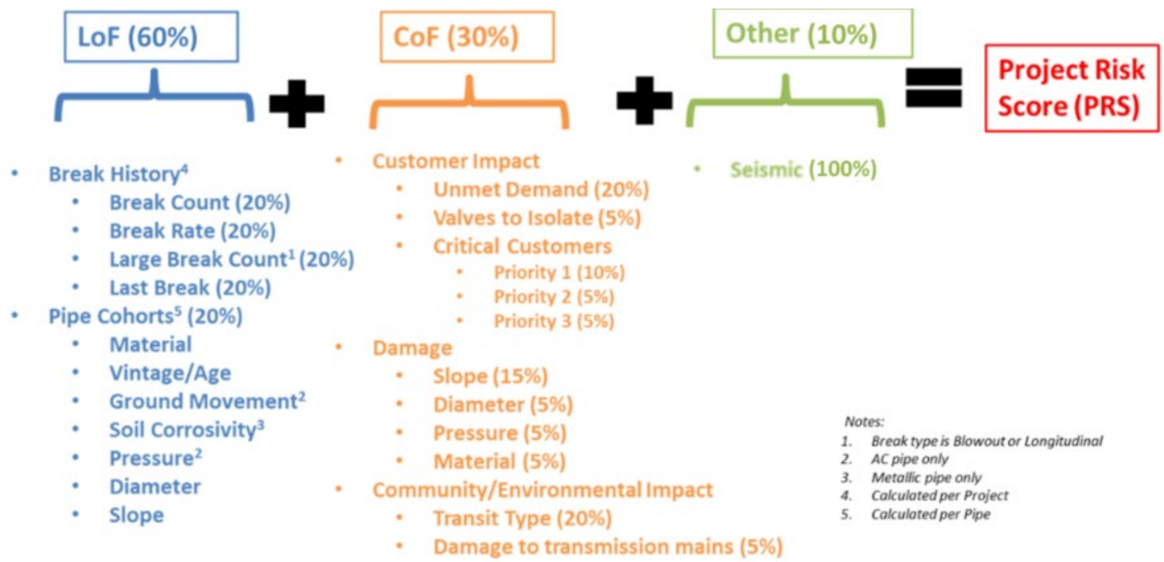
Distribution System Inventory and Evaluation

The City's water distribution system includes approximately 600 miles of piping. Table 1-4 summarizes the water piping inventory by size (diameter). Water main and transmission pipelines vary in diameter from 4 to 24 inches, with a predominance of 6 and 8 inches, and range in age with the oldest piping dating back to 1946. Approximately 56 percent of the distribution system is ductile iron pipe.

The City maintains a comprehensive risk profile of the distribution system which incorporates the LoF and Co) of watermains following the procedure in City's Watermain Asset Management Plan, included as Appendix S. The City performs annual updates to its LoF scoring to incorporate condition-related mainline break data from the previous year. The City's LoF score also considers the effect of pipe characteristics on performance by evaluating material, age, soil corrosivity, diameter, pressure, and proximity to steep slopes. Table 4-4 in Appendix S summarizes pipe condition and inventories length of pipe-by-pipe material and age.

Water main CoF is made up of factors that include customer impact, potential damage, and community or environmental impact. The City combines LoF and CoF to calculate risk. The risk score quantifies relative risk on a scale of 0 (lowest risk) to 100 (highest risk). Figure 8-6 details the factors considered in City's risk calculation method. Figure 5-2 in Appendix S summarizes this risk score for the City's water main assets. The average useful life of the City's critical mains is 88.6 years based on their material composition and average material-based useful life estimates published in the AWWA report "Buried No Longer: Confronting America's Water Infrastructure Challenge." As of 2025, the average age of the City's critical mains is 44.7 years, per the City's Water Main Condition Assessment Program Technical Memorandum, included as Appendix T.

Figure 8-6 : Risk Calculation Method



Service Saddles

Each individual service line is connected to a water main by a service saddle or direct tap. Service saddles can have variable service life due to varying soil conditions and pipe materials. The average expected life is 40-50 years with newer stainless steel saddles expected to last at least 85 years.

Saddle and service line failures often require emergency response, result in customer water service disruption until the line is repaired, and can damage roadways and private property. CIP program W-99 was established to address the increasing need for replacement of aging and deteriorating service saddles and associated service lines.

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Chapter 9 Capital Investment Program

9.1 System Design Standards

The City's Water Engineering Standards are updated annually and can be publicly accessed at the Utility's website. These standards include the following information.

- Project review procedures
- Policies and requirements for contracting, drawings & specifications, construction materials & methods, and some planning criteria
- Construction certification requirements

Current Water Engineering Standards are attached as Volume 4.

9.2 2027-2034 Capital Investment Program

The Utility maintains a 10-year CIP. Funding for the first 6 years of the CIP is approved by City Council every two years as part of the city's budget cycle. Table 9-1 shows the City's drinking water CIP programs. Some programs are for work that occurs annually, like water main replacement projects (W-16). Other programs are specific to localized improvements, such as increasing drinking water storage for the WOA (W-103). Tracking work by program simplifies fund management when projects span multiple budget cycles or require multiple phases of development. Appendix V lists programs and projects completed during the last water system plan period and projects in the current 10-year plan.

Table 9-1: 10-Year (2027-2034) CIP Plan

CIP No.	Program Name	2027-2036 Proposed Budget
W-16	Water Main Replacement	$245,934,000
W-67	Pressure Reducing Valve (PRV) Station Rehabilitation	$8,716,000
W-69	Minor (Small) Water Capital Improvement Projects	$1,199,000
W-85	Reservoir Rehabilitation or Replacement	$19,733,000
W-91	Water Pump Station Rehabilitation or Replacement	$48,834,000
W-98	Replacement of Large Commercial Meter Vaults	$5,559,000
W-99	Water Service Line and Saddle Replacement Program	$5,287,000
W-103	Increase Drinking Water Storage for WOA	$60,849,000
W-105	NE Spring Blvd Water Facilities	-
W-108	Advanced Metering Infrastructure	$2,106,000
W-110	Water Supply Inlet Rehabilitation	$13,121,000

CIP No.	Program Name	2027-2036 Proposed Budget
W-111	Maintenance and Operations Facility - Water	$14,231,000
W-112	Water System Capital Planning	$147,000
W-115	SCADA Upgrade - Water	$610,000
W-118	Water Pressure and Capacity Improvements	$6,672,000
W-119	Groundwater Well Improvements	$16,879,000
TOTAL		$449,877,000

W-16 Water Main Replacement

This program focuses on replacing water mains that have reached the end of their useful life, with the goal of reducing risk and maintaining customers desired levels of service within the distribution system. Additional benefits include increasing the firefighting flow available to neighborhoods, improving reliability with additional valves (to limit service shutdowns), and improving earthquake resiliency with more robust pipe. Chapter 4 and Chapter 8 provide additional information.

