CHAPTER 9

WATER SYSTEM IMPROVEMENTS

Peaking Storage Booster Pump Station

INTRODUCTION

This chapter presents proposed improvements to the City of Bonney Lake's (City) water system that are necessary to resolve existing system deficiencies and accommodate the projected growth of water customers. The water system improvements were identified from an evaluation of the results of the water system analyses presented in **Chapter 7 – *Water System Analysis***. The water system improvements were sized to meet both the existing and future demand conditions of the system.

A Capital Improvement Program number, herein referred to as a CIP number, has been assigned to each improvement. Water main and facility improvements are shown in **Figure 7 – *Proposed Water System Improvements (10-year and 20-year CIP)***. Improvements to the configuration of

the City's pressure zones are shown in **Figure 8 – *Proposed Pressure Zones***. The improvements are also illustrated in the hydraulic profile of the future water system that is shown in **Figure 9 – *Proposed Hydraulic Profile***. The improvements are organized and presented in this chapter according to the following categories.

- Water Main Improvements
    - Leaky Water Main Replacements
    - Transmission Main Improvements
    - Replacement Program
- Supply Improvements
- Storage Improvements
- Facility Improvements
- Pressure Zone Improvements
    - New Pressure Zones
    - Pressure Reducing Station Improvements
    - Pressure Relief Station Improvements
- Planning and Operational Improvements
- Annual Programs
- Developer-funded Improvements

The remainder of this chapter presents a brief description of each group of improvements, the criteria for prioritizing, the basis for the cost estimates, and the schedule for implementation.

DESCRIPTION OF IMPROVEMENTS

This section provides a general description of each group of improvements and an overview of the deficiencies they will resolve. Most of the improvements are necessary to resolve existing system deficiencies. However, several improvements have also been identified for some undeveloped areas to illustrate the major facilities that will be required when development occurs in those areas. Additional developer-funded projects include localized, on-site water main improvements that are not associated with overall water distribution, but are necessary when the property served by the water main is redeveloped or expanded. The costs associated with these improvements shall be borne by the developers, rather than the existing water customers. The CIP list is shown in **Table 9-1 – *Proposed Improvements Implementation Schedule (10-year CIP)***.

Table 9-1
Proposed Improvements Implementation Schedule (10-year CIP)