W-67 Pressure Reducing Valve (PRV) Station Rehabilitation

PRV Vault Replacement

This ongoing program rehabilitates or replaces aging, obsolete PRV stations throughout the water service area. The number of PRV stations that are rehabilitated varies from year to year based on the annual program budget and the rehabilitation costs, but over the long term should average about six PRV stations per year to sustainably rehabilitate over 150 stations on a roughly 25-year cycle. This average replacement rate is expected to reduce to about four per year in the future, as the City replaces older stations with newer facilities and advanced designs that include drains and epoxy coated valves. These new design elements, incorporated in the early 2000s, allow PRVs to last an estimated 35 years before rehabilitation is required. Prioritization criteria include access requirements, safety, maintenance history, age, and efficiencies gained with overlapping or adjacent projects.

W-69 Minor (Small) Water Capital Improvement Projects

This ongoing program pays for small improvements to the City’s water system to resolve deficiencies, improve efficiencies, or resolve maintenance problems, often in conjunction with other programs such as the Transportation overlay program. Projects are prioritized based on criteria including public safety/property damage, maintenance frequency, operator safety, environmental risk, reliability and efficiency gains, coordination with other city projects or development activity, and level of service impact.

W-85 Reservoir Rehabilitation and Replacement

This ongoing program funds recoating, rehabilitation, seismic retrofits and/or replacement of drinking water reservoirs to maintain these facilities for reliable operation. Additional information is provided in Chapter 4 and Chapter 8.

W-91 Water Pump Station Rehabilitation or Replacement

This ongoing program was established in 2005 to rehabilitate or replace drinking water pump stations based on prioritized needs. Based on a needs assessment of each pump station, improvements can range from basic refurbishment to complete reconstruction. The rehabilitation work may include capacity, safety and reliability improvements, new mechanical and electrical equipment, on-site emergency power generation, and seismic retrofits.

Newport Pump Station Rehabilitation

Chapter 4 and Chapter 8 provide additional information.

W-98 Replacement of Large Commercial Water Meters

This ongoing program systematically replaces aging, obsolete vaults housing high-volume commercial water meters (3-inch and larger). Due to their location and condition, these meters pose safety and access concerns and are generally beyond the ability of O&M crews to replace. Improved performance accuracy is a secondary benefit of the program. More information is included Chapter 8.

W-99 Water Service Line and Saddle Replacement Program

This ongoing program replaces aging and deteriorating customer service lines (the pipes between the water mains and customer meters), and service saddles (the component connecting the customer service lines to the water mains). The city is responsible for maintaining approximately 40,000 water services and saddles. Aging water services are typically replaced with water main replacement projects or repaired by O&M staff. However, capital projects are developed for areas with high rates of failure and where additional failures can cause extensive restoration work.

New Service Line and Saddle

W-103 Increase Drinking Water Storage Availability for West Operating Area

This program increases drinking water storage and system capacity within the WOA and includes efforts like siting studies, hydraulic analysis, design and construction of facilities. The WOA has seven neighborhood areas including Downtown, Bel-Red, Wilburton, and serviced communities along Lake Washington. Over 70 percent of the planned population growth through 2044 is anticipated to occur in the WOA.

The Meydenbauer South Reservoir is a current project to design and construct a new 6 MG reservoir and associated infrastructure. This project will provide additional water storage required to serve long-term growth projected in the WOA. The schedule to complete the new reservoir has been shifted from 2034 to 2030, due to recent growth and planned rezoning that will further increase density in the downtown corridor.

This project was recommended in previous WSPs. The project need has been re-affirmed (see Chapter 4) based on updated analysis, accounting for appropriate storage sizing criteria, revised growth projections and changing water consumption.

W-105 Water Facilities for NE Spring Blvd Multi-Modal Corridor

This program provides funds for the design and construction of new water facilities concurrent with the design and construction of the Spring Boulevard Multi Modal corridor. The corridor will consist of a new street, bikeways, pathways, and the new East Link light rail. This project will eventually design and construct approximately 2 miles of 12 and 16-inch water main. Although no expenditures are proposed in the 2025-2030 CIP, it remains an available program for additional work as the development progresses in the future.

W-110 Water Supply Inlet Rehabilitation

This ongoing program is for the renewal and replacement of water supply Inlet stations, where the City draws water from the regional water transmission system. The City manages 14 inlet stations, and shares ownership in three other inlet stations operated by adjacent utilities. Projects are proposed to maintain reliability, improve safety, reduce risk, and renew aging infrastructure. Notable projects currently in the W-110 program are the NE 40th Inlet Meter Abandonment, the Factoria Inlet Replacement (Inlet 11), the Eastgate Inlet Rehabilitation and the Inlet Station Condition Assessment.

W-111 Maintenance and Operations Facility

As the City continues to grow, there is a critical need for long-term operational facilities planning to ensure that the Utility can meet the community's current and future needs in an efficient and timely manner. The current service locations are functioning at or near capacity, and there is a significant risk that they will not be sufficient to meet the Utility's growing operational needs. To address this, the Utility developed a long-range O&M Facilities Plan.

Based on the recommendation of the O&M Facilities Plan, funding has been budgeted for property acquisition, design, and construction with funding split between the water and sewer funds.

W-112 Water System Capital Planning

This program funds early capital project planning, which is applicable to both existing CIP programs and future capital projects yet to be identified. The budget includes a new WSP, which is required every ten years by the DOH and BCC. The budget also includes funding to support work activities seeking grants from FEMA for seismic mitigation projects.

W-115 SCADA Upgrade

A SCADA system is utilized to control and monitor the potable water, wastewater and storm water systems. Since the initial installation in the 1970s, this system has utilized leased copper telephone lines as the communications media. With age, the copper phone lines used for communicating vital control logic and retrieving precious data have become increasingly unreliable. Communication outages are increasing as the telecommunication providers transition their core business away from copper telephone lines towards fiber-optic cable and cellular networks. Any break in communications within the SCADA network increases the risk and cost of providing essential Utility services to customers. It is necessary to modernize the SCADA communications network to a more reliable medium.

The projects under the SCADA Infrastructure Upgrades program will improve the reliability and security of the SCADA system across 32 potable water sites, 48 wastewater sites and 11 storm water sites. These projects will install a private, secure cellular and fiber-optic communications network and optimize the operation of the City's three utilities. Additionally, these upgrades will allow SCADA operators to leverage cutting-edge technology to improve the quality of service and reduce risks to the environment.

W-118 Water Pressure and Capacity Improvements

This ongoing program addresses level of service deficiencies identified in the WSP. Level of service deficiencies may include fire flow and service pressure deficiencies. The current funding includes a project within the Somerset Highlands area of the SS1000 Zone, where a subset of the SS1000 zone will be converted to a new SS1025 Zone via a new PRV and transmission main connection to the HV1175 Zone. Additional projects may be added as needs are identified and prioritized based on available funding and other needs.

W-119 Groundwater Well Improvements

The Utility maintains four groundwater wells for municipal water purposes, including non-potable or potable uses, and emergency water supplies. These wells were the sole supply of water to the Lake Hills and Crossroads neighborhoods in the 1950s and 1960s, before purchasing water from

Seattle. This program is proposed to fund projects that maintain readiness, protect water quality, and optimize use of groundwater. Well assessment and rehabilitation work will restore and maintain well condition and yield. Improvements at the Crossroads site will increase access to groundwater for irrigation and tanker truck filling, improve well head protection measures, and improve response time and capacity to augment normal supplies in an emergency. An emergency well siting study will evaluate options to install additional, emergency-only wells throughout the service area, as recommended by the City's Emergency Water Supply Master Plan.

9.3 New Recommendations

For most of the recommended projects and improvements listed in Section 4.13, costs are already accounted for in the CIP programs listed in Section 9.2. For example, the inlet station rehabilitations to be performed under W-110, the Water Supply Inlet Rehabilitation Program. Table 9-2 summarizes new programs recommended in Chapter 4. The source and amount of funding will be determined during each bi-annual budget update.

Table 9-2: Proposed New Capital Projects and Programs

WSP Section	Description	Estimated Budget	Applicable Policy
4.8	Check valve standardization and replacement program	TBD	Service Reliability; Efficient Water Use; Fire System Responsibility; Emergency Preparedness
4.7	Construct additional storage in Bellevue storage region	TBD	Service Reliability; Service Pressure and Flow; Drinking Water Storage for Emergency Supply Outages
4.5	Continue to work with the City of Issaquah to separate the Bellevue and Issaquah water systems in the South Cove Assumption Area	TBD	Service Ownership/ Responsibility; Water Sales Outside Bellevue's Service Area
4.11	Establish a program to proactively acquire property to meet the long-term needs of the Utility	TBD	Service Ownership/ Responsibility
TOTAL		$	

Separate from improvement projects, multiple engineering evaluations are recommended in Chapter 4, Chapter 6, and Chapter 8, as shown in Table 9-3. Based on the results of these evaluations, additional capital projects or programs may be recommended in future CIP updates, however those cannot be identified at this time.

Table 9-3: Proposed Engineering Evaluations

WSP Section	Description	Estimated Budget[26, 27]	Applicable Policy
4.5	Complete a new model calibration	$500,000	Regional Policy Development; Fire Flow Improvement Program, Service Pressure and Flow, Service Reliability
4.5	Conduct a modeling analysis of transmission velocity and distribution system pipe capacities for fire flow in recently re-zoned areas	$300,000	Fire Flow Improvement Program, Service Reliability
4.5	Additional evaluation of new Crossroads Pressure Zone	$400,000	Fire Flow Improvement Program, Service Pressure and Flow, Service Reliability
4.7	Evaluate an appropriate site for new Bellevue Region Storage	TBD	Service Reliability; Service Pressure and Flow; Drinking Water Storage for Emergency Supply Outages
4.9	Create new source reliability program which includes electrical supply reliability and seismic resiliency	TBD	Emergency Preparedness; Service Reliability
4.11	Develop and maintain updated property management plan.	TBD	Service Ownership/ Responsibility; Facility Abandonment; Facility Repurposing
4.7	Work with CCUD to secure additional storage for the Newport Hills Storage Region	TBD	Service Reliability; Drinking Water Storage for Emergency Supply Outages
TOTAL		$1,200,000	

9.4 20-Year Recommendations

The funded CIP projects W-85, W-91, and W-103, along with additional recommendations described above, satisfy the needs of projected growth through the 20-year planning period, as discussed in Chapter 4. Aside from these recommendations, only ongoing R&R programs can be recommended at this time for the 10-year (2027 to 2036) and 20-year period (2027 to 2046).

The R&R revenues are in place and built into the current rate structure per the Financial Policies (Chapter 2) and as described in Chapter 10. R&R expenditures have been projected for 75 years, as described in Chapter 8. Funding projections should be continually updated every 2 years as part of the City's biannual budgeting process.

[26] Estimated budget is estimated planning-level cost in 2025 dollars, for general information only. Estimated budget includes both consulting fees and City staff labor.

[27] Estimated costs are for engineering evaluation only. Recommendations and costs to implement capital improvements are unknown at this time and will be developed during the evaluation. If appropriate, budget for capital improvements will be proposed as part of future CIP update(s).

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Chapter 10 Financial Information

This chapter summarizes the current and forecasted financial strength of the City's Water Utility and its funding strategy for recommended investments through the 20-year planning period.

Additional information, including an evaluation of water rate affordability, is available in the Utility's annual Utilities Business Profile, which is publicly available at the Utility's website (https://bellevuewa.gov/city-government/departments/utilities). The Financial section (pages 15-19) of the 2025 Utilities Business Profile is also attached at the end of this chapter for reference.

10.1 Current Financial Status

Table 10-1 summarizes actual cash-basis revenues, expenses, and fund balances for the Utility for the most recent 8-year period. Over this period, the Utility fund balance, which represents total unexpended resources carried forward to future years, decreased from $19.7 million at the beginning of 2017 to a current balance of $18.7 million at the end of 2024. This is consistent with established reserve polices in place since 1992. Fund balances will fluctuate from year to year based on revenue and expense trends, but are always maintained above targeted reserve levels to ensure adequate funds are available to meet required needs.

During 2017 through 2024, a total of $139.3 million was transferred to the Utility Capital Improvement Fund to finance budgeted capital project expenses. These transfers represent approximately 24 percent of total water utility expenses for the 8-year period.