CIP No.	Description	Estimated Cost	Year	$/Year
S1	CWA Water Rights Purchase (White River and TPU)	$ 391,000	2018	$ 1,905,000
F	General Equipement	$ 173,000	2018	
F2	SCADA Telemetry Upgrade	$ 142,000	2018	
F1	Emergency Generator Upgrade - Tacoma Point	$ 115,000	2018	
F4	Public Works Center	$ 750,000	2018	
P1	Water System Plan Update	$ 25,000	2018	
S2	South Prairie Intertie - Additional Booster Pumps	$ 59,000	2018	
WM1	Flume Trestle Rehabilitation	$ 250,000	2018	
F	General Equipement	$ 175,000	2019	$ 2,516,000
F2	SCADA Telemetry Upgrade	$ 165,000	2019	
S1	CWA Water Rights Purchase (White River and TPU)	$ 391,000	2019	
ST2	Tacoma Point Water Reservoir Replacement (Design)	$ 350,000	2019	
S2	South Prairie Intertie - Additional Booster Pumps	$ 460,000	2019	
F3	Ball Park Wells Cooling System	$ 50,000	2019	
ST1	Ponderosa 748 Reservoir Recoating (Internal and External)	$ 675,000	2019	
WM2	24th Street East Water Main Replacement	$ 250,000	2019	
F	General Equipement	$ 110,000	2020	$ 4,860,000
ST2	Tacoma Point Water Reservoir Replacement	$ 4,500,000	2020	
WM3	36th Street East Water Main Replacement	$ 250,000	2020	
PZ1	Pressure Relief Stations	$ 58,000	2021	$ 374,000
PZ2	Northwest Plateau Pressure Zone Improvements	$ 44,000	2021	
PZ3	Southwest Plateau Pressure Zone Improvements	$ 22,000	2021	
WM4	Cedar View Water Main Replacement Program (Design)	$ 250,000	2021	
F5	Grainger Springs Upgrades (Construction)	$ 1,375,000	2022	$ 2,588,000
WM4	Cedar View Water Main Replacement Program	$ 1,213,000	2022	
ST3	Lakeridge 810 Zone Reservoir	$ 4,480,000	2023	$ 4,480,000
P3	Telemetry Upgrade Program	$ 50,000	2024	$ 2,870,000
F6	Victor Falls Metering Improvement	$ 110,000	2024	
P2	Develop Unilateral Flushing Program	$ 50,000	2024	
ST4	Lakeridge 748 Zone Water Reservoir	$ 2,660,000	2024	
F8	Pump Replacement Program	$ 50,000	2025	$ 2,910,000
F7	Victor Falls Upgrades	$ 1,000,000	2025	
WM5	Interlake Island/Inlet Lake Bed Crossing Water Main Replac	$ 500,000	2025	
WM6	192nd Water Main Replacement	$ 560,000	2025	
WM7	12" Water Main Replacement - Myers Road - To City Limits	$ 800,000	2025	
F9	Victor Falls Watershed Fencing	$ 605,000	2026	$ 3,455,000
P4	Wellhead Protection Program	$ 500,000	2026	
ST5	Reservoir Recoating Program	$ 500,000	2026	
WM9	16" Replacement - Sumner Buckley Highway	$ 1,020,000	2026	
WM8	La Rita Drive & 107th Street East Water Main	$ 830,000	2026	
P1	Water System Plan Update	$ 200,000	2027	$ 4,470,000
P5	Security System Updates	$ 350,000	2027	
PZ4	Wholesale 800 to 748 Zones Connection	$ 550,000	2027	
WM11	16" Water Main Replacement- BPA Alignment	$ 1,840,000	2027	
WM10	West Tapps Drive Water Main	$ 1,530,000	2027	
WM12	Myers Road Water Main	$ 1,850,000	2028	$ 1,850,000

Table 9-2
Proposed Annual Programs

CIP No.	Description	Estimated Cost	Year
A1	Flushing Program	$ 30,000	Annually
A2	Valve and Fire Hydrant Program	$ 18,000	Annually
A3	Reservoir Video and Inspection/Repair Program	$ 42,000	Annually
A4	Leak Detection Program	$ 30,000	Annually
A5	Meter Replacement Program (Radio Read)	$ 280,000	Annually
A6	Infrastructure Renewal Program	$ 170,000	Annually
A7	New Service Connections - Meter Installation Program	$ 100,000	Annually
A8	R&M - Replacement and Unscheduled Projects	$ 155,000	Annually

Water Main Improvements

The following water main improvements were identified from the results of the distribution and transmission system analyses discussed in **Chapter 7 – *Water System Analysis***. Water main improvements that are more specific to solving a major problem, or are larger diameter water mains that function more like transmission than distribution mains, are identified as individual projects (CIP WM1). Distinctions between design phases and construction phases are also made. Most system improvement projects are shown on **Figure 7 – *Proposed Water System Improvements*.**

All new water main extensions and replacements shall be installed in accordance with the City's Development Policies and Public Works Design Standards, which are included in **Appendix D – *Water System Standards*** (water system portion only). All new water mains shall be ductile iron pipe and sized by hydraulic analysis to ensure that all pressure, flow, and velocity requirements, as stated in **Chapter 5 – *Policies and Design Criteria***, are met. In general, new water mains that will carry fire flow in residential areas shall be a minimum of 8 inches in diameter and looped for multi-family residential developments and single-family transmission purposes. New water mains in commercial, business park, industrial, and school areas shall be a minimum of 12 inches in diameter and looped.

CIP WM1: Flume Trestle Rehabilitation

Deficiency: The existing flume is showing signs of wear and tear.