TABLE 10-1

City of Bellevue
Water Utility Fund
Actual Revenues, Expenses & Fund Balances by Year
2017 Through 2024

	Thousands of Dollars							
	2024 Actuals	2023 Actuals	2022 Actuals	2021 Actuals	2020 Actuals	2019 Actuals	2018 Actuals	2017 Actuals
BEGINNING FUND BALANCE	$ 21,564	$ 22,056	$ 18,756	$ 18,704	$ 26,579	$ 22,087	$ 22,369	$ 19,686
ANNUAL REVENUES:								
Water Service	$ 67,601	$ 70,520	$ 65,163	$ 64,411	$ 58,635	$ 56,631	$ 57,041	$ 54,193
Interest on Investments	885	692	205	39	114	490	377	180
Connection Fees	1,740	1,541	2,855	4,840	2,518	2,689	2,660	2,801
Other Revenues	10,636	6,069	5,970	6,037	5,383	5,760	6,178	7,357
Sub-Total	$ 80,861	$ 78,822	$ 74,193	$ 75,327	$ 66,650	$ 65,570	$ 66,256	$ 64,532
ANNUAL EXPENDITURES:								
Wholesale Water Purchases	$ 23,640	$ 23,103	$ 22,359	$ 22,003	$ 21,374	$ 20,645	$ 19,835	$ 19,392
Personnel Expense	9,059	8,605	8,453	8,093	7,481	7,812	8,074	8,110
Other Maintenance & Operating Expense	27,420	26,036	22,032	29,158	22,445	17,268	25,796	22,894
Capital Outlay	354	554	50	390	285	184	340	187
Transfers to Capital Project Fund	22,850	21,001	18,000	15,630	22,940	15,168	12,492	11,265
Debt Service Expense	425	15	-	-	-	-	-	-
Sub-Total	$ 83,748	$ 79,314	$ 70,893	$ 75,275	$ 74,525	$ 61,078	$ 66,538	$ 61,849
ENDING FUND BALANCE	$ 18,677	$ 21,564	$ 22,056	$ 18,756	$ 18,704	$ 26,579	$ 22,087	$ 22,369

10.2 Financial Outlook

Table 10-2 presents a projection of annual utility revenues, expenses, and fund balances for the next 10 years, based on the 2025-2026 adopted budget amounts and changes expected to occur in various categories over the subsequent 10-year period as a result of new customers, general inflation, and other related factors. This type of forecast is routinely used by utility staff to develop rate adjustment proposals and to assess the impact of changing budget assumptions on future rate requirements.

Some key assumptions used to forecast future annual revenues and expenses that appear in Table 10-2 are outlined below.

1. Growth in total water utility customers offset by reduced water consumption levels will result in net 0.5 percent growth from 2025 through 2035, based on historical and projected averages.
2. Interest and other revenue sources will grow by an average of 5.7 percent per year, based on historical trends and projected fund balances.
3. Wholesale water costs for 2025 through 2035 are expected to increase approximately 6.9 percent per year. Consistent with Utility financial policies (see Chapter 2), these increases will be "passed through" to the customer via Utility rate increases.
4. Personnel costs will increase an average of 5.3 percent per year, based on historical trends and projected increases in benefit costs.
5. Other maintenance and operations and capital outlay expenses will increase an average of 4.7 percent per year, based on historical trends and projected increases in the Seattle Consumer Price Index.
6. Water rate increases are projected each year from 2025-2035 to cover the impact of anticipated wholesale water rate increases and the cost of local program operations.

TABLE 10-2

City of Bellevue
Water Utility Fund
Forecasted Revenues, Expenses & Fund Balances by Year
2025 Through 2035

	Thousands of Dollars										
	2025 Adopted Budget	2026 Adopted Budget	2027 Forecast	2028 Forecast	2029 Forecast	2030 Forecast	2031 Forecast	2032 Forecast	2033 Forecast	2034 Forecast	2035 Forecast
BEGINNING FUND BALANCE	$ 12,925	$ 12,350	$ 12,492	$ 13,178	$ 14,171	$ 15,230	$ 15,916	$ 17,770	$ 19,536	$ 19,792	$ 21,583
ANNUAL REVENUES:											
Water Service	$ 77,005	$ 80,864	$ 85,678	$ 90,778	$ 96,909	$103,259	$110,336	$117,677	$126,566	$136,000	$140,320
Interest/Other Revenues	7,029	7,277	7,601	7,957	8,358	8,784	9,259	9,740	10,309	10,912	11,458
Sub-Total	$ 84,034	$ 88,141	$ 93,279	$ 98,735	$105,267	$112,044	$119,595	$127,417	$136,875	$146,912	$151,778
ANNUAL EXPENDITURES:											
Wholesale Water Purchases	$ 23,502	$ 24,057	$ 25,067	$ 26,120	$ 27,491	$ 28,934	$ 30,757	$ 32,695	$ 35,441	$ 38,418	$ 41,242
Personnel Expense	10,392	10,627	10,940	11,611	12,314	13,052	13,826	14,637	15,268	15,930	16,436
Other Maintenance & Operating Expense	22,815	23,808	24,192	25,281	26,566	27,856	29,157	30,635	32,413	34,289	35,351
Capital Outlay	960	279	682	322	504	1,009	51	-	1,759	349	813
Transfers to Capital Project Fund	26,938	29,228	31,712	34,408	37,332	40,506	43,949	47,684	51,737	56,135	57,370
Debt Service Expense	-	-	-	-	-	-	-	-	-	-	-
Sub-Total	$ 84,608	$ 87,999	$ 92,593	$ 97,741	$104,208	$111,358	$117,741	$125,651	$136,619	$145,121	$151,213
ENDING FUND BALANCE (1)	$ 12,350	$ 12,492	$ 13,178	$ 14,171	$ 15,230	$ 15,916	$ 17,770	$ 19,536	$ 19,792	$ 21,583	$ 22,148

(1) Ending Fund Balance and Beginning Fund Balance for the following year may differ slightly due to rounding.

10.3 Funding for Capital Investment

Transfers to the capital improvement fund included in Table 10-2 represent anticipated funding needs for projects in the current (2025-2034) CIP. These will be updated to reflect the recommendations cited in this plan for future budget and rate projections (see Chapter 8).

Potential means of funding these recommendations include re-allocating funds from other lower-priority projects identified in the CIP, obtaining low-interest public works trust fund loans for projects satisfying necessary eligibility requirements, adopting additional water service rate increases to provide additional resources for capital project support, or using funds from the R&R account for eligible projects.

10.4 Funding for Renewal and Replacement

Financial policies adopted in 1995 and revised in 1998 established an R&R account to assist with the funding of these projects over a long term replacement period (75 years with policy recommendations on a 20-year horizon). In the early years, significant balances will be accumulated which will be used to fund capital investments during periods of high expenditures. The revised financial policy relies on this R&R account, in conjunction with rates, to fund capital replacement and does not plan to use debt except to provide rate stability in the event of significantly changed circumstances, such as disasters or external mandates.

All connection charge revenues, and other one-time sources of funds, including ending fund balances higher than budgeted, will be deposited to the R&R account. Figure 10-1 shows the generalized flow of the Utility's revenues and expenses, including R&R. Table 10-3 shows the projected balances in the account from 2025-2035.

Additional information on R&R is provided in Chapter 8.