Improvement: Rehabilitate the existing flume to improve the capacity and extend the useful life.

CIP WM2: 24th & 25th Streets East Water Main Replacement

Deficiency: Water main between 24th Street East and 25th Street East is 4-inch PVC that has experienced multiple leak repairs. The water main is also under sized to provide adequate fire flow protection for the residences at 25th St East.

Improvement: Replace existing water main with 8-inch C900 PVC and install a fire hydrant at the 25th Street East.

CIP WM3: 36th Street East Water Main Replacement

Deficiency: Water main along 36th Street East is undersized and constructed of sub-standard material (cast iron and PVC). This project is needed to establish adequate fire flow capacity and re-stablish transmission capacity in the 748 Pressure Zone after reconfiguration of the Lakeridge 810 Pressure Zone.

Improvement: Install new 8-inch ductile iron water main along 36th Street East between 166th Avenue East and Sumner Tapps Highway East.

CIP WM4: **Cedar View Water Main Replacement Program**

Deficiency: Water mains throughout the Cedar View neighborhood are of substandard materials and undersized. In addition, this is an area that has been targeted by City staff as being prone to leaking. Portions of water main in this area will be replaced as part of the Leaking Water Main project, but the majority of the water main will still need to be replaced. It is anticipated that this project will be timed to coincide with the extension of sanitary sewers into the area.

Improvement: Install new 8-inch DI water main throughout the Cedar View neighborhood as necessary to replace existing 2-inch polyvinyl chloride (PVC), 4-inch steel water mains, and 4-inch asbestos cement (AC) pipe.

CIP WM5: Inlet Island to Interlake Island Lakebed Crossing

Deficiency: The existing lakebed crossing between Inlet Island and Interlake Island should be replaced due to its age and the size.

Improvement: Install new 12-inch high density polyethylene (HDPE) water main along the lakebed from Inlet Island to Interlake Island and new 12-inch ductile iron pipe along Interlake Island to West Tapps Drive. Permits and easements from the then current owner of the lakebed, Cascade Water Alliance, will be required.

CIP WM6: 192nd Water Main Replacement

Deficiency: Transmission capacity between State Route (SR) 410 and Rhodes Lake Road needs to be improved. In addition, roadway improvements are planned for the 192nd Avenue East corridor.

Improvement: Install new 12-inch ductile iron water main from SR 410 to approximately 101st Street East to replace the existing 6-inch steel water main. This will improve transmission capacity and fire flows to the area.

CIP WM7: 12-inch Water Main Replacement Myers Road to City Limits

Deficiency: Transmission capacity along the west side of the Lakeridge 810 Pressure Zone needs to be increased to accommodate growth in the south end of that zone and to improve fire flows to the existing system.

Improvement: Install new 12-inch ductile iron water main along Myers Road between 70th Street East and 182nd Avenue East. Replace existing 6-inch steel, cast iron, and ductile iron pipe.

CIP WM8: La Rita Drive and 107th Street East Water Main Replacement

Deficiency: Water main in the Ponderosa Estates area is undersized and constructed of sub-standard material (steel).

Improvement: Install new 8-inch ductile iron water main along La Rite Drive East and 107th Street East between 202nd Avenue East and 108th Street East.

CIP WM9: 16-inch Replacement Sumner Buckley Highway

Deficiency: The existing 12-inch cast iron water main along Sumner Buckley between SR 410 and Angeline Road is a central hub for dispersing Grainger Springs water to the system and moving water from the south end of the system to the central part of the system. This main should be replaced due to its age and to improve connections between the north and central part of the system.

Improvement: Install new 16-inch ductile iron water main along Sumner Buckley Highway from SR 410 to Angeline Road.

CIP WM10: West Tapps Drive Water Main

Deficiency: Water main along West Tapps Drive is undersized and constructed of sub-standard material (AC).

Improvement: Install new 8-inch ductile iron water main along West Tapps Drive and 41st Street Court East between Lakeridge Drive East and the east end of 41st Street Court East.

CIP WM11: 16-inch Water Main Replacement BPA Alignment

Deficiency: The north/south transmission capacity along the west side of Lake Tapps between the Tacoma Point area and the Lakeridge tank area needs to be improved.

Improvement: Install new 16-inch ductile iron water main along the booster pump station (BPS) easement between 33rd Street Court East and Tapps Drive East to replace the existing 8-inch steel main.

CIP WM12: 12-inch Water Main Replacement Myers Road inside City Limits

Deficiency: Transmission capacity along the west side of the Lakeridge 810 Pressure Zone needs to be increased to accommodate growth in the south end of that zone and to improve fire flows to the existing system.

Improvement: Install new 12-inch ductile iron water main along Myers Road between 70th Street East and SR 410. Replace existing 6-inch steel, cast iron, and ductile iron pipe.

Supply Improvements

The City has agreed to purchase wholesale water from the City of Tacoma (Tacoma) that is necessary to accommodate projected growth.

CIP S1: Cascade Water Alliance Water Rights Purchase (White River and Tacoma Public Utilities (TPU))

Deficiency: The City needs to obtain additional source of supply to meet additional peak day demands.

Improvement: Purchase 2 million gallons per day (MGD) from Cascade Water Alliance to meet peak day demands.

CIP S2: South Prairie Intertie Additional Booster Pumps

Deficiency: The existing pump station has reached its initial capacity.

Improvement: Install the remaining pumps within the station.

Storage Improvements

The following water system storage improvements were identified from the results of the water system analyses that are discussed in **Chapter 7 – *Water System Analysis***. The improvements are primarily necessary to resolve existing system deficiencies, but have also been sized to accommodate projected growth.

CIP ST1: Ponderosa 748 Water Reservoir Recoating (Internal and External)

Deficiency: The City's existing Ponderosa 748 water reservoir requires periodic inspections and cleaning and recoating to maintain the integrity of the structures.

Improvement: Clean and recoat the reservoir. Replace reservoir vent and ladder. Add fall protection and safety equipment.

CIP ST2: Tacoma Point Water Reservoir Replacement

Deficiency: The City's Tacoma Point Reservoir is too small, has an inadequate overflow elevation, and needs to be painted and seismically retrofitted.

Improvement: Remove and replace the existing tank with a taller, larger diameter reservoir. It is anticipated that this reservoir will have a diameter of 70 feet and a volume of 3.2 MG.

CIP ST3: Lakeridge 810 Zone Reservoir

Deficiency: The City does not currently have a storage facility in this zone.

Improvement: Select and obtain a property for the Lakeridge 810 Reservoir that has an optimum ground elevation and is conducive to permitting a tall water tank. Construct a new reservoir in the upper elevations of the 810 Zone to provide gravity storage for existing and future customers. The new reservoir will have an overflow elevation of approximately 810 feet. The new reservoir will be sized to provide approximately 1.3 MG of usable storage.

CIP ST4: Lakeridge 748 Zone Water Reservoir

Deficiency: Additional storage capacity is required to accommodate growth. It is estimated that 1.9 MG of storage capacity will be required to accommodate projected growth through 2035.

Improvement: Construct a new reservoir in the 748 Pressure Zone to provide gravity storage to the water system. The new reservoir will have an overflow elevation of 748 feet and needs to be sized to provide approximately 1.9 MG of usable storage. The preferred location for this reservoir is in the central part of the water a system, since there are no sources of supply in this location.

CIP ST5: Reservoir Recoating Program

Deficiency: The City's existing water tanks require periodic inspections and cleaning and recoating to maintain the integrity of the structures.

Improvement: Inspect the interior and exterior of each reservoir and determine where cleaning or other improvements are required. Clean and recoat the reservoirs as necessary. Replace reservoir vent and ladder. Add fall protection and safety equipment.