Figure 10-1: Revenue and Expense Flow Chart

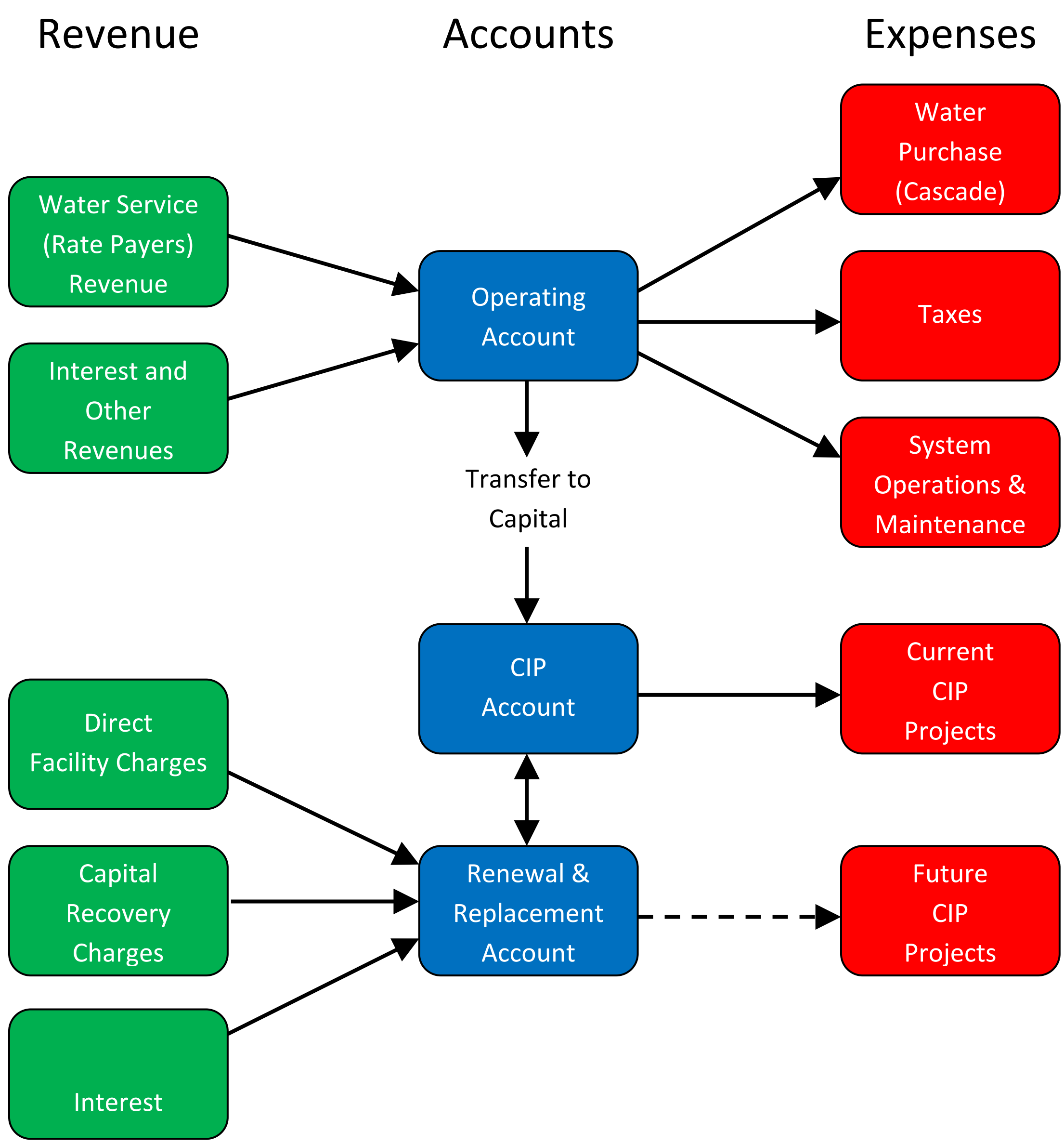


TABLE 10-3

City of Bellevue
Water Utility Renewal and Replacement Account
Forecasted Revenues, Expenses & Fund Balances by Year
2025 Through 2035

	Thousands of Dollars										
	2025 Adopted Budget	2026 Adopted Budget (1)	2027 Forecast	2028 Forecast	2029 Forecast	2030 Forecast	2031 Forecast	2032 Forecast	2033 Forecast	2034 Forecast	2035 Forecast
BEGINNING FUND BALANCE	$ 67,108	$ 83,801	$ 89,875	$ 87,199	$ 86,886	$ 90,094	$ 100,198	$ 114,738	$ 127,357	$ 148,115	$ 175,181
ANNUAL REVENUES:											
Direct Facility Charges	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500
Capital Recovery Charges	1,252	1,202	1,148	1,089	1,027	963	897	831	768	708	651
Contribution from Rates/Other Sources	26,938	30,279	31,712	35,535	37,332	41,774	43,949	49,107	51,737	57,695	57,370
Interest on Investments	1,007	1,257	1,348	1,308	1,303	1,351	1,503	1,721	1,910	2,222	2,628
Sub-Total	$ 29,696	$ 33,238	$ 34,708	$ 38,432	$ 40,163	$ 44,589	$ 46,849	$ 52,160	$ 54,916	$ 61,125	$ 61,148
ANNUAL EXPENDITURES:											
Renewal & Replacement Projects	$ 11,920	$ 25,361	$ 31,396	$ 25,885	$ 25,716	$ 27,682	$ 31,003	$ 39,541	$ 34,158	$ 34,058	$ 52,627
Other	1,083	1,803	5,988	12,860	11,240	6,802	1,306				2,041
Sub-Total	$ 13,003	$ 27,164	$ 37,384	$ 38,745	$ 36,956	$ 34,484	$ 32,309	$ 39,541	$ 34,158	$ 34,058	$ 54,668
ENDING FUND BALANCE (1)	$ 83,801	$ 89,875	$ 87,199	$ 86,886	$ 90,094	$ 100,198	$ 114,738	$ 127,357	$ 148,115	$ 175,181	$ 181,662

(1) Ending Fund Balance and Beginning Fund Balance for the following year may differ slightly due to rounding.

10.5 Debt Status and Credit Worthiness

As listed below, the Utility's Public Works Trust Fund Loan reached maturity in 2014. There is no current debt, nor any projected debt for the remaining years in the forecast period.

Table 10-4: Water Utility Debt Outstanding as of December 31, 2025

Bond Series	Issue Date	Original Issue Amount	Bonds Outstanding 12-31-13	Final Maturity Date
11994 Public Works Trust Fund Loan	1994	559,800	0	July 1, 2014

While they operate independently, the City's water, sewer, and storm and surface water utilities officially merged in 1980 into one combined "Waterworks Utility" for financial reporting purposes. This action has allowed the individual utilities to issue bonds at more favorable interest rates by presenting their combined financial resources and revenue generating capability as related debt security.

Bonds issued by the "Waterworks Utility" have earned very positive evaluation of credit worthiness by bond rating agencies, based on factors that include the financial position, reserve levels, and ratio of net annual operating revenues to annual debt service payments (that is, debt service coverage) for the three utilities as a whole. The Water Utility has no immediate plans to issue additional debt. However, if this action becomes necessary, the Utility can expect a proposed bond issue to receive a favorable credit rating and, therefore, to sell at lower interest rates than would otherwise be possible.