Facility Improvements

The following water system facility improvements were identified from the results of the water system analyses that are discussed in **Chapter 7 – *Water System Analysis***. The improvements are primarily necessary to resolve existing system deficiencies, but have also been sized to accommodate projected growth.

CIP F1: Emergency Power Generator at Tacoma Point

Deficiency: The City's existing emergency generator at the Tacoma Point Wellfield is old and needs to be replaced.

Improvement: Replace the existing generator and automatic transfer switch.

CIP F2: SCADA Telemetry Upgrade

Deficiency: The City's telemetry system is outdated.

Improvement: Upgrade the City's supervisory control and data acquisition (SCADA) telemetry system.

CIP F3: Ball Park Wells Cooling System

Deficiency: During warm days the pump station will overheat the motors and controls.

Improvement: Install air conditioning units and louvers to help prevent overheating of the system.

CIP F4: Public Works Yard

Deficiency: The City has outgrown its Public Works Yard. Currently, the City is in the process of constructing a new Public Works Center at the City-owned Peaking Storage site on 96th Street East.

Improvement: Participate in the design and funding of a new Public Works shops and maintenance facility.

CIP F5: Grainger Springs Upgrades

Deficiency: The City's Grainger Springs pump building needs to be upgraded.

Improvement: Replace the existing building, piping, electrical, generator, and automatic transfer switch.

CIP F6: Victor Falls Metering Improvements

Deficiency: Currently, the City does not meter the flows from the individual spring collection boxes. This is an important step in demonstrating the appropriate withdrawals associated with each water right.

Improvement: Install flow meters and reconfigure piping, as necessary, to meter each of the three collection boxes separately.

CIP F7: Victor Falls Upgrades

Deficiency: The City's Victor Falls Springs pump building needs to be upgraded.

Improvement: Replace the existing building, piping, electrical, generator, and automatic transfer switch. Improve site access.

CIP F8: Pump Replacement Program

Deficiency: The pumps and motors for the City's sources need to be periodically replaced due to wear and tear and other mechanical failures.

Improvement: Install new meters and or pumps as required.

CIP F9: Victor Falls Springs Watershed Fencing

Deficiency: The City's Wellhead Protection Program identified the need to more adequately secure the Victor Falls Springs collection boxes from vandalism and inadvertent intrusion.

Improvement: Install fencing improvements around the three spring collection boxes.

Pressure Zone Improvements

The following pressure zone improvements will enhance how the pressure reducing valves (PRVs) in the Angeline Valley area work together and provide for development of the western slopes of the Lake Tapps plateau in the Forest Canyon area.

CIP PZ1: Pressure Relief Stations

Deficiency: Many of the City's existing pressure zones do not have adequate pressure relief capacity in the event of an emergency over-pressurization of the City's system, including Lake Tapps Estates, and Ruby Ridge.

Improvement: The City will find appropriate locations to discharge water from the system under emergency conditions and install pressure relief stations at these locations. Preliminary evaluations indicate that the Bonney Lake 748 Zone, the Ponderosa 800 Zone, and the Lakeridge 810 Zone could all use additional pressure relief capacity. It is assumed that the City will identify sites and install two pressure relief stations per year for a period of 3 years.

CIP PZ2: Northwest Plateau Area Pressure Zone Improvements

Deficiency: Much of the northwest plateau area around Forest Canyon Road and west of the Lakeridge 810 Pressure Zone is currently not developed. As development occurs in these areas, the existing zones will need to be reconfigured and new zones established.

Improvement: Most of the pressure reducing stations required to make the improvements in the area will be funded by developer extensions. However, several new stations and water main connections may be required to be accomplished by the City.

CIP PZ3: Southwest Plateau Area Pressure Zone Improvements

Deficiency: The existing Angeline Valley Zone has too many PRVs, dead-end pipes, and zone valves, and does not cover enough area. In addition, developments along the steep western slope of the Panorama West and Sky Island areas necessitate the need for additional pressure reducing stations.