A comparative balance sheet and operating statement for the Waterworks Utility for the 8-year period from 2017 through 2024 are provided in Table 10-5 and Table 10-6 on the following pages.

TABLE 10-4

City of Bellevue
Waterworks Utility
Comparative Balance Sheet

	Thousands of Dollars							
	2024 Actuals	2023 Actuals	2022 Actuals	2021 Actuals	2020 Actuals	2019 Actuals	2018 Actuals	2017 Actuals
Assets:								
Current Assets	$ 502,240	$ 457,070	$ 417,875	$ 384,142	$ 357,612	$ 333,196	$ 291,062	$ 263,043
Noncurrent Assets	542,618	512,422	487,670	470,380	425,860	398,009	367,449	346,434
Deferred Outflows	4,974	3,581	4,030	1,136	1,253	1,050	1,008	1,396
Total Assets	$ 1,049,832	$ 973,073	$ 909,575	$ 855,658	$ 784,725	$ 732,255	$ 659,519	$ 610,873
Liabilities:								
Current Liabilities	$ 12,140	$ 11,641	$ 8,939	$ 8,263	$ 6,812	$ 7,109	$ 4,464	$ 6,601
Noncurrent Liabilities	1,882	910	917	967	2,594	2,100	4,795	8,629
Deferred Inflows	1,453	2,449	4,202	11,660	1,499	2,892	2,677	1,788
Total Liabilities & Deferred Inflows	$ 15,475	$ 15,000	$ 14,058	$ 20,890	$ 10,905	$ 12,101	$ 11,936	$ 17,018
Net Position:								
Net Investment in Capital Assets	$ 530,835	$ 502,686	$ 477,928	$ 452,900	$ 422,301	$ 393,971	$ 365,386	$ 344,329
Restricted	3,795	6,036	4,377	2,520	520	578	378	439
Unrestricted	499,727	449,351	413,212	379,348	350,999	325,605	281,819	249,087
Total Net Position	$ 1,034,357	$ 958,073	$ 895,517	$ 834,768	$ 773,820	$ 720,154	$ 647,583	$ 593,855
Total Liabilities & Net Position	$ 1,049,832	$ 973,073	$ 909,575	$ 855,658	$ 784,725	$ 732,255	$ 659,519	$ 610,873

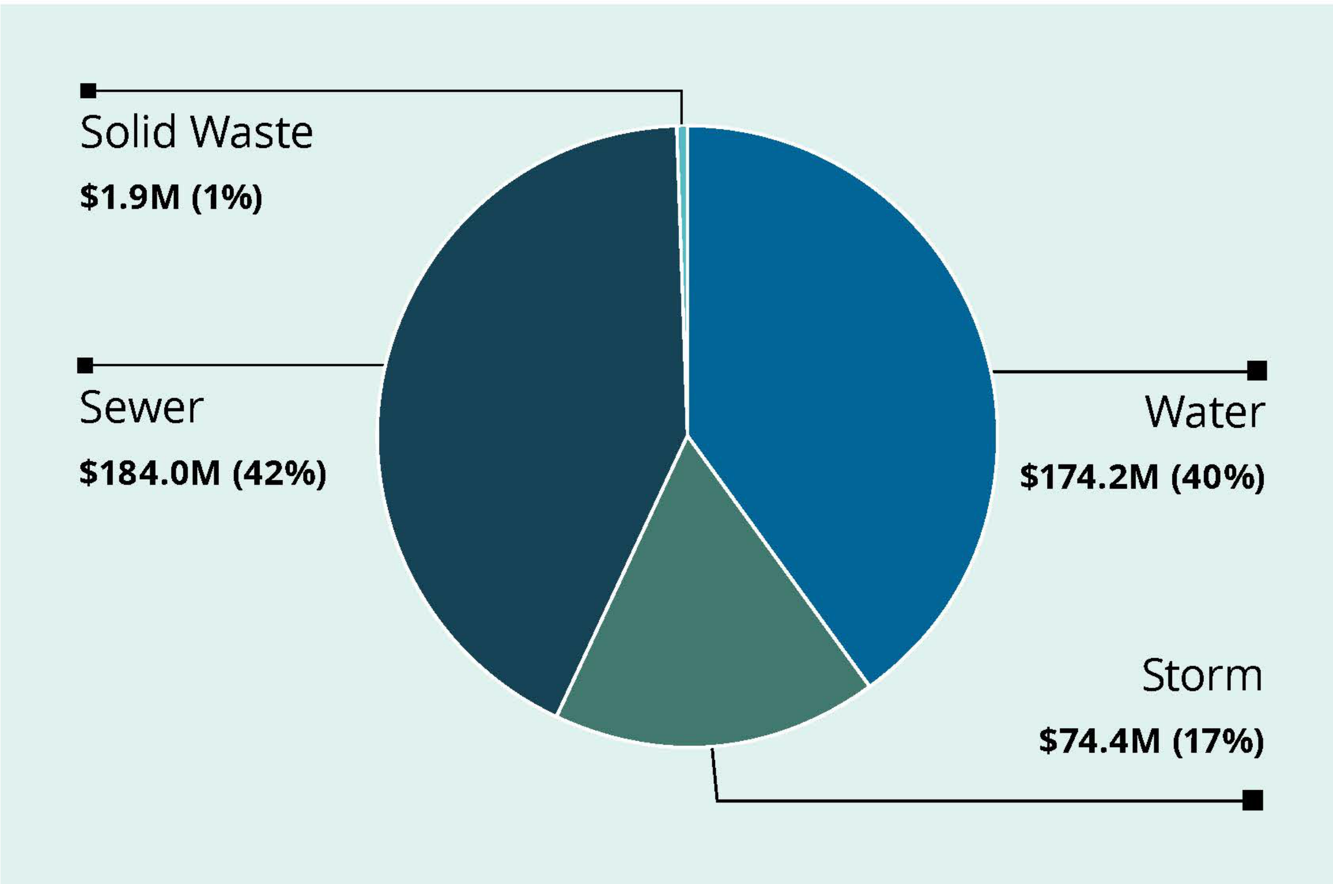
TABLE 10-5

City of Bellevue
Waterworks Utility
Operating Statement
(Years Ending December 31)