Improvement: Most of the pressure reducing stations required to make the improvements in the area will be funded by developer extensions. However, several valve replacements, adjustments, vault removals, and water main connections may be required to be accomplished by the City.

CIP PZ4: Wholesale 800 and 748 Zones Connection

Deficiency: A transmission main allowing wholesale intertie water to be supplied from the 800 Pressure Zone to the 748 Pressure Zone will be required to transmit wholesale water into the core of the City's water system.

Improvement: Install 12-inch ductile iron water main from the south of SR 410 along 214th Avenue East to the 16-inch transmission main located near 214th Avenue East and 96th Street East.

Planning and Operational Improvements

The following are planning efforts and operational program elements that are required to comply with various state water regulations and improve the system's operations.

CIP P1: Water System Plan Update

Deficiency: Washington Administrative Code (WAC) 246-290-100 requires that the City's Water System Plan be updated every 10 years and submitted to the Washington State Department of Health (DOH) for review and approval.

Improvement: The City will update and submit its Water System Plan every 10 years to comply with DOH requirements.

CIP P2: Flushing Program

Deficiency: Systematic flushing of the City's water system will help ensure the water system provides the highest quality water possible.

Improvement: Establish a unilateral flushing program that is well conceived and easy to administer so that Public Works staff can conduct the program with confidence.

CIP P3: Telemetry Upgrade Program

Deficiency: The City's telemetry system needs to be maintained and updated periodically.

Improvement: Upgrade both software and hardware within the City's telemetry and SCADA system to improve reliability and accommodate advances in technology.

CIP P4: Wellhead Protection Program

Deficiency: The City needs to update and revise its Wellhead Protection Plan to DOH and Ecology requirements.

Improvement: Update the City's Wellhead Protection Plan and fund potential improvements to enhance the protection of the City's water sources and recharge areas.

CIP P5: Security System Updates

Deficiency: Facilities throughout the City's water system are susceptible to vandalism and theft.

Improvement: Upgrade and establish security systems that monitor facilities continuously and alert City staff to intruders.

Annual Programs

The following programs will be performed on an annual basis.

CIP A1: Flushing Program

Deficiency: Systematic flushing of the City's water system will help ensure that the water system provides the highest quality water possible.

Improvement: Conduct a unilateral flushing program to specific parts of the water system according to the Flushing Program.

CIP A2: Valve and Fire Hydrant Program

Deficiency: The ability to easily locate and operate valves and fire hydrants in emergency situations is imperative to a timely response.

Improvement: Conduct valve and fire hydrant maintenance according to the established program.

CIP A3: Reservoir Video and Inspection/Repair Program

Deficiency: Cleaning of reservoir exteriors prolongs the life of the reservoir surface and improves reservoir appearances.

Improvement: Clean roofs of concrete reservoirs and pressure wash steel reservoirs.

CIP A4: Leak Detection and Water Use Efficiency Program

Deficiency: The City needs to monitor its system annually to identify leaking water mains. Several water conservation measures must be carried out on an ongoing basis to comply with DOH water use efficiency requirements.

Improvement: The City will continue to implement its comprehensive leak detection/water main repair program to further reduce the amount of distribution system leakage. The City will perform other ongoing conservation measures, including public education programs, as outlined in **Appendix C – *Water Use Efficiency Program***. The City budgets $45,000 per year for this program, which includes leak detection and a limited amount of water main repairs.

CIP A5: Meter Replacement Program (Radio Read)

Deficiency: The City currently uses a significant amount of staff time to read customer water meters. Only 4,000 meters have been converted to the radio read system to date.

Improvement: The City will continue to install radio read meter systems on all remaining customer meters. The City budgets $250,000 per year for this program. This number is adjusted annually and will be $257,000 in 2016.

CIP A6: Infrastructure Renewal Program

Deficiency: As the system ages, there will be a need to replace parts and appurtenances.

Improvement: Replace aging infrastructure.

CIP A7: New Service Connections/Meter Installation Program

Deficiency: As lots develop within the service area, new meters will be required.