	Thousands of Dollars							
	2024 Actuals	2023 Actuals	2022 Actuals	2021 Actuals	2020 Actuals	2019 Actuals	2018 Actuals	2017 Actuals
Service Charges & Fees	$199,902	$185,898	$177,956	$173,013	$157,081	$159,813	$152,318	$146,742
Miscellaneous	8,311	413	3	1,773	62	75	10	14
Total Operating Revenue	$208,213	$186,311	$177,959	$174,786	$157,143	$159,888	$152,328	$146,756
Non-Operating Revenue	7,834	16,809	5,988	1,914	2,829	9,591	6,065	5,845
Total Revenue & Income	$216,047	$203,120	$183,947	$176,700	$159,972	$169,479	$158,393	$152,601
Administrative & General	$ 34,214	$ 31,084	$ 30,588	$ 29,781	$ 28,093	$ 26,184	$ 24,119	$ 20,450
Maintenance & Operations	97,959	94,567	86,312	81,071	78,785	80,693	78,170	79,077
Miscellaneous	15,291	14,277	13,720	13,023	12,077	10,389	10,192	9,126
Total Operating Expenses	$147,464	$139,928	$130,620	$123,875	$118,955	$117,266	$112,481	$108,653
Available for Debt Service	$ 68,583	$ 63,192	$ 53,327	$ 52,825	$ 41,017	$ 52,213	$ 45,912	$ 43,948
Actual Debt Service	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Coverage	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

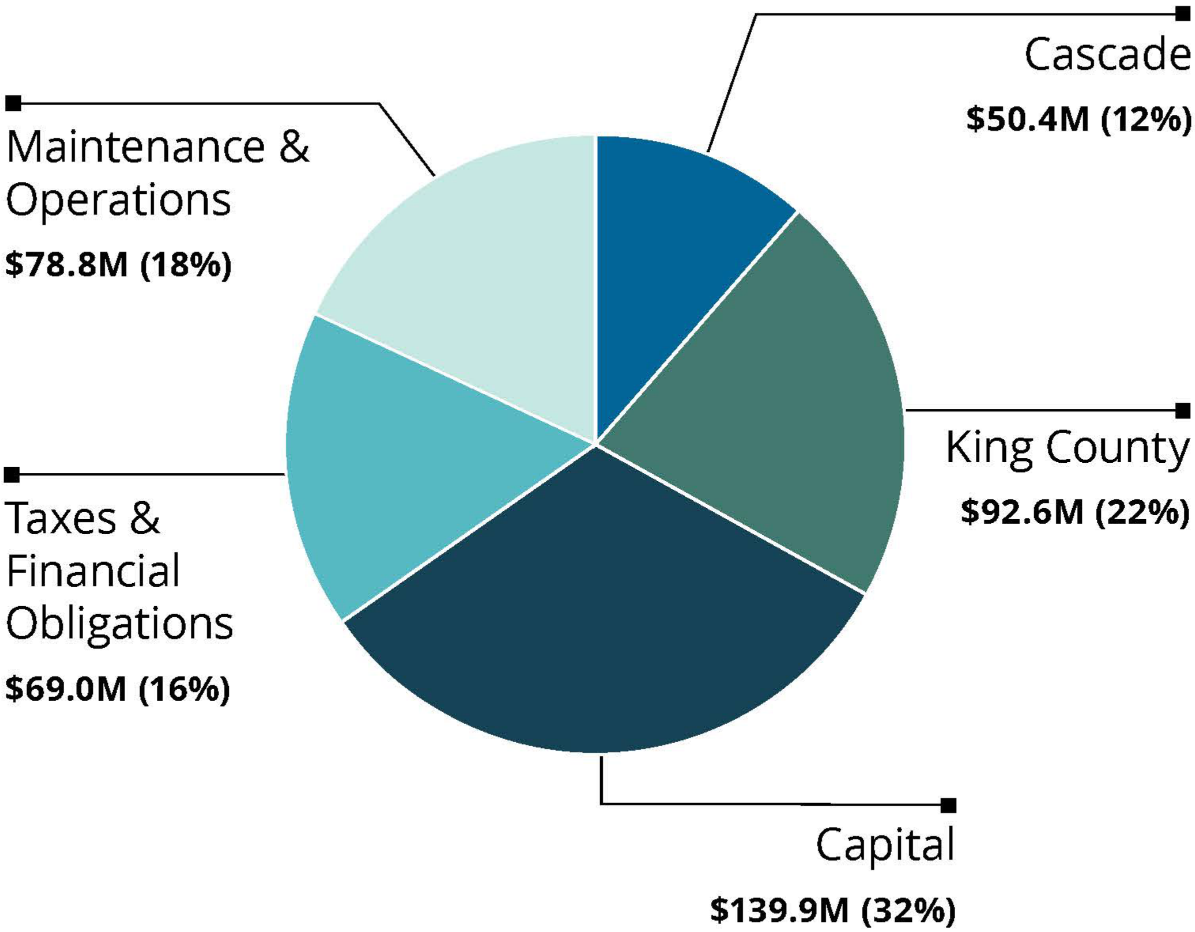
2025-2026 Utilities Operating Revenue Budget

$434.5M Operating Revenue



2025-2026 Operating Expense Budget

$430.7M Operating Expenses



2025-2026 Total Appropriated Budget

	Water	Sewer	Storm	Solid Waste	Total
Operating Expense	$172.5M	$182.7M	$73.4M	$2.1M	**$430.7M**
Asset Replacement Contingencies	$11.5M	$10.1M	$10.1M	$0.0M	**$31.7M**
Operating Contingencies	$10.5M	$3.9M	$0.9M	$0.2M	**$15.5M**
Total Appropriated Budget	**$194.5M**	**$196.7M**	**$84.4M**	**$2.3M**	**$477.9M**