Improvement: Provide new service connections and meters to proposed developments.

CIP A8: Repair and Maintenance (R&M) – Replacement and Unscheduled Projects

Deficiency: Emergency water line and unscheduled projects that occur during the year.

Improvement: Provide improvements for unscheduled projects.

Developer-funded Improvements

Improvements have been identified for the undeveloped areas of the City's existing and expected service area to illustrate the major facilities that will be required to properly serve those areas. Additional developer-funded projects include localized on-site water main improvements that are not associated with overall water distribution, but would be necessary if the property served by the water main is redeveloped or expanded. Although locations of many possible developer-funded facilities are shown schematically in **Figure 7 – *Proposed Water System Improvements***, no attempt has been made to predict all improvements that may be required to reach buildout, or to comprehensively plan or delineate individual improvements required to serve specific areas or developments.

ESTIMATING COSTS OF IMPROVEMENTS

Project costs for the proposed improvements were estimated based on costs of similar, recently constructed water projects in Bonney Lake and around the Puget Sound area, and are presented in 2015 dollars. The cost estimates include the estimated construction cost of the improvement and indirect costs estimated at 35 percent of the construction cost for engineering preliminary design, final design, and construction management and contract administration services, permitting, legal, and administrative services. The construction cost estimates include a 10-percent contingency and sales tax of 9.3 percent.

Construction cost estimates for water main projects were determined from the water main unit costs (i.e., cost per foot length) shown in **Table 9-3 – *Water Main Unit Costs***, and the proposed diameter and approximate length of each improvement.

Table 9-3
Water Main Unit Costs

Water Main Diameter	Construction Cost[1]
8-inch	$170/LF
12-inch	$194/LF
16-inch	$290/LF

Note:
[1] Based on 2018 dollars.
LF = linear foot

The unit costs for each water main size are based on estimates of all construction-related improvements, such as materials and labor for the water main installation, water services, fire hydrants, fittings, valves, connections to the existing system, trench restoration, asphalt surface restoration, and other work necessary for a complete installation. The unit costs also include a contingency and sales tax. Additional costs were added to some water main improvements to cover anticipated increased costs related to the project location and degree of difficulty.

PRIORITIZING IMPROVEMENTS

The water system improvements were prioritized from established criteria to formulate a schedule that identifies projects with the most deficiencies and greatest need for improvement to be completed prior to projects with fewer deficiencies. A description of the criteria and method for prioritizing each category of improvements is provided below.

Water Main Improvements

Table 9-4 – ***Water Main Improvements Priority Ranking Criteria*** lists criteria that were established for prioritizing the water main improvements. The criteria are based on the underlying deficiencies of the existing water main that will be replaced. The criteria are arranged in four different categories, with a weight factor assigned to each category. The criterion given the most weight is the "Existing Water Main Fire Flow Capability" category.

Table 9-4
Water Main Improvements Priority Ranking Criteria

Points	Category	Weight Factor	Weighted Points
	Existing Water Main Fire Flow Capability		
3	Available Fire Flow is 69%	4	12
2	Available Fire Flow is 70%-89% of Required Fire Flow	4	8
1	Available Fire Flow is 90%-100% or more of Required Fire Flow	4	4
	Existing Water Main Year of Installation		
3	Before 1960	3	9
2	1960-1980	3	6
1	After 1980	3	3
	Existing Water Main Material		
3	PVC	3	9
2	Steel or Galvanized Iron	3	6
1	Asbestos Cement	3	3
	Existing Water Main Benefit Area		
3	Large Benefit Area (i.e., transmission main)	2	6
2	Medium Benefit Area	2	4
1	Small Benefit Area (i.e., localized area)	2	2

Notes:
High Priority = 27 to 36 points
Medium Priority = 24 to 26 points
Low Priority = 12 to 23 points

The "Existing Water Main Fire Flow Capability" category ranks the water main improvements based on the ability of the existing water mains to provide the required fire flow as determined by the results of the hydraulic analyses addressed in **Chapter 7 – *Water System Analysis***. The "Existing Water Main Year of Installation" category ranks the water main improvements based on the age of the existing water mains. The "Existing Water Main Material" category ranks the water main improvements based on the material of the existing water main. The "Existing Water Main Benefit Area" category ranks the water main improvements based on the size of the area that will benefit from the water main replacement.