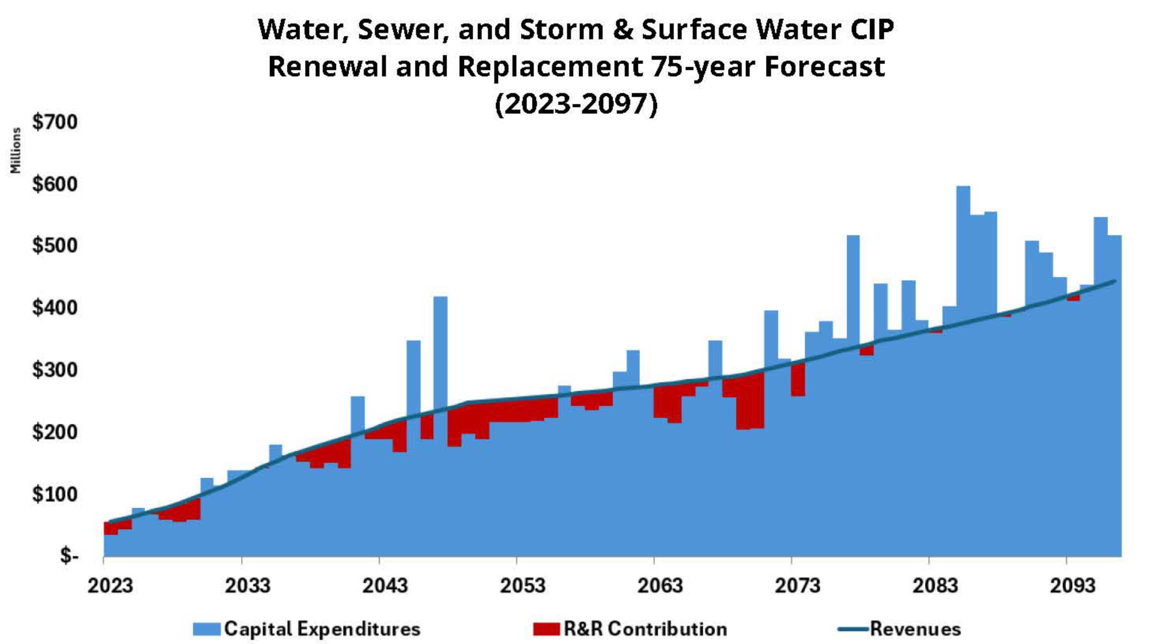
Utilities Budget and Rates

Long-term Renewal and Replacement Fund

City Council created the Renewal and Replacement Fund in 1995 to accumulate funds necessary to replace infrastructure as it ages. This account allows Utilities to:

- Amortize major pending liabilities over a long-time span, while maintaining current service levels
- Keep rate increases gradual and uniform
- Maintain equity – each generation should pay its fair share

Spending on system renewal and replacement will increase significantly in the next ten years to adequately address the needs of aging infrastructure.



Business Line	2025-2026 Budgeted R&R Fund Balances
Drinking Water	$90M
Wastewater (Sewer)	$190M
Storm & Surface Water	$124M

Typical Monthly Single-Family Residential Bill

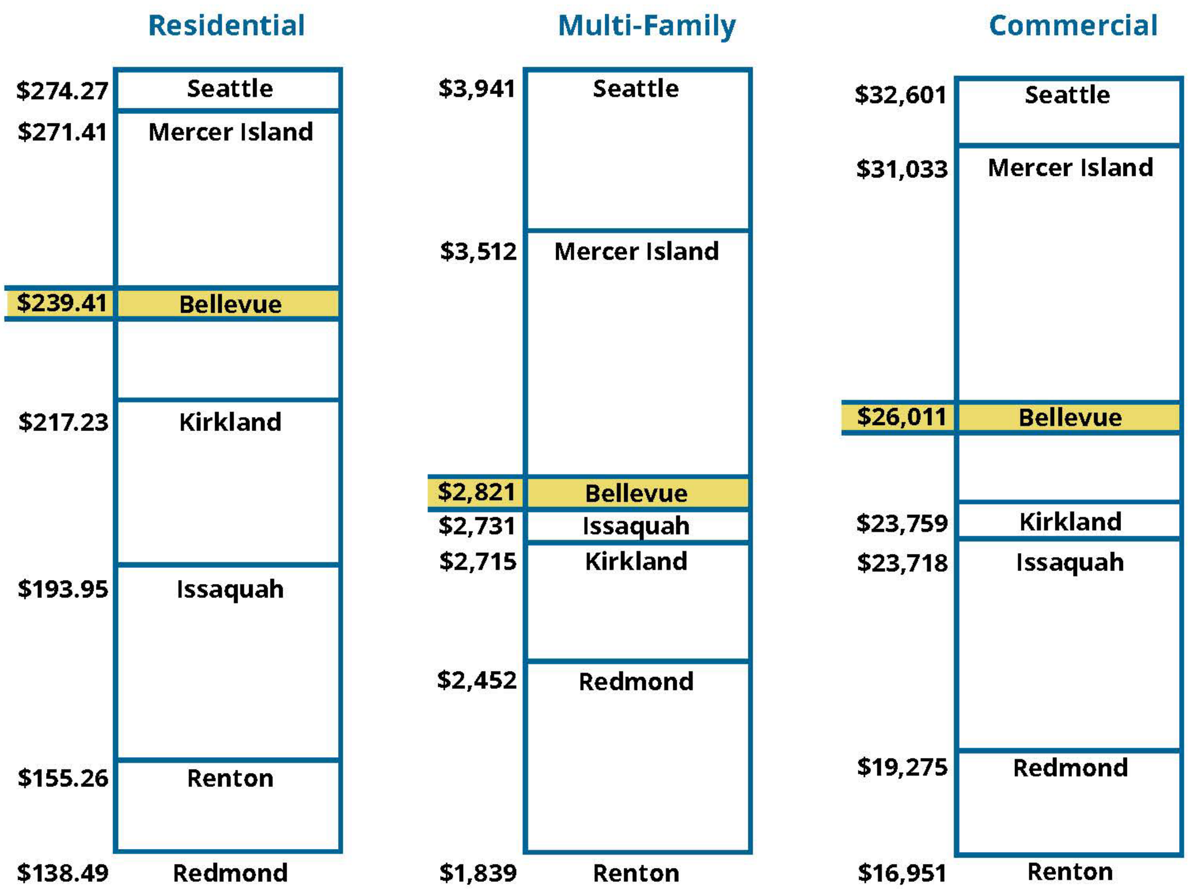
Water	Service Year					
	adopted 2025	adopted 2026	proposed 2027	proposed 2028	proposed 2029	proposed 2030
Rate Revenue Increase	**6.8%**	**4.9%**	**5.7%**	**5.8%**	**6.4%**	**6.4%**
Total Monthly Bill	$88.49	$92.83	$98.13	$103.82	$110.47	$117.54

Sewer	Service Year					
	adopted 2025	adopted 2026	proposed 2027	proposed 2028	proposed 2029	proposed 2030
Rate Revenue Increase	**7.4%**	**7.6%**	**7.6%**	**7.4%**	**8.1%**	**8.1%**
King County	$58.28	$62.36	$70.85	$76.04	$82.61	$89.71
Wastewater Utility	$56.59	$61.23	$62.13	$66.79	$71.79	$77.20
Total Monthly Bill	$114.87	$123.59	$132.98	$142.83	$154.40	$166.91

Storm	Service Year					
	adopted 2023	adopted 2024	proposed 2025	proposed 2026	proposed 2027	proposed 2028
Rate Revenue Increase	**9.2%**	**9.0%**	**6.3%**	**6.3%**	**6.3%**	**6.3%**
Total Monthly Bill	$36.05	$39.29	$41.77	$44.40	$47.20	$50.17

Total	Service Year					
	adopted 2025	adopted 2026	proposed 2027	proposed 2028	proposed 2029	proposed 2030
Total Monthly Bill	$239.41	$255.71	$272.88	$291.05	$312.07	$334.62

Water, Sewer & Surface Water Utilities 2025 Combined Monthly Bill Comparison



Source: Rate information for neighboring cities based on reported 2025 rates.