The water main priority ranking criteria were applied to the water main replacement projects, which are grouped under CIP WM1 through WM32, as shown in **Figure 7 – *Proposed Water System Improvements*** and presented in the 6-year, 10-year, and 20-year CIP tables. Some modifications priority rankings were made to group different water main alignments into single projects according to their proximity.

Other Improvements

The pressure zone, pressure reducing station, and facility improvements were prioritized based on existing deficiencies, safety concerns, maintenance requirements, and capacity requirements. The miscellaneous improvements were prioritized based on regulatory requirements and an assessment of water system needs. The priority order of these improvements is reflected in the schedule of improvements, which is presented in the next section.

SCHEDULE OF IMPROVEMENTS

The results of prioritizing the improvements assisted with establishing an implementation schedule that can be used by the City for preparing its 6-year CIP and yearly water budget. The implementation schedule for the proposed improvements is shown in **Table 9-1 – *Proposed Improvements Implementation Schedule (10-year CIP)*** and **Table 9-5 – *Proposed Improvements Implementation Schedule (20-year CIP).***

Future Project Cost Adjustments

All cost estimates shown in the tables are presented in year 2015 dollars. Therefore, it is recommended that future costs be adjusted to account for the effects of inflation and changing construction market conditions at the actual time of project implementation. Future costs can be estimated using the Engineering News Record (ENR) Construction Cost Index for the Seattle area, or by applying an estimated rate of inflation that reflects the current and anticipated future market conditions.

Table 9-5
Proposed Improvements Implementation Schedule (20-year CIP)

CIP No.	Description	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Water Main Improvements											
WM13	Jenks Point Way	$ 300,000									
WM14	189th CT East	$ 450,000									
WM15	58th Street East & 59th Street East	$ 750,000									
WM16	193rd Avenue CT East	$ 375,000									
WM17	Banker's Island		$ 750,000								
WM18	184th Avenue East		$ 250,000								
WM19	43rd Street East/183rd Avenue East		$ 350,000								
WM20	185th Avenue East		$ 300,000								
WM21	Bonanza Drive		$ 1,130,000								
WM22	202nd Avenue East			$ 880,000							
WM23	108th Street East			$ 630,000							
WM24	178th Avenue East			$ 750,000							
WM25	Bonney Lake Boulevard				$ 1,950,000						
WM26	West Tapps Highway					$ 750,000					
WM27	Church Lake Road					$ 750,000					
WM28	206th Avenue East					$ 750,000					
WM29	Locust Avenue East						$ 1,500,000				
WM30	Sumner Tapps Highway East						$ 500,000				
WM31	Water Main Replacements							$ 2,500,000			
WM32	Water Main Replacements								$ 2,500,000		
WM33	Water Main Replacements									$ 2,500,000	
WM34	Water Main Replacements										$ 2,500,000
Storage Improvements											
ST6	Repainting Program		$ 500,000				$ 500,000				
Facility Improvements											
F8	Pump Replacement Program		$ 50,000					$ 50,000			
F10	Water Quality Treatment	$ 1,000,000									
Planning and Operational Improvements											
P1	Water System Plan Update									$ 200,000	
P3	Telemetry Upgrades	$ 50,000					$ 50,000				
P6	Reclamation and Reuse Program					$ 1,000,000					
	GRAND TOTAL	**$ 2,925,000**	**$ 3,330,000**	**$ 2,260,000**	**$ 1,950,000**	**$ 3,250,000**	**$ 2,550,000**	**$ 2,550,000**	**$ 2,500,000**	**$ 2,700,000**	**$ 2,500,000**